

April 6, 1965

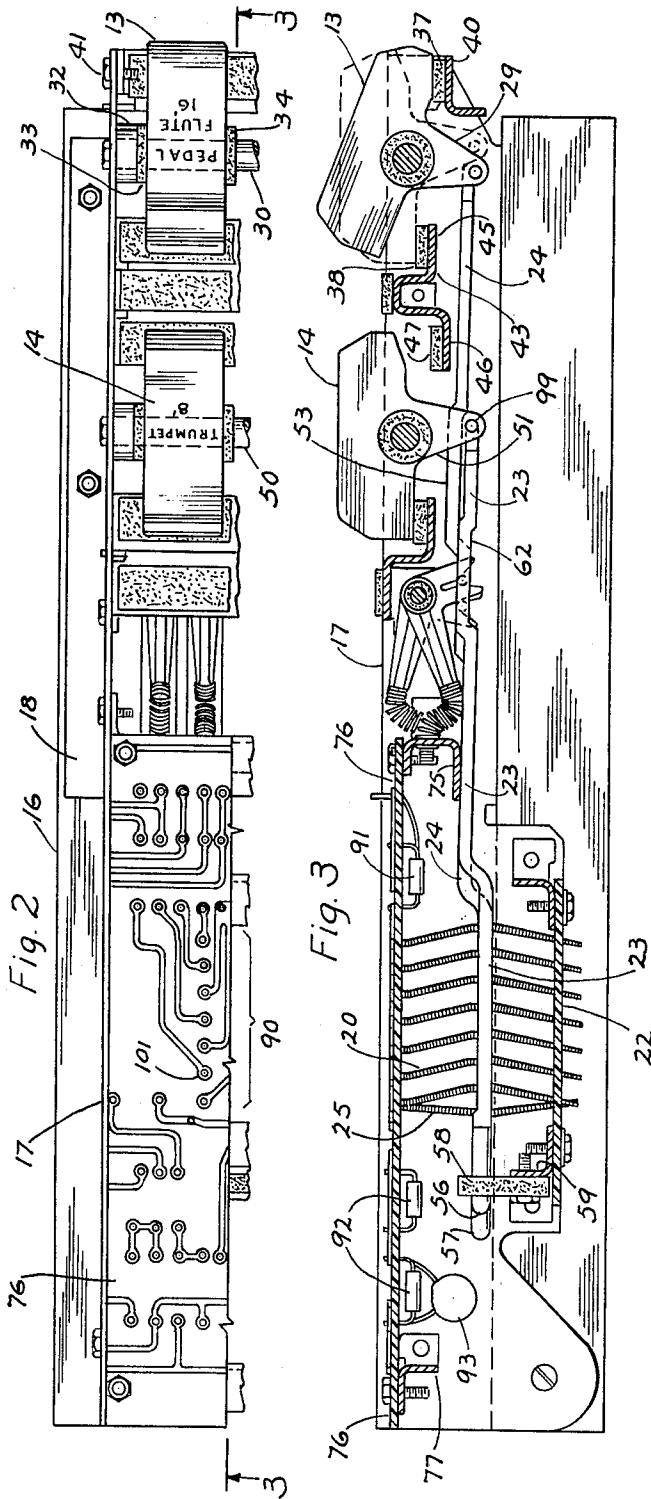
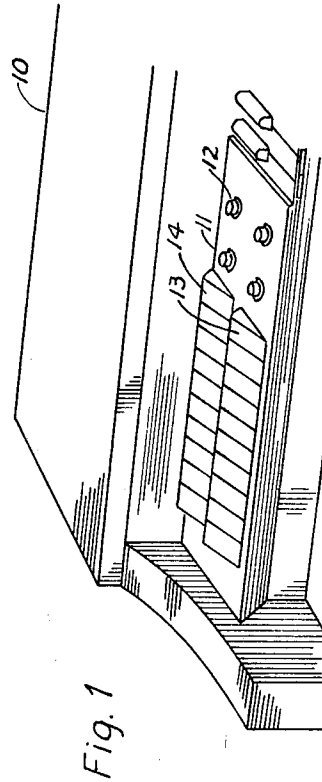
I. F. HYDEN

3,176,527

TAB SWITCH ASSEMBLY

Filed July 13, 1960

2 Sheets-Sheet 1



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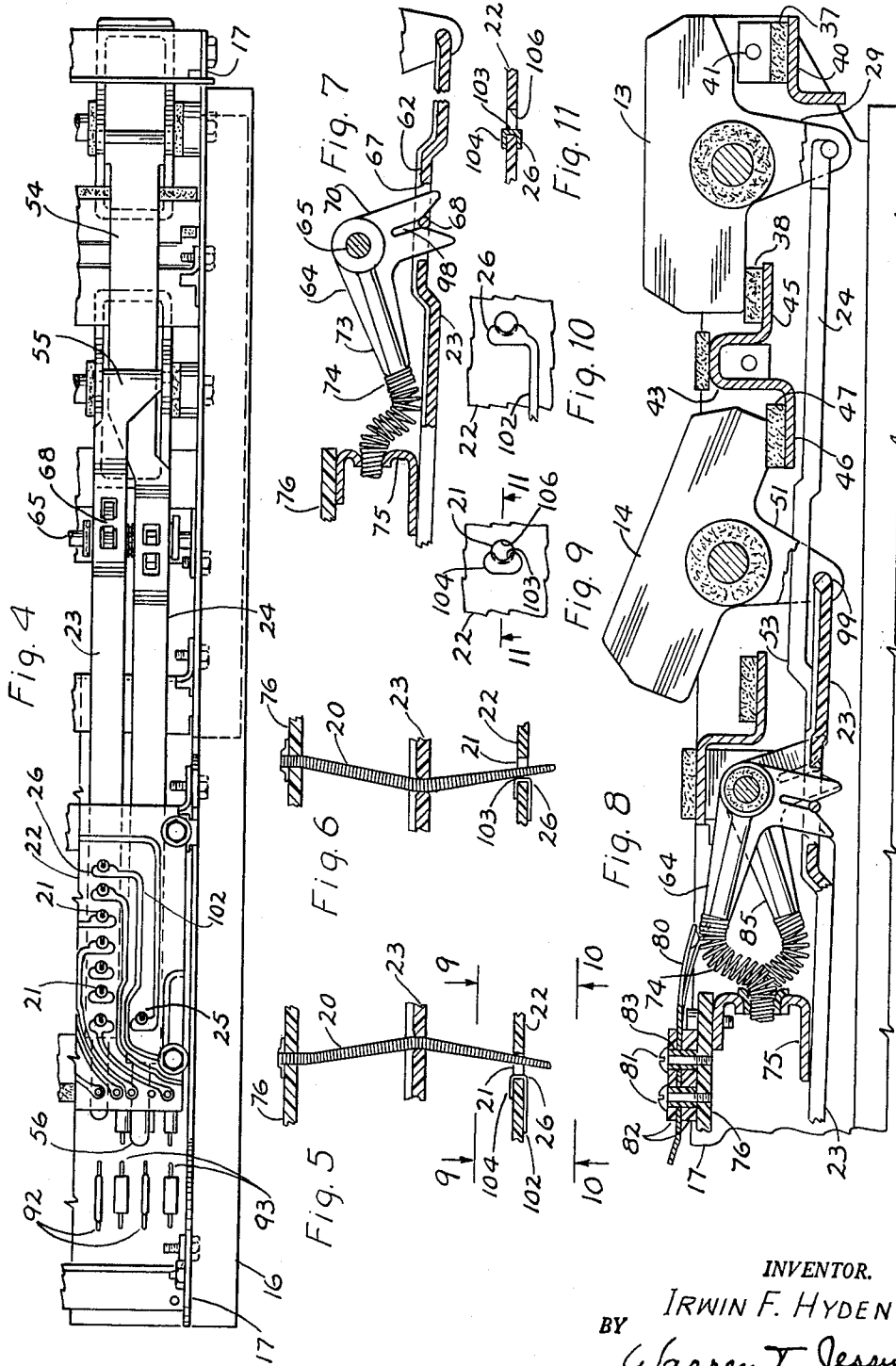
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TAB SWITCH ASSEMBLY

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2 Claims. (Cl. 74-100)

This invention relates to a multiple actuator assembly and more particularly to a multiple tab switch assembly particularly adaptable for use in the control circuitry of electronic organs.

Such organs are ordinarily operated in part by rocker tabs which actuate multiple switches or multiple contactors. It is a primary object of this invention to provide an improved and simplified construction and assembly of rocker tabs and actuators operable thereby for actuating multiple contacts.

It is a further object of the invention to provide such an improved assembly having tandem mounted rocker tabs connected to parallel actuator bars or links, including a longer link connected to one rocker tab with another rocker tab having a yoke straddling the longer link and connected to the shorter link whereby the assembly occupies a minimum of space and facilitates manufacture and assembly.

Another object of this invention is to provide in an assembly as in the foregoing object, bi-stable position control for the actuator links in the form of coil springs fixed at one end and means connected to the other ends of the springs operable to move the said ends laterally with respect to the fixed ends whereby the ends move between extreme positions with a snap action.

Further objects and numerous additional advantages of the invention will become apparent from the following detailed description and annexed drawings wherein:

FIGURE 1 is a partial perspective view of the key board or control panel of an electronic organ;

FIGURE 2 is a plan view of the assembly of the invention;

FIGURE 3 is a view taken along line 3-3 of FIGURE 2;

FIGURE 4 is a bottom view of the assembly of the invention;

FIGURE 5 is a detail view of an individual electrical contactor;

FIGURE 6 is a detail view of the contactor of FIGURE 5 in another position;

FIGURE 7 is a detail view of the snap mechanism;

FIGURE 8 is an enlarged view of the rocker tabs and snap action mechanism;

FIGURE 9 is a fragmentary view taken on line 9-9 in FIGURE 5, with the switch arm or spring eliminated for sake of clarity;

FIGURE 10 is a fragmentary view taken on line 10-10 in FIGURE 5, also with the switch arm removed; and

FIGURE 11 is a fragmentary cross section taken on line 11-11 in FIGURE 9.

Referring now more particularly to the drawings, an electronic organ is shown at 10 having a key board or control panel 11 which includes in addition to the keys, control knobs as shown at 12, and rocker tabs such as 13 and 14. FIGURE 2 shows a plan view of an electrical contactor assembly with the two rocker tabs 13 and 14 mounted in tandem for actuating electrical contacts. Numeral 17 designates one of two side mounting panels between which the tabs 13, 14 reside. Panel 17 has a flange or foot 18 attached to a base 16 by suitable means such as screws.

The electrical contactors are in the form of tightly

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wound coil springs as shown, for example, at 20 and as shown in FIGURES 5 and 6, having tapering lower ends. The lower ends extend through openings or passageways shown, for example, at 21 in FIGURE 4 in an insulating panel 22. The intermediate parts of the springs 20 extend through openings provided in part of an actuator link as designated at 23. Numeral 24 designates a second actuator link having similar openings and as shown in FIGURE 3 this link actuates a single contactor spring 25 although it may actuate multiple contactor springs.

The spring 20 constitutes a conducting switch member or switch arm which carries current from a terminal and lead exemplified by 101 in FIGURE 2, through the body of the spring 20, and thence to a stationary contact or pad 26 (FIG. 4) which is integral with a flat conductor 102 formed on the under surface of the panel or plate 22. The spring 20 extends through the recess or opening 21, and when moved to the right as shown in FIGURE 5 engages the right hand side of the opening 21; when moved to the left as shown in FIGURE 6 it engages the left hand side of the opening 21. The interior of the opening or passageway 21 at the left side is lined with a conducting layer or lamination 103, which is in physical and electrical contact with the terminal or pad 26 and also with a corresponding terminal or pad 104 on the upper surface of the panel 22. The right hand side 106 of the opening 21, opposite the layer or lamination 103, is free of conducting material. Thus in the position shown in FIGURE 5 the switch is in open position, while in the position shown in FIGURE 6 the switch is closed.

The switch contact structure described above is fabricated by a technique known generally as printed circuitry, and described specifically, as follows. The panel or plate 22 is first completely coated on each side with copper foil bonded thereto by known techniques. This forms a laminate structure consisting of the insulating phenolic panel 22 sandwiched between two thin layers of copper foil bonded thereto. The holes 21 are then punched through the plate 22. That portion of the copper which is not desired in the finished product is etched away to leave the desired pattern of leads and terminals shown, for example, in FIGURE 4. By known techniques, the interior of the holes 21 is then coated or lined with copper, thus making an integral contact structure consisting of the pads or terminals 104 and 26 linked together by the generally cylindrical lining 103.

In accordance with the present invention, and to make the simple and elegant switch structure illustrated in FIGURES 5, 6, 9, 10, and 11 the right hand side of the hole or opening 21, opposite the pads 26 and 104 is further cut or punched away to remove approximately one half of the interior lining and expose the non-conducting or phenolic surface at 106. Thus upon assembly of the switch, when the spring 20 moves to the left it moves into the saddle shaped stationary contact structure 103 and closes the switch; when the spring 20 moves to the right as shown in FIGURE 5, it bears against the exposed non-conducting surface 106 and the switch is opened.

The rocker tab 13 actuates the longer link or bar 24 and the rocker tab 14 actuates the shorter link 23. The tabs and links may preferably be formed, as by molding, from light weight plastic materials. The tabs 13 and 14 are molded in the form of shells, the tab 13 having downwardly extending arms forming a yoke as indicated at 29. The end of arm 24 is pivoted on a yoke pin extending between the said arms. Tab 13 is mounted to pivot or rock on a pivot pin or shaft 30 extending between the plate 17 and its counterpart at the other side of the assem-

bly. Numeral 32 designates a spacer collar and on opposite sides of the tab 13 are sound deadening fiber washers 33 and 34.

The tab 13 rocks between stops formed by cushioning pads 37 and 38 as shown in FIGURES 3 and 8. Pad 37 is mounted on a bracket 40 attached to the member 17 by a screw 41 as shown. Numeral 43 designates a bracket similarly attached to the panel 17 and having the shape as shown in FIGURES 3 and 8. It has horizontally extending feet 45 and 46, foot 45 carrying the pad 38 and foot 46 carrying a pad 47 which forms one of the stops for tab 14.

The construction of the tab 14 is like 13 and therefore need not be described in detail. It is mounted on a pin or stem 50 in tandem with tab 13, that is forwardly of it. Tab 14 has extending legs shown at 51 forming a yoke and the link or bar 23 is attached pivotally to this yoke by a pair of trunnions 99 integral with bar 23 and engaging journal holes in the arms 51. The yoke arms 51 of tab 14 straddle the longer link or actuating bar 24 as may be seen in the figures. At this point the actuating bar 24 has an upward offset 53 facilitate the arrangement. Also the extending part of the actuating link 24 is laterally offset from the rearward part 54 which is pivoted to the tab 13 as may be seen in FIGURE 4. The end part of the link or bar 23 which is pivoted to the tab 14 is offset laterally as shown at 55 in FIGURE 4. The extending parts of the actuating bars 23 and 24 as may be seen are narrower than the parts that are pivoted and they are parallel and of the same shape as may be observed.

The ends of the actuator bars 23 and 24 have a downward offset as may be seen in FIGURE 3 and at the ends of these bars they have round extending projections as designated at 56 and 57. These projections extend through bifurcated fibre cushioned pads one of which may be seen at 58 in FIGURE 3. These pads are mounted as from brackets as shown at 59 attached by screws to the insulator panel 22 and the pads themselves similarly being attached by screws as shown.

Each of the actuator bars 23 and 24 has a slight upward offset as may be seen at 62 for the bar 23 in FIGURE 3. This construction is shown in more detail in FIGURE 7. Means are provided so that each of the actuator bars 23 and 24 operates with a snap action or movement. Referring to FIGURE 7, numeral 64 designates a bell crank lever mounted on a pin or stem 65 extending between the frame members of the assembly including the member or panel 17. The offset part 62 of actuator bar 23 has an opening 67 in it with a rib 68 extending across the intermediate part of the opening. The bell crank lever 64 has a bifurcated arm 70 which extends through the opening 67 with the bifurcations pivotally straddling the rib 68. The pivot hole is larger than the kerf 98 between the bifurcation, and the resiliency of the plastic of which the crank 64 is made permits the arm 70 to be snapped into place over the rib 68. The other arm 73 of the crank lever 64 extends into the end of a coil, over-center toggle spring 74. The other end of the spring fits into an opening in and is attached thereby to a bracket 75 suitably secured as by a screw to an upper insulated panel 76 which is attached to the member or panel 17 by an angle bracket 77 and a screw as may be seen in FIGURE 3.

Numeral 80 designates a flexible electrical contact strip having a button on its end which is engageable with the toggle spring 74. The contact strip 80 is attached to the panel 76 by screws as shown at 81 and insulative spacer members 82 as shown. Insulative sleeves are provided around the screws 81 as shown at 83.

As will be understood by those skilled in the art, in operation, in response to rocking of the tabs 13 and 14 the actuator bars or links 23 and 24 move longitudinally, that is, in the direction of their length. The bell crank lever and spring 74 form a snap action mechanism for the link 23. When the tab 14 is rocked between its two

positions the bell crank lever 64 moves with a snap action between the two positions shown in FIGURES 7 and 8. The spring 74 moves over center and therefore acts with a snap action. In the position shown in FIGURE 8 the spring directly engages the button on the end of contactor strip 80 so that an electrical contact is made. These parts therefore constitute a switch.

Numeral 85 designates a second bell crank lever which is associated structurally in the same manner with the actuator bar or link 24 and it is also mounted on the pin or stem 65. Since its construction and operation is the same it need not be described in further detail.

The upper panel 76 is made of insulating material and the upper ends of the springs 20 extend through it and connect to printed circuitry on the top of the panel as shown at 90 in FIGURE 2. The circuitry itself includes various types of electrical components shown at 91, 92, and 93. The panel 22 similarly has printed circuitry formed on the lower side thereof as may be seen in FIGURE 4 connecting with the various contact members such as 26 previously described.

From the foregoing those skilled in the art will readily understand the overall operation of the assembly. The rocker tabs 13 and 14 are mounted in tandem as described. Each one operates its respective actuator link or bar with a snap action which actuates its respective electrical contactors. The shape of the contactor bars or links 23 and 24 is generally similar except for the additional length of one of them. By reason of the offsets and the shape of the contactor bars a simplified but effective arrangement is provided for, occupying a minimum of space with the tabs 13 and 14 mounted in tandem. Production, fabrication, and assembly is simplified and made more inexpensive although a highly effective component is realized.

While the instant invention has been shown and described herein in what is conceived to be the most practical and preferred embodiments, it is recognized that departures may be made therefrom within the scope of the invention which is therefore not to be limited to the details disclosed herein but is to be afforded the full scope of the claims.

What is claimed is:

1. A tab switch assembly for an electronic organ, comprising:
 - a first and second tab lever, pivot means mounting said tab levers in longitudinal alignment;
 - each lever having a finger contact top portion and a driven extension arm projecting downwardly on the side of said pivot means opposite said top portion;
 - a first link bar pivotally attached to said extension arm of the first tab lever and extending generally parallel to said pivot means under said second tab lever to a remote terminus;
 - a second link bar pivotally attached to said extension arm of the second tab lever and extending generally parallel to said pivot means to a remote terminus;
 - said first link bar offset vertically with respect to the place of pivotal attachment of said second link bar to said second tab extension arm;
 - said first and second link bars extending in lateral alignment at a given location between the said terminus and said second tab lever; and
 - over-center detent means attached to said link bars at said given location.
2. In an organ having a key board, a tab switch assembly having a bank of control tabs projecting from said key board, comprising:
 - said key board having a top surface panel with tab slot openings therein, said bank of control tabs comprised of a plurality of pairs of tandem positioned key tabs, each said pair having a first and second tab lever, pivot means under said keyboard mounting each said tab to project through a slot opening;
 - each lever having a finger contact top portion and a

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driven extension arm projecting downwardly on the side of said pivot means opposite said top portion;
 a first link bar pivotally attached to said extension arm of the first tab lever and extending generally parallel to said top surface and under said second tab lever to a remote terminus;
 a second link bar pivotally attached to said extension arm of the second tab lever and extending generally parallel to said top surface and to a remote terminus;
 said first link bar offset vertically with respect to the place of pivotal attachment of said second link bar to said second tab extension arm;
 said first and second link bars extending in lateral alignment over at least a portion of their length between the said terminus and said second tab lever; and
 over-center detent means attached to said link bars in said alignment area;
 said over-center detent means being a bell crank lever for each said link rod, said lever having a pivot mount above said alignment area, one leg of said crank lever pivotally joined to said link, the other end having an over-center spring means for resisting movement of the crank and link until forced to a center position and thereafter imparting a snap action drive to a new rest position;

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whereby a switching means may be actuated by said link arm in a quick and positive manner.

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