

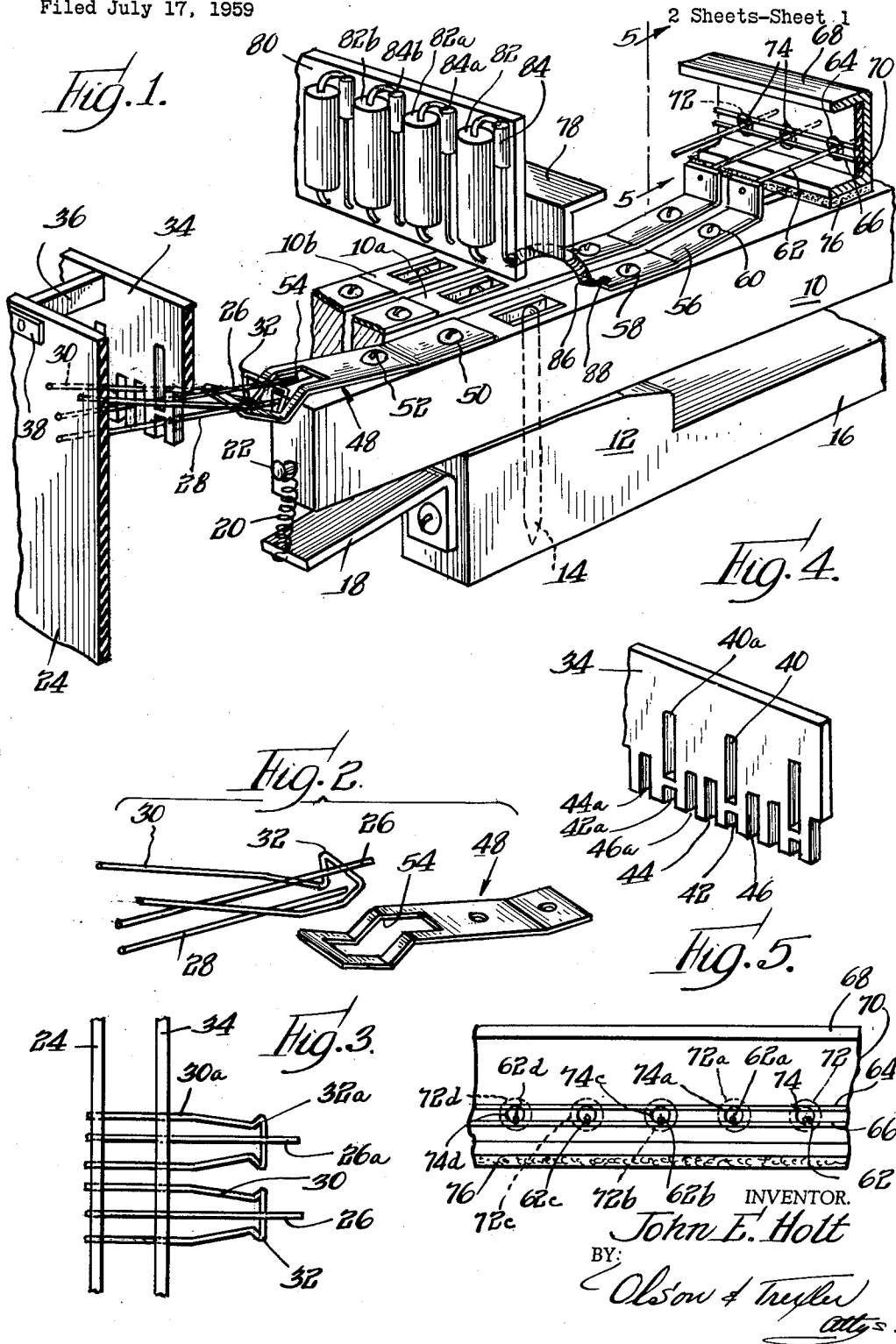
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SWITCH ARRANGEMENT FOR ELECTRONIC ORGANS

Filed July 17, 1959



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Fig. 6.

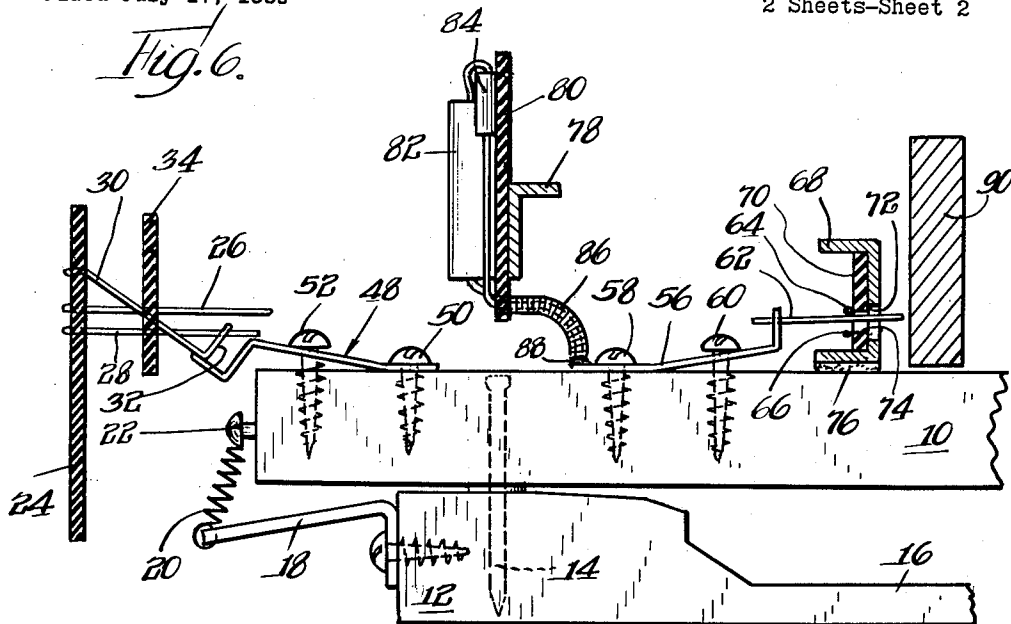
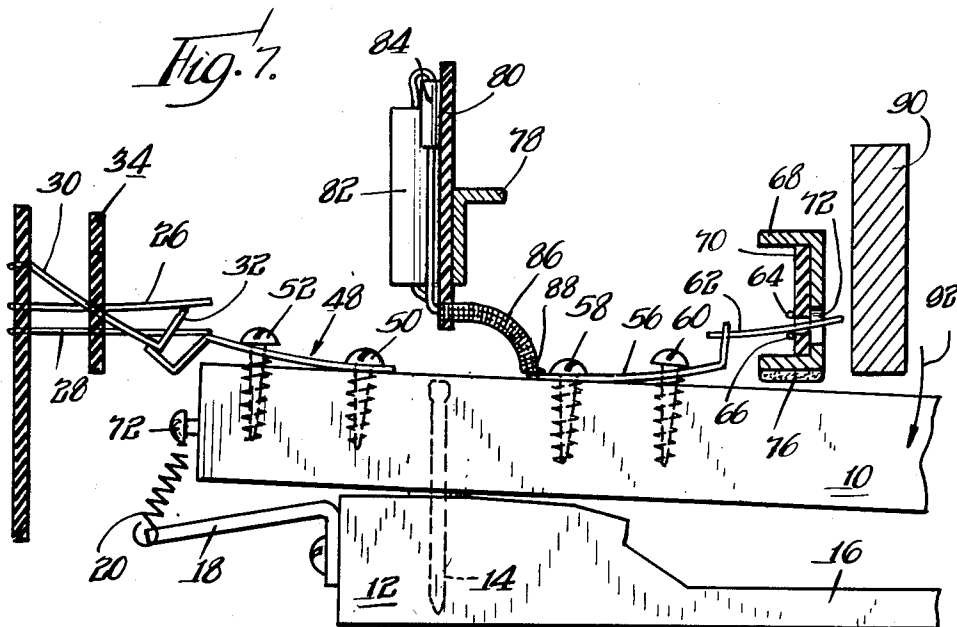


Fig. 7.



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SWITCH ARRANGEMENT FOR ELECTRONIC ORGANS

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This invention relates generally to operating mechanisms for electronic organs and more particularly to organ key operated electrical switch arrangements.

The switch arrangement of the present invention is especially useful when it is desired to strike an electronically produced musical note, such as for example would be desired in playing an electronic organ. A common practice in switch arrangements of the type described involves utilization of the movement of the organ key to close an electrical circuit through a mechanical linkage coupling the electrical circuit to the organ key. Use of such a mechanical linkage, of course, predisposes an organ so constructed to frequent servicing, required in order to maintain the mechanical linkages in proper adjustment. It is, therefore, an object of the present invention to provide an improved switch arrangement for electronic organs which is directly actuated by the organ key and which requires less frequent servicing.

Another object of the invention is to provide a more reliable switch arrangement for electronic organs.

Yet another object of the invention is to provide a switch arrangement for electronic organs by the use of which the desired musical note can be struck while the appropriate percussion is simultaneously actuated.

A further object of the invention is to provide an improved switch arrangement for electronic organs which is simply constructed and which is economical to manufacture.

Additional objects and features of the invention pertain to the particular structure and arrangements whereby the above objects are attained.

The structure in accordance with the invention includes an apertured switch arm which is adjustably mounted to an organ key in order to relocate a moveable contact between two fixed contacts, the fixed and moveable contacts being fastened to a circuit board which is disposed rearwardly in spaced-apart relationship from the organ key.

The invention, both to its structure and mode of operation, will be better understood by reference to the following disclosure and drawings forming a part thereof, wherein:

FIG. 1 is a perspective view of an electronic organ key associated with a switch arrangement in accordance with the present invention;

FIG. 2 is a perspective view of the fixed and moveable contacts and the apertured switch arm used in the switch arrangement of FIG. 1;

FIG. 3 is a fragmentary view of the contacts of FIG. 2, showing the contacts mounted in the circuit board and extending through the guide board;

FIG. 4 is a fragmentary perspective view of the guide board used in FIG. 3;

FIG. 5 is an elevational view through the section 5-5 of FIG. 1;

FIG. 6 is an elevational side view in partial cross section of the showing of FIG. 1, illustrating the switch arrangement in its normal or rest position; and

FIG. 7 is an elevational side view in partial cross section of the switch arrangement of FIG. 1, illustrating the switch arrangement in its operating position.

Referring now in detail to the drawings, specifically to FIG. 1, a conventional organ key 10 is shown pivotally mounted to a balance rail 12 by means of a balance rail

pin 14. Balance rail 12 is integrally joined to a keyed 16 which extends across the body of an electronic organ.

Advantageously, an angled bracket 18 is secured to the rearward end of balance rail 12 in order that a tension spring 20 can be extended between the free end of bracket 18 and a nail 22 that is driven into key 10. Spring 20 serves to bias the keyboard end of key 10 in a vertically upward direction.

In accordance with the invention, a circuit board 24 is disposed rearwardly in spaced-apart relationship from organ key 10 to extend across through the body of the organ. A suitable electric circuit is printed or otherwise suitably applied to board 24; and this circuit, it is to be understood, provides connections such as to the amplifiers and continuously operating oscillators customarily incorporated in an electronic organ.

An upper, fixed, straight wire contact 26 and a lower, fixed, straight wire contact 28 are secured to circuit board 24, being by way of illustration, electrically connected to signal output and ground respectively. Also secured to circuit board 24 are the free ends of a generally U-shaped spring wire contact 30 which is connected to the signal input portion of the circuit carried by board 24. Contact 30 is arranged to make connection normally with the contact 28, being further arranged to be moveable to make electrical connection with contact 26.

The closed portion 32 of moveable contact 30 is preferably upwardly right angularly formed as shown in the several figures. Contact 30 additionally is preferably inwardly tapered toward the apexes of the right angular bend. Other useful configurations of contact 30 will, of course, suggest themselves to those skilled in the art.

An insulating guide board 34 is disposed between circuit board 24 and key 10, as by being mounted in spaced-apart relationship from board 24 by means of interconnecting struts 36. Fastener 38 may be employed to secure struts 36 firmly in place.

As best shown in FIG. 4, guide board 34 is provided with a vertical aperture or slot 40 which is adapted to pass the upper fixed contact 26. Board 34 is also provided with a smaller downwardly opening vertical aperture or recess 42 aligned vertically beneath aperture 40 in order to pass the lower fixed contact 28. Straddling the aperture 42 are downwardly opening vertical apertures or slots 44 and 46 which are adapted to pass the leg portions of moveable contact 30. It will be apparent that the several apertures in guide board 34 tend to keep the contacts 26, 28, and 30 in proper alignment, additionally insuring spaced-apart or insulating relationship between the several contacts.

In order to implement movement of contact 30 from connection with contact 28 to connection with contact 26, a longitudinally zigzag switch arm 48 is fastened adjacent to the end of key 10 by means of a screw 50. Advantageously, switch arm 48 may be adjustably positioned by means of a screw 52. Switch arm 48 extends beyond the end of key 10 to engage the leg portions of contact 30, switch arm 48 being appropriately provided with a rectangular aperture 54 adjacent to its free end in order to pass and thereby avoid interference with the fixed contacts 26 and 28. Arm 48 may be provided with its zigzag shape and with aperture 54 by fabrication according to a metal stamping process.

While the striking of the musical note is achieved through contacts 26, 28 and 30, it is sometimes desirable to actuate simultaneously the percussion effects of the organ notes. Accordingly, an electrically conductive, substantially L-shaped switch arm 56 is secured to key 10 forwardly of switch arm 48 by means of a screw 58, arm 56 being adjustably positioned by means of a screw 60.

The free end of switch arm 56 has affixed to its upwardly turned end a whisker wire contact 62 that extends between longitudinally disposed conductors 64 and 66. Conductors 64 and 66 are preferably associated respectively with power and the percussion circuit, being positioned in the organ body by means of a metal channel 68. Conductors 64 and 66 are secured to channel 68 by means of an intervening insulation strip 70.

Advantageously, channel 68 is provided with an aperture 72 whereas insulating strip 70 is provided with an aperture 74 of smaller diameter than aperture 72. Apertures 72 and 74 appropriately pass the free end of contact 62. This arrangement is best shown in FIG. 5.

If desired, a felt stop 76 may be adhered to the bottom surface of channel 68 so as to provide a cushioned engagement between the key 10 and channel 68.

The angled element 78 extends across the body proper of the organ slightly rearwardly of switch arm 56 in order to support an insulation board 80. Board 80 has affixed to one of its sides a capacitor 82 which is connected in series with a resistor 84. Resistor 84, in turn, is connected to a flexible conductor 86. Conductor 86 is preferably a helical, electrically conductive spring connected to the fixed end of switch arm 56 by a soldered connection 88 or other suitable means.

As will become apparent, the functional elements hereinabove described are advantageously disposed behind the front plate 90 of the organ keyboard in accordance with the showing of FIGS. 6 and 7. Additionally, it will be recognized that a switch arrangement, such as has been described, is associated with each of the organ keys displayed in the keyboard. Insofar as these duplicate arrangements are illustrated in the drawings, like numerals have been used to denote like elements, the suffix letters "a," "b," etc. being applied to the duplicate members.

Having thus described one construction of the invention, it is important now to state how the illustrated embodiment operates. The rest or normal configuration illustrated in FIG. 6, moveable contact 30 makes connection with the grounded fixed contact 28 whereas whisker contact 62 makes connection with power input conductor 64 through the contact 62, the switch arm 56, the flexible conductor 86 and the resistor 84 to the capacitor 82. Furthermore, spring 20 biases the organ key 10 upwardly against the felt stop 76.

However, when the organ key 10 is depressed in the general direction of arrow 92 (FIG. 7), zigzag switch arm 48 will lift the closed portion 32 of moveable contact 30 out of engagement with fixed contact 28 and into connection with output circuit contact 26 thereby connecting the input signal circuit to the output circuit through the moveable contact.

Simultaneously, whisker contact 62 will be lowered to make connection with percussion output conductor 66; and accordingly, capacitor 82 (having been charged, when an accompanying percussion switch is "on") will discharge through resistor 84 to control amplifier conduction to effectuate appropriate percussion.

As will be realized, when organ key 10 is released, the biasing spring 20 will return key 10 to its rest position; and with switch arm 48 no longer urging moveable contact 30 upwardly, the resilient nature of contact 30 will cause it to return to its rest position in connection with grounded fixed contact 28. At the same time, whisker contact 62 will be raised again into connection with power input conductor 64 whereby capacitor 82 will be restored to rest position for charging when the percussion switch is "on."

The foregoing descriptions given with particular regard to an electronic organ are not intended to restrict use of the invention. The switch arrangement of the invention finds other uses, as for example in electronic pianos.

The specific example herein shown and described is illustrative only. Various changes in structure will, no doubt, occur to those skilled in the art; and these changes

are to be understood as forming a part of this invention insofar as they fall within the spirit and scope of the appended claims.

The invention is claimed as follows:

1. A switch arrangement for electronic musical instruments comprising: a key depressible again a bias; circuit means located rearwardly of said key; at least one fixed contact extending from said circuit means toward said key; a moveable contact fastened to said circuit means to extend towards said key in operable relationship with said fixed contact; a first switch arm fastened to and extending beyond the rear end of said key to reposition said moveable contact in response to depression of said key; a pair of conductors extending in parallel relationship transversely of said key spaced-apart therefrom forwardly of said first switch arm; a second switch arm fastened to said key forwardly of said first switch arm in operable association with said conductors; and a wire contact extending from said second switch arm between said conductors, whereby depression of said key relocates said wire contact from connection with one of said conductors to connection with the other of said conductors simultaneously with relocation of said moveable contact.

2. A switch arrangement for electronic musical instruments comprising: a key depressible against a bias; circuit means located rearwardly of said key; at least one fixed contact extending from said circuit means toward said key; a generally U-shaped moveable contact fastened to said circuit means to extend its closed portion toward said key in operable relationship with said fixed contact; a zigzag switch arm fastened to and extending beyond the rear end of said key to reposition said moveable contact in response to depression of said key; a pair of conductors extending in vertically aligned, parallel relationship transversely of said key spaced-apart therefrom forwardly of said zigzag switch arm; a generally L-shaped switch arm fastened to said key forwardly of said zigzag switch arm in operable association with said conductors; a whisker wire contact extending from said L-shaped switch arm between said conductors; and capacitor means connected to said L-shaped switch arm, whereby depression of said key relocates said whisker contact from connection with one of said conductors to connection with other of said conductors allowing discharge of said capacitor means simultaneously with relocation of said moveable contact.

3. A switch arrangement for electronic musical instruments comprising: a key depressible against a bias; circuit means located rearwardly of said key; an insulating guide board interposed between said key and said circuit means; at least one fixed contact extending through said guide board from said circuit means toward said key; a generally U-shaped moveable contact fastened to said circuit means passing through said guide board to extend its closed portion toward said key in operable relationship with said fixed contact; a zigzag switch arm adjustably fastened to and extending beyond the rear end of said key to reposition said moveable contact in response to depression of said key, said switch arm having an aperture disposed near its free end adapted to pass the free end of said fixed contact; a pair of conductors extending in vertically aligned, parallel relationship transversely of said key spaced-apart therefrom forwardly of said zigzag switch arm; a generally L-shaped switch arm fastened to said key forwardly of said zigzag switch arm in operable association with said conductors; a whisker wire contact extending from said L-shaped switch arm between said conductors; and capacitor means flexibly connected to said L-shaped switch arm whereby depression of said key relocates said whisker contact from connection with one of said conductors to connection with other of said conductors allowing discharge of said capacitor means simultaneously with relocation of said moveable contact.

4. A switch arrangement for electronic musical instruments comprising: a key depressible against a bias; circuit means located rearwardly of said key; an insulating guide

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board interposed between said key and said circuit means, said guide board having a pair of vertically aligned fixed-contact-passing apertures and a pair of moveable-contact-passing apertures straddling said fixed-contact-passing apertures; a pair of straight wire fixed contacts extending through said guide board from said circuit means toward said key in vertically aligned, parallel relationship; a generally U-shaped moveable spring wire contact fastened at its ends to said circuit board and passing through said guide board to extend its upwardly formed, closed portion toward said key between said fixed contacts; a transversely zigzag switch arm adjustably fastened at one end to said key and extending beyond the rear end of said key to reposition said moveable contact from connection with one of said fixed contacts to connection with the other of said fixed contacts in response to depression of said key, said switch arm having a rectangular aperture disposed near its free end adapted to pass the free ends of said fixed contacts; a pair of conductors extending in vertically aligned, parallel relationship transversely of said key spaced-apart therefrom forwardly of said zigzag switch arm; a generally L-shaped switch arm fastened to said key forwardly of said zigzag switch arm in operable association with said conductors; a whisker wire contact extending from said L-shaped switch arm between said conductors; and capacitor means flexibly connected to said

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L-shaped switch arm, whereby depression of said key relocates said whisker contact from connection with one of said conductors to connection with the other of said conductors allowing discharge of said capacitor means simultaneously with relocation of said moveable contact.

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