March 22, 1966 MASARU SUZUKI 3,242,282

SNAP-ACTION PLUNGER-OPERATED ELECTRICAL SWITCH

Filed Aug. 28, 1963 2 Sheets-Sheet 1

Fig. 2

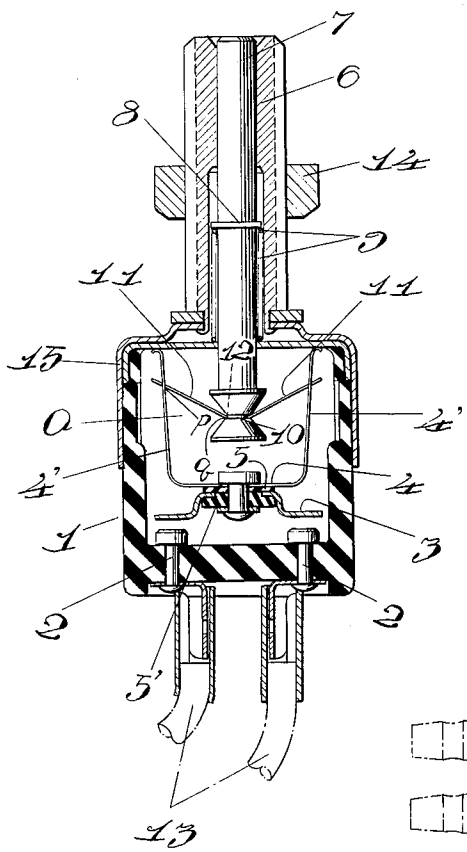
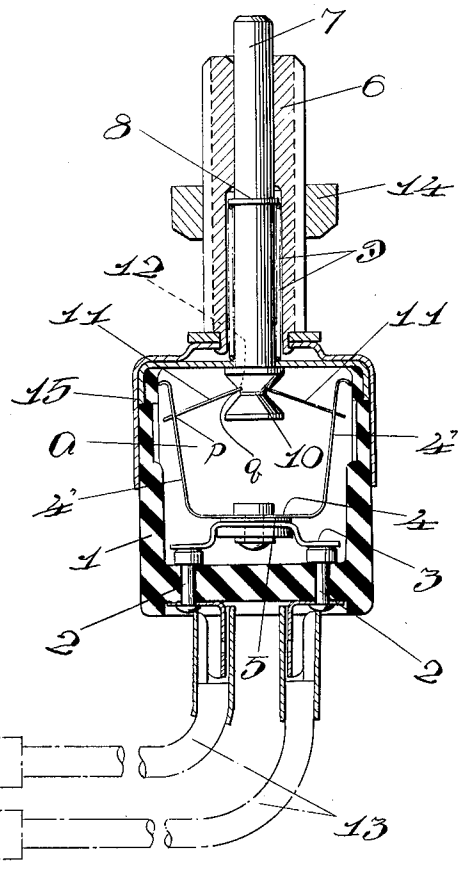


Fig. 1



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Filed Aug. 28, 1963 2 Sheets-Sheet 2

Fig. 3

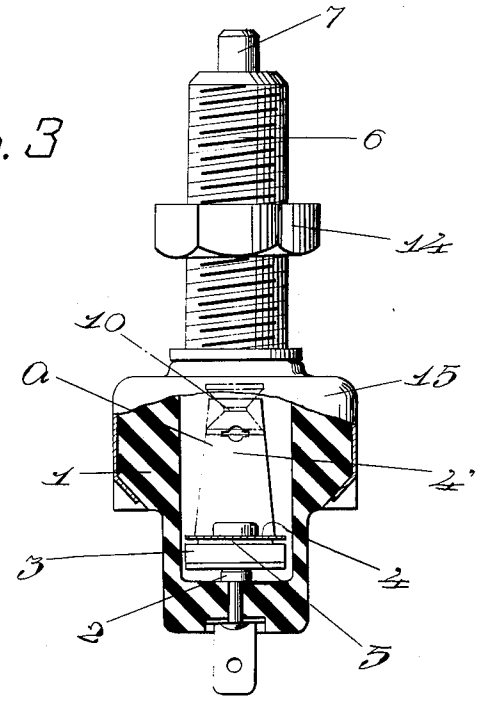
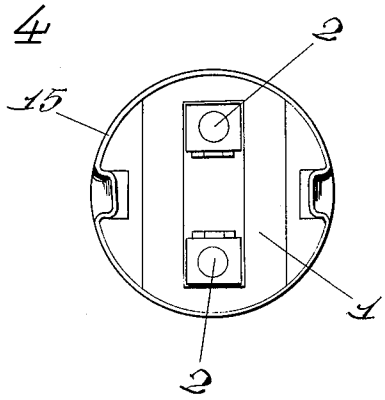


Fig. 4



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SNAP-ACTION PLUNGER-OPERATED ELECTRICAL SWITCH

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1 Claim. (Cl. 200—76)

This invention relates to a snap-action plunger-operated electrical switch wherein the contacts are opened and closed with a high speed snap-action through a reversing means operated by a plunger or push-button.

An object of the present invention is to provide a simplified and less expensive snap-action plunger-operated electrical switch construction.

A further object of the invention is to provide a snap-action plunger-operated electrical switch including a relatively short operating plunger and having minimum overall dimensions.

A further object of the invention is to provide a snap-action plunger-operated electrical switch particularly designed for use in a brake controlling circuit for motor vehicles.

According to the above mentioned objects, an embodiment of the present invention is explained in detail in the following with reference to the drawings and the invention is defined in the appended claims.

In the drawings, FIGURE 1 is a vertically sectioned elevation of an embodiment of the push-button switch according to the present invention as the circuit is closed;

FIGURE 2 is a vertically sectioned elevation of the same embodiment as opened;

FIGURE 3 is a partly sectioned side view of the embodiment illustrated in FIGURE 1;

FIGURE 4 is a bottom surface view of the same.

As illustrated in the accompanying drawings, **1** is a case body on enclosure in which fixed contact points **2** are arranged in a row and embedded. A movable contact piece or bridging member **3** is arranged to contact with and separate from the fixed contact points and is secured through a washer **5** and an insulator **5'** to the center of a channel-shaped spring means **4** for a resilient reversing mechanism *a* contained in the case body **1**. A tubular mounting member **6** is secured to the upper part of the case body **1**. A push-button or plunger **7** is inserted through member **6**. A coil spring **9** is fitted and interposed between the engaging part **8** of said push-button **7** and the case body **1**, and its forward end has an engaging part **10** in the form of a concave ring at the forward end of the push-button **7** and engaged with concave engaging parts **12** at the inner ends *q* of reversing resilient pieces **11** engaged at the outer ends *p* as opposed to each other with the insides of resilient arms **4'** of said channel-shaped spring means **4**. When the push-button **7** is released, as in FIGURE 1, the resilient-pieces **11** will assume the form of an angle with the push-button **7** in the center, the right and left resilient arms **4'** will exert a bias in the inclined directions of the reversing resilient pieces **11** and thereby the channel-shaped spring means **4** will be pressed downward so that the movable contact piece **3** may be pressed in resilient contact with the fixed contact points **2**. The movable contact piece **3** includes downwardly offset contacts which are centered in respect to the spring means **4**. The spring means **4** are centered and its biasing pressure is limited by the lateral walls of the enclosure against which the arms **4'**, **4'** abut when in a downward contact making position. The engaging part **10** at the forward end of the push-button **7** is so adjusted that, when the push-button **7** is pushed down,

the engaging parts *q* of the reversing resilient pieces **11** may reach a position below the engaging parts *p* of the resilient arms **4'**.

Lead wires **13** are connected to the fixed contacts, and a fastening nut **14** is screwed to the mounting member **6**. Part **15** is an upper cover of the case body **1**.

The operation of the above described formation will now be explained. First of all, when the push-button **7** is pushed down from the position shown in FIGURE 1, it will compress the spring **9** and will move down to the position shown in FIGURE 2. In such case, as the engaging part **10** at the forward end of the push-button **7** moves down, it will gradually push down the engaging parts *q* of the reversing resilient pieces **11** opposed to each other. Until said engaging parts *q* reach the same position as the level of the engaging parts *p* of the resilient sides **4'**, that is, a dead center, the resiliency of each of said reversing pieces **11** will act diagonally downward. But, when the engaging parts *q* fall past the position of dead center, the reversing resilient pieces **11** will quickly reverse and jack up the engaging parts *p* of the resilient sides **4'** while pressing and expanding the resilient sides **4'** outward and will form a reverse angle with the forward end engaging part as a center. Since a diagonally upward bias will be given to each of the resilient arms **4'** along the reversed form of the reversing resilient pieces **11**, the channel-shaped plate **4** will be pushed upward as a whole and the movable contact piece **3** will be separated from the fixed contact points **2** so that the circuit is opened.

Then, when push-button **7** is released, by the returning force of the spring **9**, the push-button **7** will be pushed up, the direction of the action of the tension of the reversing resilient pieces **11** will be changed over to the state shown in FIGURE 1 from the state in FIGURE 2. Thereby the reversing resilient pieces **11** will be reversed and the movable contact piece **3** will be again pressed into contact with the fixed contact points **2** so that the circuit is closed.

According to the present invention, as described above, when the push-button is pushed, the movable contact piece will be separated from the fixed contact points so that the circuit may be opened. When the push-button is released, the movable contact piece will be brought into contact with the fixed contact points so that the circuit may be closed. The contact and separation of the movable contact piece can be made positively without any malfunction by the quick switching operation of the resilient reversing mechanism including the reversing resilient pieces. The contact deterioration caused by separation of the contact points in the switching operation can be perfectly prevented. In case the movable contact piece is in contact with the fixed contact points and the circuit is closed, said contact piece will be positively operating always with a constant contact pressure. Therefore, there is an effect that the movable contact piece can be prevented from accidentally breaking the contact state and opening the circuit. The mechanism is so simple and small and can be so cheaply manufactured that it can be applied to various uses and is adapted specifically to a brake switch for automobiles.

Though the present invention has been explained in the above with reference to the specific embodiment, it is to be understood that this embodiment can be modified in any manner within the scope of the present invention described in the appended claim.

What is claimed is:

A normally closed, snap-action plunger-operated switch comprising, in combination, a switch enclosure having lateral wall means; a pair of contacts in spaced relation on one end wall of said enclosure fixed; a tubular mounting member extending from an opposite end wall of said enclosure substantially perpendicular to said one end

wall; a relatively elongated plunger slidably mounted through said member and extending into said enclosure; means limiting outward movement of said plunger; a contact bridging member engageable with said contacts including offset projecting contacts centered in respect to said plunger; and toggle joint snap-action support means supporting said bridging member on the inner end of said plunger; said support means including a substantially U-shaped spring member, having a base secured to said bridging member and a pair of resilient arms extending outwardly from the ends of said base, and a pair of reversing pieces each having an outer end fulcrummed in a respective arm at a short distance from the outer end of the latter and an inner end supportingly fulcrummed on said plunger; said reversing pieces normally extending upwardly and inwardly from the arms with said bridging member engaged with said contacts under pressure with said plunger at its limit of outward movement and the outer ends of said arms engaging said lateral wall means for limiting outward movement thereof in order to control the contact engaging pressure and for centering said offset projecting contacts of said bridging member with said fixed contacts; said plunger, when pressed inwardly, moving the inner ends of said

reversing pieces downwardly to spread said arms apart until said reversing pieces pass dead center, whereupon the pressure of said arms on said reversing pieces snaps the latter to positions in which they extend downwardly and inwardly from said arms and snap said spring member and said bridging member away from said contacts; the outer ends of said arms abutting said opposite wall of said enclosure after a relatively short movement of said bridging member; said spring member and said reversing pieces being free of supporting engagement with said enclosure.

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