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F. H. OSBORNE ET AL
ORGAN STOPS AND KEY SWITCHES

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Fig. 1.

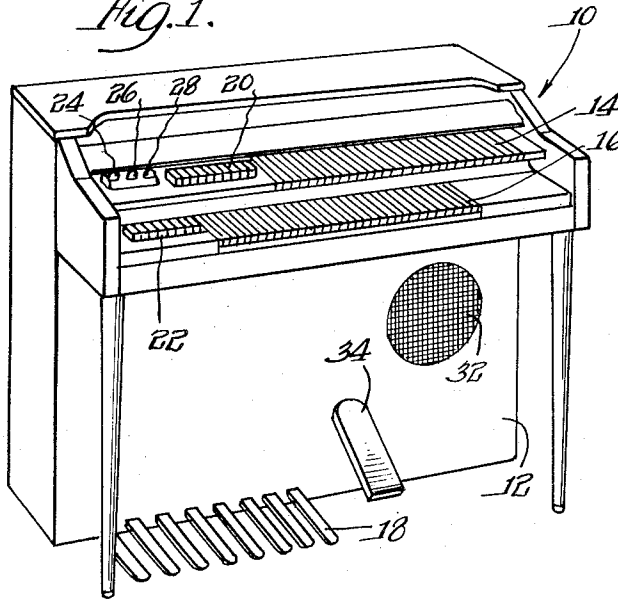


Fig. 2.

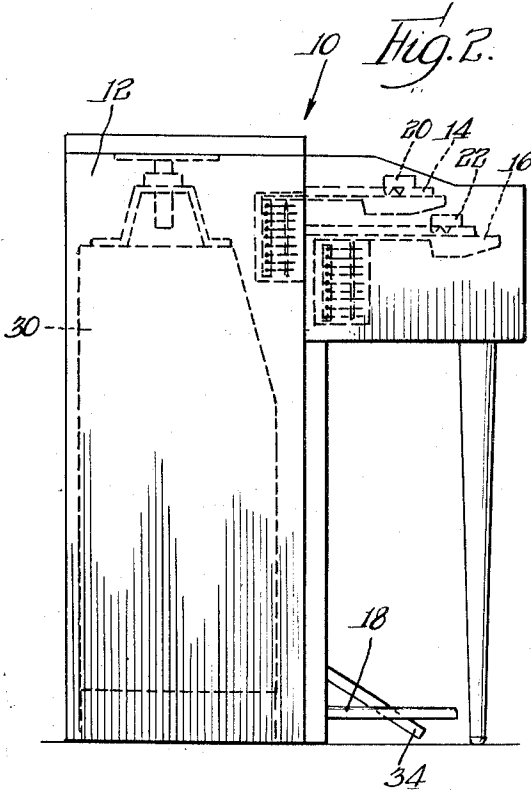
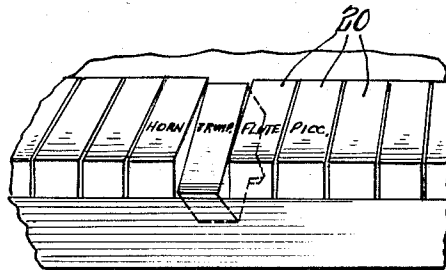


Fig. 3.



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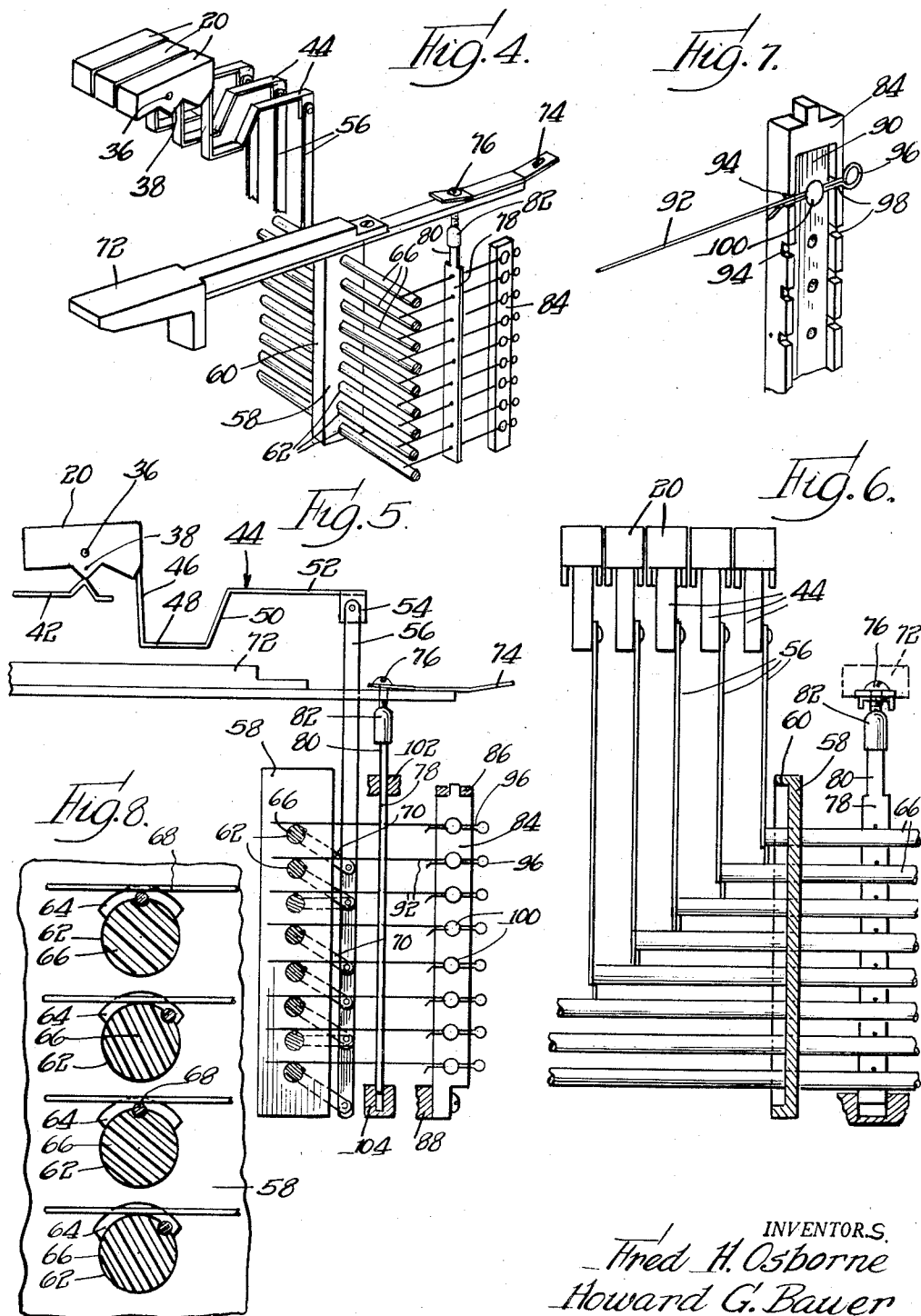
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ORGAN STOPS AND KEY SWITCHES

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2 Claims. (Cl. 84—341)

This invention is concerned with an electronic organ and more particularly with the organ stops and key switches of a continuous reed organ.

Organs are distinguished from most other musical instruments in that a single key may produce a plurality of tones depending on which organ stops are open. Thus, if the proper stops are open, a key may produce a note corresponding to any or all of an organ flute stop, or trumpet stop, or life stop, etc. In electronic organs, a plurality of switches is actuatable by each key, and organ stops are connected to these switches in such manner as to condition preselected switches of each key group for actuation when a key is depressed.

It is an object of this invention to provide organ stops and key switches of the foregoing character which are rugged in operation, occupy a minimum of space, and are inexpensive to produce.

According to the principles of this invention, the foregoing object is carried out by locating the key switches and stops in the organ cabinet directly behind the keyboards where a movable switch member of each switch is moved each time a key is depressed, and a cooperable member for each movable switch member is positioned for electrical contacting engagement thereby when a stop is opened, and is not so positioned when a stop is closed.

It is most important for all of the keys of an organ keyboard to offer a uniform resistance to the organist's fingers and for each key to offer the same resistance at all times. If there is a non-uniform resistance, an organist's rhythm is very likely to be thrown off.

An object of this invention is to provide an electronic organ having a constant key resistance regardless of the number of switch contacts closed by any depression.

Another object of this invention is to provide electronic organ stop and key switches having no critical adjustments, thereby simplifying and reducing the cost of manufacture and rendering the structure more rugged and less likely to get out of order in use.

A further object of this invention is to provide electronic organ stops and key switches having a wiping contact providing a self-cleaning action and avoiding faulty action and noise caused by dust or corrosion.

Yet another object of this invention is to provide additional means for cleaning electronic organ stops and key switches.

Other objects and advantages of the present invention will be apparent from the following description when taken in connection with the accompanying drawings wherein:

Fig. 1 is a perspective view of an electronic organ embodying the principles of the invention;

Fig. 2 is an end view of the organ;

Fig. 3 is an enlarged perspective view of the organ stop controls;

Fig. 4 is a perspective view showing the organ stops and key switches;

Fig. 5 is an end view of the same parts shown in Fig. 4;

Fig. 6 is a front view thereof;

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Fig. 7 is an enlarged perspective view of one of the switch contacts and the mounting therefor; and

Fig. 8 is an end view of a guide plate or mounting plate and illustrating the mounting of stop rods.

Referring first to Figs. 1 and 2 for a general understanding of the invention disclosed herein, there will be seen an electronic organ 10 comprising a cabinet 12. The organ is provided with a pair of keyboards 14 and 16 and a pedal manual 18. Suitable stop tablets 20 and 22 are mounted adjacent the keyboards along with a control 24 for adjusting the relative intensity of the notes produced by the foot pedals, and controls 26 and 28 for controlling the speed and intensity of a vibrato effect.

A reed box 30 is housed within the cabinet and contains sound generators in the form of vibratile metallic reeds having cooperable pick-up elements spaced therefrom. As disclosed in Hoschke Patent No. 2,015,016, each reed and cooperable pick-up forms a capacitor the capacity of which varies with the vibration of the reed and consequent variation in spacing between the capacitor plates. A D. C. potential impressed between each reed and cooperable pick-up gives rise to an electrical oscillation corresponding to the organ tone when the reed is vibrated. Such oscillations are amplified by amplifier means (not shown) in the organ cabinet, and the electrical oscillations are translated into audible organ tones by a loudspeaker 32. A volume control pedal 34 is provided for controlling the amplification of the amplifier means and thereby controlling the volume of the sound output of the loudspeaker 32.

Each of the stop tablets 20 and 22, the stop tablet 20 being illustrated in Fig. 3, corresponds to a given organ stop such as horn, trumpet, flute, and piccolo. Each of the stop tablets, 20 again being chosen for illustration in Figs. 4, 5, and 6, comprises a molded block pivotally mounted on a pin 36 carried by a fixed part secured to the organ cabinet. Each tablet 20 is formed with a triangular projection 38 on its lower side which cooperates with a similar triangular projection 40 formed near the end of a fixedly mounted leaf spring 42. The projection 40 of the leaf spring is adapted to lie on either side of the stop tablet projection 38 to hold the tablet in closed, substantially horizontal position, or to hold the tablet in open tilted position. As shown in Fig. 3, all of the stop tablets are in closed position except for the trumpet stop tablet which is shown in open position. In Fig. 5 the tablet is shown passing dead center position as it is moved either way between closed and open position. It will be appreciated that the pivot pin 36 is near the center of each stop tablet 20 so that all the organist need do to open a stop is to push on the end near to him of the stop it is desired to open. Conversely, a stop is closed by merely depressing the end which is farther removed from the organist.

Each stop tablet 20 is provided at its remote end with an arm 44 extending generally outwardly from the remote end. More specifically, the arm first projects downwardly substantially at right angles to the tablet as at 46, then outwardly substantially parallel to the tablet as at 48, then upwardly and slightly outwardly as at 50, and finally outwardly parallel to the stop tablet as at 52. At the outer end of each arm 44 there is provided a depending ear 54 to which is pivotally connected a stop actuating bar 56 which depends in substantially vertical position.

Beneath each keyboard there is provided a pair of spaced apart guide plates or support plates 58 constructed of suitable insulating material. As a specific example, in an organ constructed in accordance with the principles of this invention, these plates are made of methyl methacrylate, known commercially as "Lucite." Each plate 58 is substantially flat and is provided with a pe-

ripheral flange 60 best seen in Fig. 6. Each plate 58 is provided with a vertical series of openings 62, corresponding openings of each pair of plates being aligned. Each opening is substantially circular with an arcuate enlargement 64 along its upper edge. The arcuate enlargements are symmetrical about the vertical center lines of the plate 58 so that identical plates are in reverse positions for each pair.

A plurality of stop rods 66 is supported in spaced apart, horizontal position by each pair of guide plates or support plates 58. The stop rods 66 are rotatably received in the openings 62 of the plates 58, and are made of a suitable insulating material. In the specific organ previously referred to, these rods are made of the phenolic compound known as Bakelite. Each stop rod 66 is provided with a conductive insert 68 extending longitudinally substantially from end to end of the stop rod. The inserts extend a slight distance from the surface of the stop rods 66 and are received in the enlargements 64 of the openings 62 in the plates 58, these enlargements limiting the degree of rotation of the rods. The inserts 68 preferably are made of wire inserted in grooves in the surfaces of the rods. Specifically, and by way of example only, the inserts 68 are made of relatively soft Nichrome wire. Flexible connections are made to corresponding ends of the wires 68 by means of bronze coil springs (not shown).

A radially extending arm 70 is fixed on the end of each stop rod 66 and is connected to one of the depending stop actuating bars 56. As may be seen in Fig. 6, the stop rods 66 are of non-uniform length. The rods end under their respectively associated stop tablets for direct actuation by the stop actuating bars 56.

Each key, for example one of the keys 72 (Figs. 4, 5, and 6) of the keyboard 14 is formed of molded plastic and is secured by means of a spring member 74 to a fixed part of the organ (not shown). A screw 76 is threaded through each key near the end thereof attached to the spring 74. An end of each spring is deflected upwardly beneath each screw to maintain tension thereon and thereby to hold each screw firmly in adjusted position.

Beneath each screw 76 there is located an elongated actuator 78 in the form of an insulating sheet of plastic or fiber arranged substantially parallel to the plane of the stop rods 66. An upper reduced portion 80 on each actuator 78 is provided with a rubber cap or bumper 82 engageable by one of the screws 76.

A plurality of plastic or other insulating support blocks 84 (Figs. 4, 5, and 7) is secured to fixed parts 86 and 88 of the organ in parallelism with the actuator 78 and on the opposite side thereof from the stop rods 66. One face of each support block 84 is recessed as at 90, and a plurality of switch contact or cat whisker wires 92 is secured on this face with outwardly extending arms thereof projecting through suitable recesses 94. The opposite end of each wire is formed into a loop having an eyelet 96 for attaching lead wires, the eyelet projecting outwardly from the support 84 through a suitable groove or recess 98. The wires 92 preferably are mounted on support 84 by means of rivets 100 passing through the looped portions of the wires and through the support 84.

The wires 92 pass through suitable holes in the actuators 78 which are mounted for sliding movement in guides 102 and 104. There is one support 84 and one actuator 78 for each key 72, and each support 84 carries one wire 92 for each stop rod 66. When any one key 72 is depressed, it forces down the corresponding actuator 78, and this deflects the corresponding wires 92 downwardly into contact with the stop rods 66 or inserts 68. When a stop is closed, the stop actuating bar 56 is lowered and the stop rod 66 associated therewith is rotated in a clockwise direction (as viewed from the right end of Figs. 4 and 6) so that the insert 68 cannot be contacted by one of the wires 92. In Fig. 8 the bottom rod 66 and the second rod above it are shown in this position.

When a stop is in open position, the corresponding stop rod 66 is rotated in a counterclockwise direction to bring its insert 68 to the top where it is in position to be contacted by the wires 92. In Fig. 8, the top rod 66 and the second one below it are shown in this position. Thus, each time a key 72 is depressed, a plurality of corresponding wires 92 is depressed to close the key switches comprised by the wires 92 and inserts 68 whenever one of the rods 66 is in proper position for engagement of its insert 68 by one of the wires 92.

Whenever a set of wires 92 is depressed by its associated actuator 78, each of the wires engages either a stop rod 66 or its insert 68. Either the stop rod or insert resists further movement of the wire to the same extent, and accordingly the same pressure to actuate a key 72 is required at all times regardless of how many stops are in open position.

The wires 92 are designed to engage either the stop rods 66 or inserts 68 before a key 72 is fully depressed. Further depression of a key merely causes the centers of the wires to be moved further downwardly while the ends contacting the rods 66 or inserts 68 flex relatively upwardly. This arrangement makes vertical adjustment unnecessary. If a wire should be displaced downwardly slightly from its desired position, it would just be flexed a little farther, whereas conversely a wire which was displaced upwardly slightly would be flexed a lesser distance.

It will be apparent that once a wire 92 has engaged a rod 66 or insert 68 further depression of the center of the wire will impart a slight longitudinal movement to the wire 92 adjacent its free end. This causes each wire 92 to move over the insert 68 of an open stop with a wiping motion, thereby tending to maintain the contact clean. This eliminates noise and spurious operation that could be caused by dust or corrosion. The contacts further can be cleaned by depressing one or more keys (preferably with the organ turned off) and opening or closing the stops to move the inserts 88 longitudinally of the wires 92 to rub against the wires.

It has been noted earlier that the inserts 68 preferably are made of relatively soft Nichrome wire. The wires 92 preferably are of relatively hard Nichrome wire. The hard Nichrome wire possesses sufficient resiliency for the purposes described. A further advantage obtained by using Nichrome wires and inserts is that Nichrome is relatively resistant to corrosion. This resistance to corrosion coupled with the self-cleaning action of the contacts as just described insures trouble-free operation over an extended period. The Nichrome wire further has a relatively high resistance which, while transferring potential, tends to hold currents down and thereby to reduce key clicks when the contacts are closed.

It will be apparent that all of the stop rods of any one set can be installed or removed as a unit by simply handling the two supports 58. Similarly, all of the cat whisker wires 92 associated with any one key are handled as a unit by means of the support 84.

The specific example of the invention herein shown and described is for illustrative purposes only. Various changes can be made in the specific structure shown without departing from the spirit and scope of the invention as expressed in the following claims.

The invention is hereby claimed as follows:

1. A switch construction comprising an insulating support, a contact strip carried by the support and extending outwardly therefrom, insulating means connected to the contact strip for movement thereof, a rotatable contact rod of non-conducting material adjacent the strip and engageable thereby, said rod having a conductive insert extending axially over a major portion of the length thereof and partially embedded therein but extending radially outwardly from the surface of the rod, said insert and rod being in the path of movement of said contact strip, means selectively to rotate the rod to move the insert into and out of the path of movement of the strip,

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an insulating support for said rod, said insulating support having a generally circular opening therein rotatably receiving said rod, said opening having a radially projecting arcuate enlargement accommodating the conductive insert in the rod and limiting pivoting movement thereof. 5

2. A switch construction as set forth in claim 1 wherein the cross sectional area of said insert is quite small relative to the cross sectional area of the rod.

1,788,963
2,117,002
2,567,870
2,741,670

128,523

6

Steinfeld ----- Jan. 13, 1931
Hammond ----- May 10, 1938
Bozak et al. ----- Sept. 11, 1951
Kent et al. ----- Apr. 10, 1956

FOREIGN PATENTS

Austria ----- June 10, 1932

References Cited in the file of this patent

10

UNITED STATES PATENTS

492,563 Singer ----- Feb. 28, 1893