United States Patent

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[33] **Germany**
[31] **A54637**

[54] **SLIDER SWITCH WITH ADJUSTABLE ABUTMENT ON FRAME, AND STATIONARY CONTACT FACES WITH AN ANGLE GREATER THAN 180° THEREBETWEEN BRIDGED BY A FORK SHAPED BRIDGING CONTACT**
7 Claims, 3 Drawing Figs.

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[51] **Int. Cl.** **H01h 1/20,** H01h 1/18, H01h 3/46
[50] **Field of Search** ..... 200/16.1, 166 (H), 166 (B)4, 166 (B)8, 76—78 (Inquired), 166 (M) (Inquired), 170, 153.8

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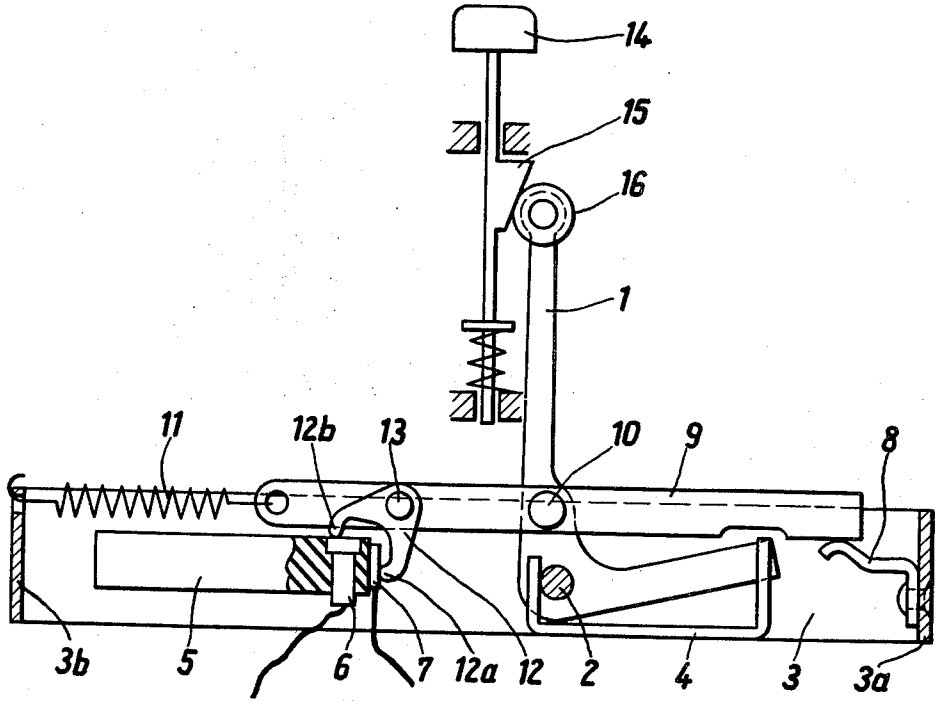
ABSTRACT: A switch slider of an electric switch is linked with an actuating member and is reciprocably movable by the actuating member. A spring applies a force to the switch slider to position an electrically conductive bridge member pivotally mounted on the switch slider in electrical bridging contact with a pair of spaced electrical contacts positioned in fixed relation to each other and to maintain good electrical contact between the bridge member and the contacts by relative motion of the bridge member and the contacts.



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2 Sheets-Sheet 1

Fig.1

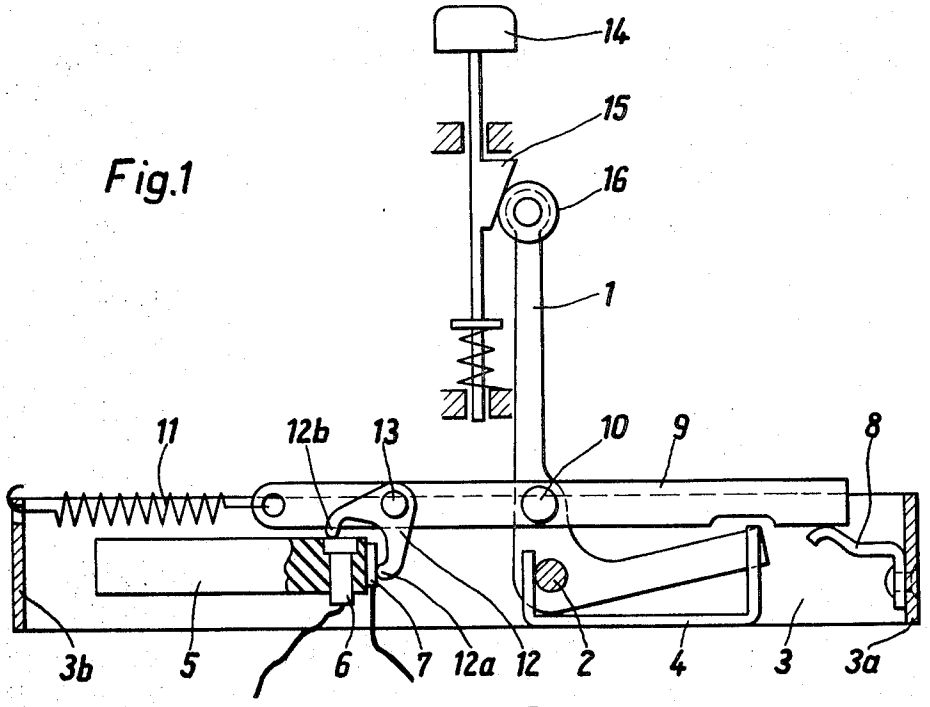

Fig.2

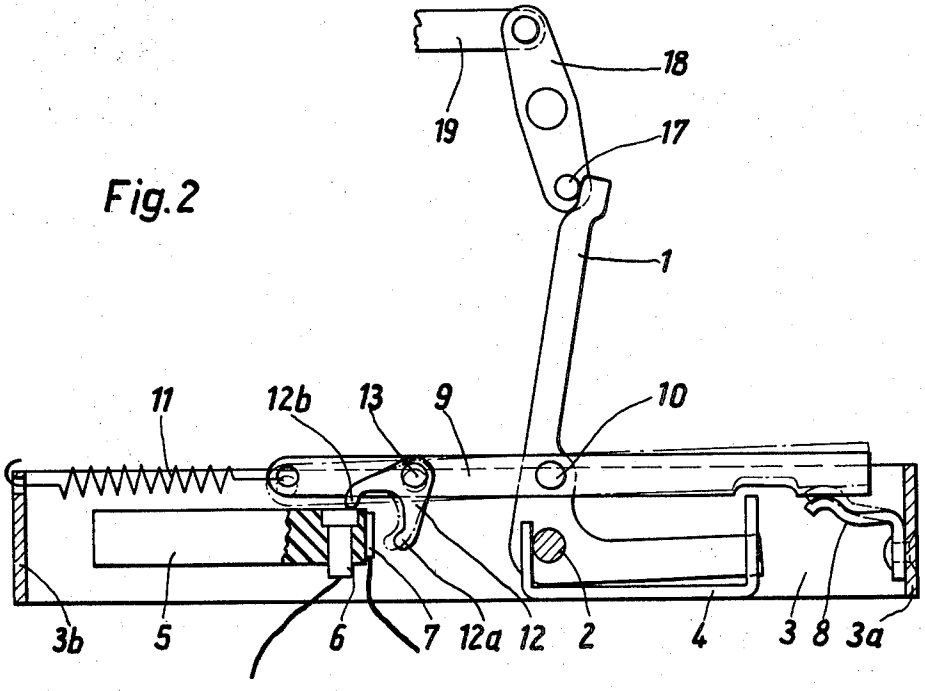

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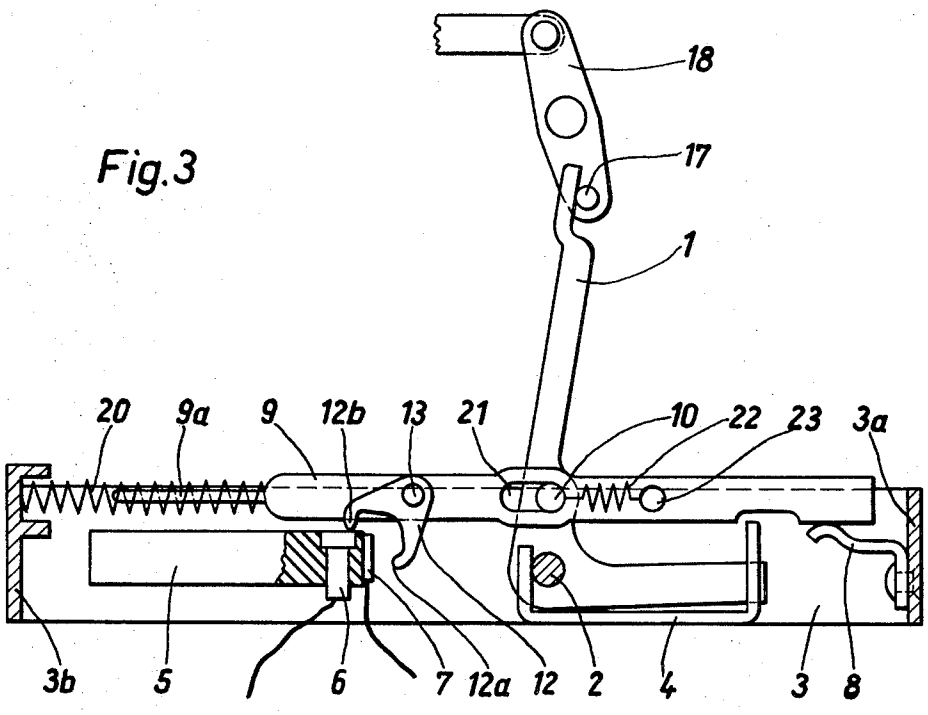
Fig.3



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SLIDER SWITCH WITH ADJUSTABLE ABUTMENT ON FRAME, AND STATIONARY CONTACT FACES WITH AN ANGLE GREATER THAN 180° THEREBETWEEN BRIDGED BY A FORK SHAPED BRIDGING CONTACT

DESCRIPTION OF THE INVENTION

My invention relates to an electric switch. More particularly, my invention relates to an electric switch for calculating and accounting machines and the like, which switch opens and closes selected circuits at specific instants.

Switches of this type generally comprise a movable contact member which coacts with a fixed contact member. The movable contact member is spring-biased. When the spring-biased contact members are moved into and out of electrical contact with the fixed contact members, vibrations often occur which lead to undesirable and troublesome bouncing of the electrical contacts. This causes the release of several, rather than one, current pulses, so that faulty electrical connections result, especially in controlling bistable multivibrators.

In keyboard-actuated circuit components, electrical contact engagement is usually dependent upon the time and intensity of the actuation or touch of the key. In tightly closing contacting devices, an additional high resistance to key motion must be surmounted so that it is difficult to attain operation with a light touch. Thus, when a key of a key-control mechanism is depressed, a predetermined operation occurs only once. German Pat. No. 1,097,726 discloses a contact key mechanism which is provided with a locking device. Upon completion of an operation by an electromagnet, the locking device unlatches a latched switch lever which closes a spring contact and pivots the switch lever into an inactive position. In the inactive position of the switch lever, the spring contacts are reopened. This locking device is clumsy in operation and, due to the properties of the leaf spring contacts, the contact pressure of the switch is limited so that contact adjustments of the switch point is unattainable and is not stable.

German Pat. application DPB 847,222 discloses a device for avoiding vibrations and bouncing of electrical contacts in a switching arrangement. In the device of the German application, the pressure exerted by a contact member, which is movable by one member to engage the electrical contacts, is increased by another member. This is accomplished by interpolating a control member immediately after the engagement of the contacts. This apparatus is also clumsy and is not suitable for key operations, due to the high power required. Furthermore, it does not ensure reliable contact engagement for longer periods since there is no relative movement during the engagement of the contacts. Thus, even a slight layer of dust or oxide may produce insufficient engagement of the contacts, especially when the current is weak.

An object of the present invention is to avoid the disadvantages of known switches and to provide a switch which is operated by small key pressure and small movement pressure and which ensures high electrical contact engagement and freedom from bouncing of the electrical contacts. The electrical switch of the present invention provides self-cleaning electrical contacts.

Another object of the present invention is to provide an electrical switch which functions with efficiency, effectiveness and reliability to provide good electrical contact at predetermined instant without vibration or bouncing of such contacts.

In accordance with the present invention, a switch slider has a bridge member pivotally mounted thereon. The bridge member is moved into electrical bridging contact with a pair of spaced electrical contacts positioned in fixed relation to each other in transverse planes by a spring which applies a force to the switch slider. Good electrical contact between the bridge member and the contacts is maintained by relative motion of the bridge member and the contacts, which keeps the contacts clean. The switch slider is supported by an abutment on a supporting frame which abutment is adjustable to adjust the point of contact between the electrical contacts.

The electrical contacts are positioned so that in each position of the switch slider there are, within the pivotal range, contact arms of the bridge member, which is fork-shaped.

In order that the present invention may be readily carried out into effect, it will now be described with reference to the accompanying drawings, wherein:

FIG. **1** is a side view, partly in section, of an abutment of the electrical switch of the present invention, such switch being normally closed and operated by a key;

FIG. **2** is a side view, partly in section, of the switch of FIG. **1** operated by a lever; and

FIG. **3** is a side view, partly in section, of an electrical switch of a modification of the switch of FIGS. **1** and **2**, which is normally open.

In the FIGS. the same components are identified by the same reference numerals.

In each of FIGS. **1**, **2** and **3**, the switch comprises an actuating lever **1** of angular configuration which is rotatably mounted on a pivot pin or pivot axle **2**. The actuating lever **1** is mounted between the legs of a box-shaped base frame **3** and is laterally guided in a guide comb **4**. An insulating plate **5** is affixed to the base frame and carries two electrical contacts **6** and **7** which are in planes perpendicular to each other. The contacts **6** and **7** are spaced in fixed relation to each other.

An adjustable angular abutment **8** is affixed to one leg **3***a* of the frame **3**. One end of a switch slider **9** rests on the adjustable abutment **8**. The switch slider **9** is of electrically insulating material and is positioned on the actuating lever **1** by a pivot pin **10**. The switch slider **9** is mechanically coupled to the other leg **3***b* of the frame **3** by a pull spring **11**. The switch slider **9** is reciprocably movable by the actuating lever **1**.

An electrically conductive bridge member **12** is pivotally mounted on the switch slider **9** by a pivot pin **13**. The bridge member **12** is fork-shaped and has a pair of spaced contact arms **12***a* and **12***b*. The bridge member **12** is pivotable to a limited extent and is of such configuration and is so positioned on the switch slider **9** that the electrical contact areas of the electrical contacts **6** and **7** are positioned within the pivotal range of the arms **12***a* and **12***b* of said bridge member when said bridge member is in and out of electrical bridging contact with said contacts, in each position of the switch slider.

In FIG. **1**, a depressible key **14** is provided for operating the actuating lever **1**. This is accomplished by a slide cam **15**, in the shape of inclined plane positioned at the shank of the key **14** which cam coacts with a roller **16** affixed to the corresponding end of the actuating lever **1**. The key **14** is usually coupled to a locking device of suitable type (not shown in the FIGS.), which arrests said key in its depressed position until a predetermined machine operation is completed.

In FIG. **2**, the actuating lever **1** is operated by an entrainer pin **17** which is affixed to a two-arm lever **18**. The lever **18** is pivotally movable about a center pivot by a pull rod **19**.

In FIG. **3**, the switch slider **9** has an oblong slot **21** formed therethrough and is mounted upon the pivot pin **10** of the actuating lever **1** in a pivotable and displaceable manner. A tension spring **22** is affixed at one end to the pivot pin **10** of the actuating lever **1** and at the other end to a pin **23** of the switch slider **9**. The tension spring **22** ensures that the switch slider **9** in its rest position abuts against the pivot pin **10**. The compression spring **20** is affixed at one end to the switch slide slider **9** and at its other end to the leg **3***b* of the frame **3** and functions to urge said switch slider to its rest position shown in FIG. **3**. The switch slider **9** includes a rod-shaped extending member **9***a* in order to prevent the compression spring **20** from becoming misaligned.

The switch of FIGS. **1** and **2** is normally in closed condition wherein the electrical contacts are in engagement with each other. In operation, in the closed or rest position of the switch of FIGS. **1** and **2**, the switch slider **9**, as shown in FIG. **1**, is in its left-end position, due to the force exerted by the spring **11**. The contact arms **12***a* and **12***b* of the bridge member **12** are in engagement with the contact areas of the electrical contacts **6** and **7**. The force exerted by the pull spring **11** causes the con-

tact arm 12*a* of the bridge member 12 to abut against the electrical contact 7. Due to the pivotal mounting of the bridge member 12 and therefore its limited pivotal motion about the pivot pin 13, the contact arm 12*b* of said bridge member engages the electrical contact 6 with the same pressure as that of the engagement of the contact arm 12*a* with the electrical contact 7. This is the case when the arms 12*a* and 12*b* of the bridge member 12 are of equal length. Thus the force exerted by the spring 11 is equally distributed to the electrical contacts 6 and 7 by the pivotal bridge member 12 and therefore ensures a constantly high contact engagement pressure.

When the key 14 of FIG. 1 is depressed or when the lever 18 of FIG. 2 is rotated in a counterclockwise direction, the actuating lever 1 is pivoted about the pivot axle 2 in a clockwise direction. The pivot pin 10 which moves with the actuating lever 1 thus moves or depresses the switch slider 9 to the right, to its position shown in FIG. 2.

The slightest shift, movement or displacement of the switch slider 9 to the right relieves the contact engagement pressure between the bridge member 12 and the contacts 6 and 7 and produces an air gap between the contact arm 12*a* of said bridge member and the electrical contact 7, as shown in FIG. 2. Any pivotal movement of the bridge member 12 about the pivot pin 13 which may be caused by vibration or the like, cannot produce further contact bridging. This is due to the fact that when a contact arm 12*a* or 12*b* of the bridge member 12 moves in the direction of the corresponding electrical contacts 7 or 6, respectively, the other contact arm 12*b* or 12*a*, respectively, moves away from its corresponding electrical contact.

Upon the elevation of the key 14 to its rest position or upon the rotation of the lever 18 to its rest position, the force exerted by the spring 11 again moves the switch slider 9 to the left, the spring 11 exerts a force which moves the switch slider 9 into the switching position wherein the electrical contacts 6 and 7 are again in electrical contact via the bridge member 12. The switching time or instant at which contact engagement occurs may be varied in order to adjust the switching instant for a plurality of switches; for example, the variation of the switching instant may be accomplished by the adjustment or bending of the abutment 8.

Thus, as shown in FIG. 2, when the abutment 8 is bent or adjusted upward to its broken line position (FIG. 2), the switch slider 9 is rotated slightly in a counterclockwise direction and the pivot pin 13 is thus moved downward toward the insulating plate 5. Thus, if the contact arm 12*b* of the bridge member 12 is already in electrical engagement with the contact area 6, the contact arm 12*a* of said bridge member approaches the contact area 7 and the switching instant occurs sooner than it would otherwise occur. The switching instant may be delayed, to a timer later than that at which it would normally occur, by adjusting or bending the abutment 8 downward from its position shown in FIG. 2.

In the operation of the electrical switch of FIG. 3, which is normally open, or in which the electrical contacts are normally discharged, when the actuating lever 1 is rotated in the counterclockwise direction by the lever 18, the switch slider 9 is moved to the left into its closed position and the contact arm 12*a* of the bridge member 12 approaches the electrical contact 7. When the 22 tightens, since the path of the pivot pin 10, up to the end arm 12*a* of the bridge member 12 abuts the contact 7, said bridge member rotates in a counterclockwise direction until the contact arm 12*b* abuts the electrical contact 6 and both electrical contacts 6 and 7 are abutted by the contact arms 12*b* and 12*a* with the same contact pressure. This occurs if the contact arm 12*b* does not abut the contact 6 as soon as the contact arm 12*a* abuts the contact 7. During the bridging of the contacts 6 and 7 by the bridge member 12, the spring 22 tightens, since, the path of the pivot pin 10, up to the end position, is longer than that of the switch slider 9. The contact pressure of the bridge member 12 is thus increased by the force of the spring member so that said bridge member is prevented from bouncing back due to the fact that its rebound force is smaller than the force exerted by the additionally tightened spring 22.

During the opening and closing of the switch, the bridge member 12 is relatively moved due to the circular arc-type movement of the switch slider 9 by the pivot pin 10, which pivot pin is movable in the circular arc. The relative movement of the bridge member 12 produces a friction movement when the contact arms 12*a* and 12*b* thereof abut against the contact areas of the electrical contacts 7 and 6. Such friction movement is produced between the contact arms of the bridge member and the corresponding electrical contacts and ensures the cleanliness and therefore good electrical contact characteristics of the contact areas.

While the invention has been described by means of specific examples and in specific embodiments, I do not wish to be limited thereto since obvious modifications will occur to those skilled in the art without departing from the spirit and scope of the invention.

I claim:

1. An electric switch for calculating and accounting machines and the like, comprising an actuating member; a switch slider linked with said actuating member and reciprocably movable by said actuating member; a pair of spaced electrical contacts rigidly positioned in planes that are transverse to each other; said contacts having surfaces disposed at an angle of greater than 180° therebetween; an electrically conductive bridge member pivotally mounted on said switch slider; and spring means affixed and applying a force to said switch slider for positioning said bridge member in electrical bridging contact with said contacts and for cleaning said contacts by relative motion of said bridge member and said contacts.

2. An electric switch for calculating and accounting machines and the like, comprising an actuating member; a switch slider linked with said actuating member and reciprocably movable by said actuating member; a pair of spaced electrical contacts positioned in planes that are transverse to each other; and electrically conductive bridge member pivotally mounted on said switch slider; spring means affixed and applying a force to said switch slider for positioning said bridge member in electrical bridging contact with said contacts and for cleaning said contacts by relative motion of said bridge member and said contacts; a frame for supporting said electric switch and an adjustable abutment affixed to said frame, said switch slider being movably supported by said abutment.

3. An electric switch as claimed in claim 1, wherein said bridge member is of fork shape.

4. An electric switch as claimed in claim 1, wherein said electrical contacts have contact surfaces respectively disposed in planes perpendicular to each other.

5. An electric switch for calculating and accounting machines and the like, comprising an actuating member; a switch slider linked with said actuating member and reciprocably movable by said actuating member; a pair of spaced electrical contacts positioned in planes that are transverse to each other; an electrically conductive bridge member pivotally mounted on said switch slider; spring means affixed and applying a force to said switch slider for positioning said bridge member in electrical bridging contact with said contacts and for cleaning said contacts by relative motion of said bridge member and said contacts; a frame for supporting said electric switch and an abutment affixed to said frame and adjustable transversely to the direction of movement of said switch slider, said switch slider being movably supported by said abutment in a manner whereby the extent of movement of said switch slider required to bring said bridge member into and out of electrical bridging contact with said electrical contacts depends upon the adjusted position of said abutment.

6. An electric switch as claimed in claim 1, wherein said bridge member is of fork shape having a pair of spaced arms each adapted to contact a corresponding one of said electrical contacts, said bridge member being pivotable to a determined extent about a pivot point on said switch slider, said contacts being within the pivotal range of the arms of said bridge member when said bridge member is in and out of electrical bridging contact with said contacts.

7. Electric switch for calculating and accounting machines and the like comprising a reciprocable shaft, an oscillatable contact pivotally mounted on said shaft, and a contact block having a pair of contacts located on different faces of said contact block, said oscillatable contact being engageable with the pair of contacts on said contact block.