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PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Snap Action Electric Switch

We, TATEISI ELECTRONICS COMPANY, a company duly organised under the laws of Japan, locating at 10 Tsuchido-Cho Hanazono, Ukyo-Ku, Kyoto City, Japan, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to improvements in electric switches, more particularly, in electric switches having snap acting mechanisms.

At present numerous switches having snap acting mechanisms are suggested. In one such switch, however, since members corresponding to tension member, and contact carrier of the present invention as hereinafter described are integrally formed by one element, bending, tensile, distorting, compressive and the like forces act in complicated manner upon a diverging portion of the element during operation of the switch, whereby unsustainable stress is created at the portion and said portion tends to be broken or the snap action of the switch impaired.

As a means to overcome the above described objections it has been suggested that, instead of composing said tension member and contact carrier into one element, said two members be formed separately and connected to each other in engagement so as to operate relatedly. However, when the tension member and contact carrier are engaged in this manner, the electric circuit including a terminal member of the switch contains two engaging portions. Thus the electric resistance is increased. Further, such an increased resistance means that when switching on and off a large electric current, heat is generated in the circuit including the terminal member. When switching on and off extremely small electric current of several tens of mm A, for example, the stability of the circuit is impaired.

The principal object of the present invention, therefore, is to provide a useful and practical novel snap action electric switch in which the above mentioned disadvantages are obviated.

A further object of the invention is to provide a snap action electric switch which has high resistance to vibration and shock and which is stable and has an improved snap action.

According to the invention there is provided a snap action electric switch comprising an actuating member swingably engaged at one point with a terminal member, a contact carrier provided with a longitudinally compressible spring portion, and having one end engaged with said terminal member, the other end of said contact carrier being unsupported and carrying a movable contact located between stationary contacts, and a tension member pivotally engaged with said actuating member at a point near to one end of said tension member, said tension member being pivotally engaged, at a point near its other end, with said contact carrier at a point between said longitudinally compressible spring portion and said contact, the actuating member being swingably engaged to constrain the point of engagement of the tension member and the actuating member to move on an arc about the point of engagement of the actuating member and the terminal member from one side to the other side of an imaginary line, extending through the points of engagement of the contact carrier, so that on movement of said actuating member the movable contact snaps back and forth between respective positions in which it engages said stationary contacts.

The invention will be described further, by way of example with reference to the accompanying drawings, in which:—

Fig. 1 is a side view of a switch in accordance with the present invention;

[Price 5s. 0d.]

Price 25p

Fig. 2 is a side view similar to Fig. 1, showing contacts of the switch in an opposite position;

Fig. 3 is a view in perspective on an enlarged scale of only a tension member and a contact carrier of a switch in accordance with the invention, said parts being disassembled;

Fig. 4 is a side view on an enlarged scale of the tension member and contact carrier of a switch constructed in accordance with the invention; and

Fig. 5 is a perspective view on an enlarged scale of an actuating member of a switch in accordance with the invention.

Now, referring to Fig. 1, a terminal member 2 is disposed in a switch case 1, one end of an actuating member 3 being swingably engaged at a point B with said terminal member 2. The other end of said actuating member is adapted to receive the pressure from a push button 4. In order to prevent as much as possible the effects of impact and vibration on the parts of the switch, the actuating member 3 is provided with an opening 15 medially disposed therein as shown in Fig. 5, whereby it is made lighter. A tension member 5 made of resilient material and disposed substantially horizontally within the case 1 has a rectangular opening 13 formed longitudinally therein. One shorter side of said opening pivotally engages said actuating member at a point E and the other shorter side of said opening pivotally engages a contact carrier 6 of the switch at a point K.

The contact carrier 6 carries at one end a movable contact 9 located between stationary contacts 7 and 8. Contact carrier 6 is made of a resilient material and has a longitudinally compressible spring portion comprising an arcuate portion 14, and also has a flat portion 10 wherein is mounted movable contact 9, and an intermediate flat portion 16 at right angles to said flat portion 10. Contact carrier 6 is pivotally engaged with the tension member 5 at a point K which is preferably located midway of the intermediate flat portion 16 of the contact carrier 6, and the other end of the contact carrier 6 is pivotally engaged, at G, with the terminal member 2. Fig. 3 shows how the contact carrier 6 is pivotally engaged with the tension member 5. Cuts 12 formed in opposed sides of said contact carrier 6 receive opposed edges of the opening 13 formed in the tension member 5, but pivotal engagement is, of course, not limited to such an example.

In Fig. 1, when the push button 4 is depressed, a force is applied to the actuating member 3, which, supported at the engaging point B, is thereby urged to pivotally move downwards, tension member 5 being moved therewith so that engaging point E moves on an arc of a circle about the point B. During this pivotal movement, before the engaging point E reaches the imaginary line, connecting the engaging point K of the tension member 5 and the contact carrier 6 to the engaging point G of the contact carrier 6 and the terminal member 2, which line is called the dead-centre line of the switch, the movable contact 9 is kept in contact with the stationary contact 7, but when the point E further moves downward beyond said dead-centre line, the contact carrier 6 snaps over and brings the movable contact 9 into contact with the other stationary contact 8 (as shown in Fig. 2) with a rapid movement. When button 4 is released, contact carrier 6, which has been longitudinally compressed, snaps back so that contact 9 once more engages stationary contact 7.

As apparent in the above description, since the contact carrier acts as a compression element and carries the movable contact, the electric current which is to flow into the circuit including the terminal member flows through the contact carrier and the engaging point G into the terminal member where the electric resistance is small, so that the circuit is free from the objectional effects such as heat generation with large currents or instability with small currents. Further, the life of the switch is increased as the contact carrier and the tension member are not formed in one piece as in some conventional switches but are pivotally engaged. This also enables the position of the dead-centre line to be more definitely determined. As a result of the present construction, when a small pressure is applied to the push button 4, it can be seen that the switch performs the snap action properly.

Since the pressure from the push button is not delivered directly to the movable contact mounted on the contact carrier but is delivered thereto through the tension member, any slight vibration or impact transmitted by the push button is absorbed before it reaches the movable contact, whereby a far more stable switching action is obtained. In other words, a switch constructed in accordance with the present invention is provided with resistance against impact and vibration.

Positioning of the engaging point K close to that end of the contact carrier on which the contact 9 is mounted allows the tension member more extensive movement in the limited space during switching, whereby the dead-centre line can be readily positioned.

WHAT WE CLAIM IS:—

1. A snap action electric switch comprising an actuating member swingably engaged at one point with a terminal member, a contact carrier provided with a longitudinally compressible spring portion, and having one end engaged with said terminal member, the other end of said contact carrier being unsupported and carrying a movable contact located between stationary contacts, and a tension member pivotally engaged with said actuating member at a point near to one end of said tension member, said tension member being

Fig. 2 is a side view similar to Fig. 1, showing contacts of the switch in an opposite position;

Fig. 3 is a view in perspective on an enlarged scale of only a tension member and a contact carrier of a switch in accordance with the invention, said parts being disassembled;

Fig. 4 is a side view on an enlarged scale of the tension member and contact carrier of a switch constructed in accordance with the invention; and

Fig. 5 is a perspective view on an enlarged scale of an actuating member of a switch in accordance with the invention.

Now, referring to Fig. 1, a terminal member 2 is disposed in a switch case 1, one end of an actuating member 3 being swingably engaged at a point B with said terminal member 2. The other end of said actuating member is adapted to receive the pressure from a push button 4. In order to prevent as much as possible the effects of impact and vibration on the parts of the switch, the actuating member 3 is provided with an opening 15 medially disposed therein as shown in Fig. 5, whereby it is made lighter. A tension member 5 made of resilient material and disposed substantially horizontally within the case 1 has a rectangular opening 13 formed longitudinally therein. One shorter side of said opening pivotally engages said actuating member at a point E and the other shorter side of said opening pivotally engages a contact carrier 6 of the switch at a point K.

The contact carrier 6 carries at one end a movable contact 9 located between stationary contacts 7 and 8. Contact carrier 6 is made of a resilient material and has a longitudinally compressible spring portion comprising an arcuate portion 14, and also has a flat portion 10 wherein is mounted movable contact 9, and an intermediate flat portion 16 at right angles to said flat portion 10. Contact carrier 6 is pivotally engaged with the tension member 5 at a point K which is preferably located midway of the intermediate flat portion 16 of the contact carrier 6, and the other end of the contact carrier 6 is pivotally engaged, at G, with the terminal member 2. Fig. 3 shows how the contact carrier 6 is pivotally engaged with the tension member 5. Cuts 12 formed in opposed sides of said contact carrier 6 receive opposed edges of the opening 13 formed in the tension member 5, but pivotal engagement is, of course, not limited to such an example.

In Fig. 1, when the push button 4 is depressed, a force is applied to the actuating member 3, which, supported at the engaging point B, is thereby urged to pivotally move downwards, tension member 5 being moved therewith so that engaging point E moves on an arc of a circle about the point B. During this pivotal movement, before the engaging point E reaches the imaginary line, connecting the engaging point K of the tension member 5 and the contact carrier 6 to the engaging point G of the contact carrier 6 and the terminal member 2, which line is called the dead-centre line of the switch, the movable contact 9 is kept in contact with the stationary contact 7, but when the point E further moves downward beyond said dead-centre line, the contact carrier 6 snaps over and brings the movable contact 9 into contact with the other stationary contact 8 (as shown in Fig. 2) with a rapid movement. When button 4 is released, contact carrier 6, which has been longitudinally compressed, snaps back so that contact 9 once more engages stationary contact 7.

As apparent in the above description, since the contact carrier acts as a compression element and carries the movable contact, the electric current which is to flow into the circuit including the terminal member flows through the contact carrier and the engaging point G into the terminal member where the electric resistance is small, so that the circuit is free from the objectional effects such as heat generation with large currents or instability with small currents. Further, the life of the switch is increased as the contact carrier and the tension member are not formed in one piece as in some conventional switches but are pivotally engaged. This also enables the position of the dead-centre line to be more definitely determined. As a result of the present construction, when a small pressure is applied to the push button 4, it can be seen that the switch performs the snap action properly.

Since the pressure from the push button is not delivered directly to the movable contact mounted on the contact carrier but is delivered thereto through the tension member, any slight vibration or impact transmitted by the push button is absorbed before it reaches the movable contact, whereby a far more stable switching action is obtained. In other words, a switch constructed in accordance with the present invention is provided with resistance against impact and vibration.

Positioning of the engaging point K close to that end of the contact carrier on which the contact 9 is mounted allows the tension member more extensive movement in the limited space during switching, whereby the dead-centre line can be readily positioned.

WHAT WE CLAIM IS:—

1. A snap action electric switch comprising an actuating member swingably engaged at one point with a terminal member, a contact carrier provided with a longitudinally compressible spring portion, and having one end engaged with said terminal member, the other end of said contact carrier being unsupported and carrying a movable contact located between stationary contacts, and a tension member pivotally engaged with said actuating member at a point near to one end of said tension member, said tension member being

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pivotally engaged, at a point near its other end, with said contact carrier at a point between said longitudinally compressible spring portion and said contact, the actuating member being swingably engaged to constrain the point of engagement of the tension member and the actuating member to move on an arc about the point of engagement of the actuating member and the terminal member from one side to the other side of an imaginary line, extending through the points of engagement of the contact carrier, so that on movement of said actuating member the movable contact snaps backs and forth between respective positions in which it engages said stationary contacts.

2. A snap action switch as claimed in claim 1 wherein said contact carrier comprises a flat portion having said movable contact thereon, an adjacent intermediate portion at right angles to said flat portion, and an arcuate portion extending from said intermediate portion, which intermediate portion is pivotally engaged with said tension member.

3. A snap action switch as claimed in claim 2 wherein cuts are provided in opposed sides of said intermediate portion and receive opposed edges of an opening formed in said tension member so as to be pivotably engaged therewith.

4. A snap action switch as claimed in claim 1, 2 or 3 wherein the actuating member is formed from a strip of material and has a portion thereof excised to reduce the weight and inertia of the actuating member.

5. A snap action switch as claimed in claim 2, 3 or 4 wherein said tension member has a rectangular opening centrally disposed therein, one shorter edge of said opening engaging with said actuating member and the other shorter edge engaging with said intermediate portion of said contact carrier.

6. A snap action electric switch as claimed in any preceding claim mounted in a switch case and provided with a push button for moving the actuating member.

7. A snap action electric switch substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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