Dec. 30, 1958 L. W. D. SHARP ET AL 2,866,860

ELECTRICAL SWITCHES

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Fig. 1.

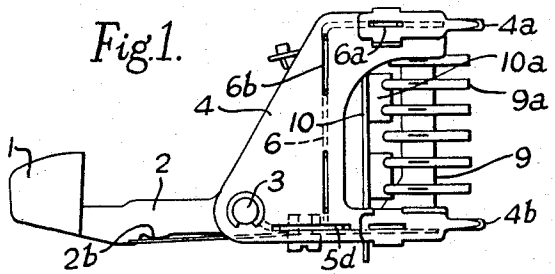


Fig. 2.

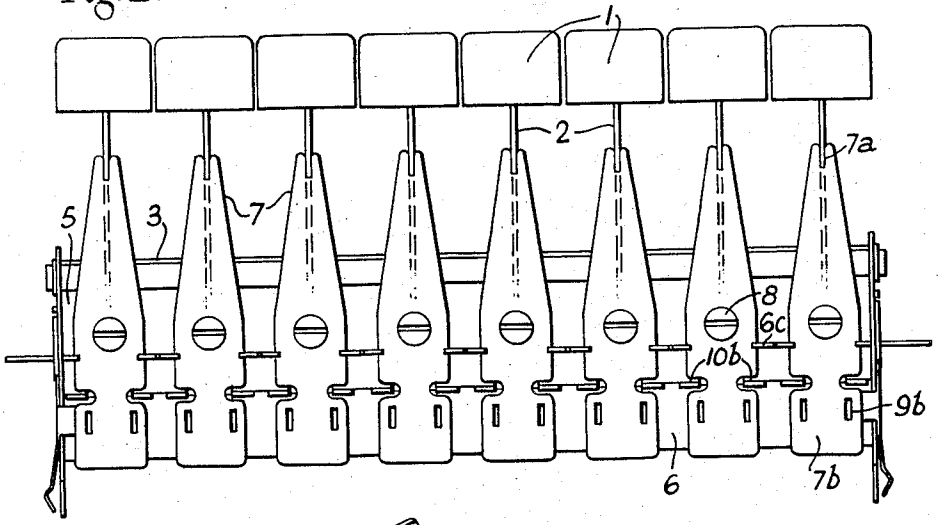
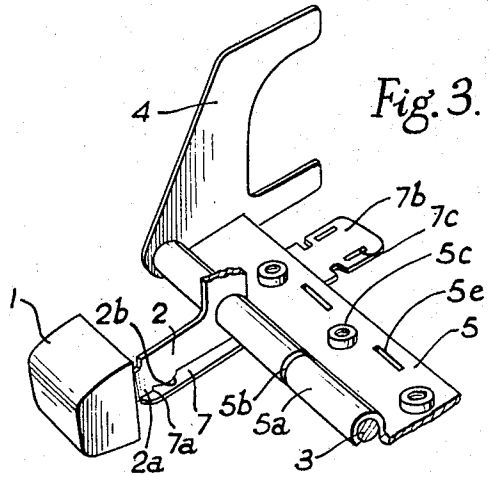


Fig. 3.



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Fig.4.

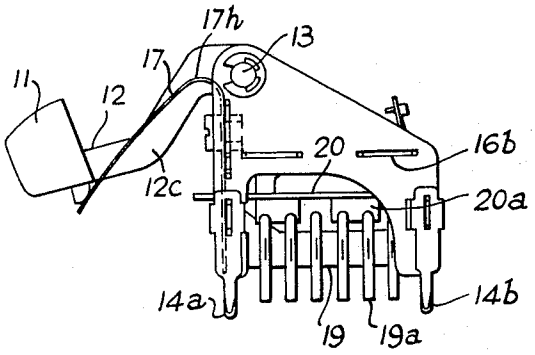


Fig.5.

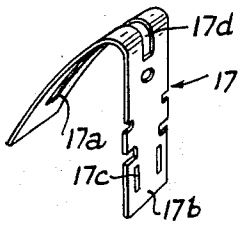
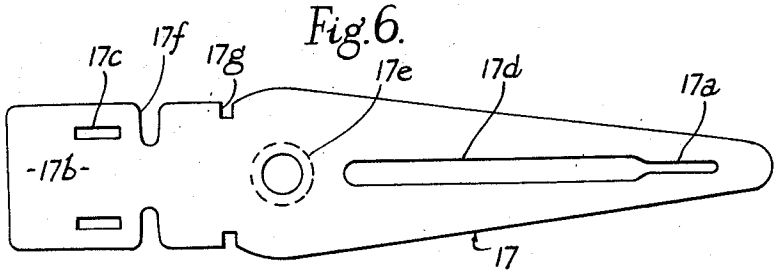


Fig.6.



United States Patent Office

2,866,860

Patented Dec. 30, 1958

2,866,860

ELECTRICAL SWITCHES

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Application August 26, 1957, Serial No. 680,362

Claims priority, application Great Britain September 6, 1956

8 Claims. (Cl. 200—5)

This invention relates to electrical switches and more specifically to switches of the piano-key type, in which a number of adjacent piano-key levers each serve when pressed down against the action of a spring to establish selectively one or another of a number of alternative circuits. A latch bar is normally provided for retaining a key that has been fully depressed until it is released and returns to normal upon depression of another key. The invention has for an object to improve the construction of piano-key switches.

According to the invention each key lever co-operates with a blade or leaf spring which extends longitudinally of the key lever, and which is utilised not only for urging the key lever to its normal position but also to guide the key lever at a point distant from its pivot axis. For this purpose, according to a feature of the invention, the blade spring is provided with a longitudinal guide at or near its forward end, in which a portion of the key lever is guided. The guide aperture is preferably a slot extending longitudinally of the spring, and the key lever may be arranged substantially wholly at one side of the spring and have a portion projecting into that guide aperture or slot at a point spaced for the pivot axis, or alternatively substantial portions of the lever may be arranged at each side of the spring, the lever thus extending through, or along, the slot or the like over an appreciable distance. This latter feature offers advantages when the switch is intended to be mounted on a horizontal panel, and the spring is bent into a shape somewhat between an L and a U. In this case it may be convenient for the curved part of the spring to be slotted so that it may project beyond the lower or inner edge of the key lever. Preferably the spring is further provided with location apertures, preferably slots or notches, co-operating with projecting parts of the switch frame, so that a single screw is sufficient for securing the spring to the frame, thus rendering it readily detachable.

According to another feature the spring is extended rearwardly beyond its attachment to the frame, the rearwardly projecting part of the spring forming the support for one end of a contact holder on which the stationary contacts of the switch are mounted, and the guide for one end of a bar carrying the movable contacts. This permits ready removal of the contact bars associated with any one of a number of switch levers in a bank without intereference with the adjacent switch units.

One embodiment of the invention is illustrated in the accompanying drawing.

Fig. 1 is a side elevation of a switch incorporating the invention.

Fig. 2 is an underneath plan view thereof, and

Fig. 3 is a fragmentary perspective veiw showing the arrangement of one of the key levers and the associated lea spring, and in the accompanying drawing,

Fig. 4 is a view similar to Fig. 2, showing a modified construction, while

Fig. 5 is a perspective view of the spring element thereof.

Fig. 6 is a plan view of the spring before it is bent.

Referring now first to Figs. 1 to 3; the switch as illustrated comprises eight switch units each equipped with a separate key 1 carried by a key lever 2. These levers are pivoted on a common pin 3, which is held in two end-wall members 4. The latter are rigidly interconnected by a base rail 5 and an L-section member 6 forming the back and top walls of the switch frame. The base rail 5 is bent to form a trough-like part 5*a* around the pin 3, subdivided by slots 5*b* for the lateral location of the levers 2, and is furthermore formed with internally screw-threaded bosses 5*c*. The L-section member 6 and the base member 5 are secured to the end walls 4 with the help of tabs 6*a*, 6*b* and 5*d*, which engage suitable slots of the end walls, and similar tabs 6*c* at the lower edge of member 6 project through slots 5*e*, in the base member 5. Each lever 2 is urged upwardly into a normal position by a leaf spring 7, which is pre-bent to produce the desired initial loading and secured, by a screw 8 engaging the threaded bore of the appropriate boss 5*c*, to the lower side of base member 5. Each spring 7 is located by a pair of the tabs 6*c*, which co-operate with corresponding notches in the spring 7 to prevent pivotal movement of the spring about the screw. A notch-like slot 7*a*, provided at the leading end of each spring 7, guides a projection 2*a* of the associated lever 2, thus preventing the lever from rocking out of its plane even if there is some clearance between the lever and the slot 5*b* due to production tolerances. A further, rounded, projection 2*b* at the underside of the lever 2 serves as a point of support on the leaf spring 7, reducing the area of frictional contact.

The stator contacts 9*a* for the switch unit of each lever 2 are mounted on stator boards 9 which are held located between the upper wall of the L-section member 6 and a rearward extension 7*b* of the spring 7. For this purpose tabs 9*b* of the boards 9 engage slots 7*c* of the spring extensions 7, and similar slots (not shown) in said upper wall. The movable contacts 10*a* are carried by slider boards 10, which are operated by the levers in any conventional or convenient manner and have tabs 10*b* guided in cross-notches 7*d* of the spring extensions 7*b*. When it is desired to repair or replace any of the contacts in a switch unit, this can be readily achieved without interference with the wiring or the fixing of the contacts in any of the other switch units upon removing the appropriate screw 8. The spring 7 can then be taken off, thereby releasing both the stator boards 9 and the slider board 10 of the unit.

While the embodiment so far described is mainly intended for attachment of the switch device to a vertical panel by means of the tabs 4*a* and 4*b* provided at the rear edge of the side wall member 4, Figures 4 to 6 illustrate a modified embodiment, which is adapted for attachment to a horizontal panel. Corresponding parts of this embodiment bear the same reference numbers as the parts in the embodiment described with reference to Figures 1 to 3, increased by ten, so that only features differing from those of the first-mentioned embodiment need be described. While the structure of the switch in general may be substantially identical with that described with reference to Figures 1 to 3, and the shape of side members 14 may be identical to that of the side members 4, the switch is used in a different position, in which the tabs 14*a* and 14*b* are adapted for insertion into suitable apertures of a horizontal panel (not shown). Since for convenient operation the keys 10 must be arranged for substantially vertical operation, as in the case of Figures 1 to 3, the key arms 12 are of suitably curved shape as shown, and in order to allow the spring blades

17 to be fixed in the switch mechanism in the same manner as in the preceding example, and yet to co-operate in an appropriate manner with the horizontally projecting key arm 12, the spring blades 17 are bent to a more or less hairpin-like shape including a curved portion 17*h*. More particularly since the blades are made of spring material, the radius of this curved part should not be too small, and for this reason it would be inconvenient to have the whole of the key arm 12 arranged at the upper side of the spring blades 17. In view of this, according to a feature of the invention, the spring blade 17 is provided with a clearance slot 17*d* extending longitudinally outwardly for an appropriate distance from a point near the switch frame, a portion 12*c* of the lever arm 12 being arranged to project through this slot to the lower side of the spring blade 17. Preferably the outermost end portion 17*a* of this slot 17*d* is made narrower than the remainder, so as to guide the arm 12 near its outer end thus performing the function of the slot-like notches 7*a* in the embodiment described with reference to Figures 1 to 3. Figure 6 further shows the bore 17*e* in the spring blade 17, which co-operates with the screw 8. The notches 17*f* and 17*g* respectively for co-operation with the card 10 for the movable contact and for location of the blade against movement about the screw 8 by means of the edge portions of the tabs 6*c* are also clearly visible in this figure. It will be appreciated that the last-mentioned features are identically present in the spring blades 7 of the embodiment described with reference to Figures 1 to 3.

What we claim is:

1. An electrical switch comprising a fixed switch contact; a contact movable relative to the fixed contact; a key lever having a rest position, connected to move the movable contact for switching purposes; a pivot member for the key levers; means for supporting the pivot member; a leaf spring extending longitudinally of the key lever for resiliently urging the key lever to its rest position and a longitudinally directed guide in the leaf spring which guidingly co-operates with at least a portion of the key lever at a point distant from its pivot axis.

2. An electrical switch comprising at least one fixed switch contact; a movable switch contact co-operable with each fixed contact; a separate key lever associated with each movable contact and having a rest position, connected to move each movable contact for switching purpose; a pivotal mounting for each key lever; a leaf spring extending longitudinally of each key lever for resiliently resisting movements of the associated key lever from its normal position; and guide means in each leaf spring which guidingly co-operate with at least a portion of the associated key lever at a point distant from its pivot axis.

3. An electrical switch comprising a fixed switch contact; a movable switch contact co-operable with the fixed contact; a key lever associated with the movable contact, the key lever having a rest position and being connected to move the movable contact relative to its associated fixed contact; a pivot means for the key lever; a mounting for the pivot means; a curved leaf spring extending longitudinally of at least a part of the key lever for resiliently resisting movements of the key lever from its normal position, one end of the leaf spring being secured to the mounting; and guide means in the leaf spring which guidingly co-operates with at least a portion of the key lever at a point distant from the pivot axis of the key lever.

4. An electrical switch comprising a fixed switch contact; a movable switch contact co-operable with the fixed contact; a key lever associated with the movable contact; the key lever having a rest position and being connected to move the movable contact relative to the fixed contact; a pivot means for the key lever, a mounting for the pivot means; a leaf spring extending longitudinally of the key lever for resiliently resisting movements of the key lever from its normal position, one end of the leaf spring being secured to the mounting; a longitudinally directed slot in the other end of the leaf spring; a first projection on the key lever, the first projection being located at a point distant from the pivot axis of the key lever, which guidingly engages with the slot; and a second projection adjacent the other end of the leaf spring which serves as the point of contact between the key lever and the leaf spring.

5. A piano key switch comprising a number of switch units as claimed in claim 4 arranged side by side with the pivoting axes of the key levers axially aligned.

6. An electrical switch comprising a fixed switch contact; a movable switch contact co-operable with the fixed contact; a key lever having a rest position, the key lever being co-operable with the movable contact to move the movable contact relative to the associated fixed contact; a pivot member mounting for the key lever; a frame supporting the pivot member; a leaf spring having one end portion thereof attached to the frame; and the other end portion co-operating with the key lever to resiliently resist movements of the key lever from its rest position, the leaf spring being curved so that the other end portion of the spring faces in the same direction as the one end portion; a longitudinal slot in the spring, the slot being intermediate of the ends of the leaf spring; said slot guidingly accommodating a part of the key lever which is distant from the key lever pivot axis, and a projection on the key lever which serves as the point of contact betwen the key lever and the leaf spring.

7. A piano key switch comprising a plurality of switch units as claimed in claim 6, arranged side-by-side with the pivoting axes of the key levers axially aligned.

8. An electrical switch comprising a fixed switch contact; a movable switch contact co-operable with the fixed contact; a key lever having a rest position, the key lever being co-operable with the movable contact to move the movable contact relative to the associated fixed contact; a pivot member mounting for the key lever; a frame supporting the pivot member; a leaf spring having one end portion thereof attached to the frame, and the other end portion co-operating with the key lever to resiliently resist movement of the key lever from its rest position, the leaf spring being curved so that the other end portion of the spring faces in the same direction as the one end portion; a longitudinal slot in the spring, the slot being intermediate of the ends of the leaf spring, said slot guidingly accommodating a part of the key lever which is distant from the key lever pivot axis; a projection on the key lever which serves as the point of contact between the key lever and the leaf spring; location apertures on the one end of the spring; projections on the frame co-operating with the location aperture; and a single screw means attaching the spring to the frame.

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