

UNITED STATES PATENT OFFICE

2,630,503

ELECTRIC SWITCH

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Application March 5, 1951, Serial No. 213,966

3 Claims. (Cl. 200—52)

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This invention relates to electric switches and more particularly to switches for use in the keying-circuits of an electric organ for controlling transmission of audio tone signals to an electroacoustical translating system for conversion of selected signals into audible sounds, for musical expression.

An object of the invention is the provision of an electric switch characterized by constructional features which make for simplicity and resulting functional coaction of the elements with assurance of long life and dependability of the device.

A further object is the provision of an exceedingly compact organization of similar electric switches capable of being easily installed in a musical instrument and disposed and connected to preassigned playing-keys of a keyboard for individual actuation of the switches in response to motion of the keys when the instrument is played.

A still further object is the provision of a switch, an essential feature of which is a new and novel form of contactor which is electrically coactive with a unique arrangement of bus-bars and a motion imparting means, such as a pivoted key or equivalent actuator for respectively making and breaking electrical engagement of the contactor with said bus-bars and whose action insures maintaining the effective contacting surfaces of the bus-bars and the contactor in a clean condition, thereby making for excellent functioning of the switch.

A still further object is the provision of a switch characterized by inexpensive elements of simple form and construction that can be quickly fabricated into the finished product.

A still further object is the provision of a switch, the electrically coactive elements of which are so arranged and disposed as will simplify the process of connecting same in a keying circuit.

Another object is the provision of a playing-key controlled switch actuator which is adjustable in a manner to enable determining an operative relation between a movable contactor and a pair of coacting bus-bars.

The invention accordingly consists in the features of construction, combinations of elements, and arrangements of parts, all as will be illustratively described herein, and the scope of the invention will be indicated in the following claims.

Figure 1 is a perspective view of a portion of the keyboard of a musical instrument showing the invention applied;

Figure 2 is a perspective view of an organization or unitary structure embodying a plurality of similar individually actuable switches;

Figure 3 is a vertical section taken substan-

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tially on the line 3—3 of Figure 1, illustrating the position of the actuator for an "off" condition of the switch, and

Figure 4 is a view similar to Figure 3 showing the actuator in a position for an "on" condition of the switch.

In Figure 1 there is shown a section of the keyboard of a musical instrument, the same consisting of a base member 10 of conventional design and on which the playing-keys K are mounted for vertical pivotal motion. At the back end of the shank of each key and connecting the key to the base member 11 is a spring 12, the purpose of which is to urge the front end of the key to an elevated or playing position, all as customary in keyboards of this type.

A keyboard designed to fulfill the requirements of the disclosed invention will have at least sixty playing-keys, each of which will selectively control actuation of an electric switch in a keying-circuit between a tone signal supply source and the audio amplifier of an electroacoustical translating system.

We find it advantageous to provide a number of unitary structures, each consisting of a given number of similar electric switches, as shown in the accompanying drawings.

Referring to Figure 2 of the drawings, it is noted that the unit comprises a multiplicity of similar switches, such that for each playing-key there will be three switches that will be in "off" condition when the key is elevated under the normal urging tendency of its spring 12. This is clearly appreciated upon referring to Figure 3, whereas, on referring to Figure 4, it is noted that when playing pressure is applied to the key, the back end of the key will be raised, with the result that the switch will be in an "on" condition. It is not intended that the invention be limited to the total number of switches per unitary assembly or organization. It often times is necessary to provide a plurality of switches for each separate playing-key in order that by separate keying circuits, signals at different tone frequencies can be concurrently transmitted to an electroacoustical translating system. In the disclosed embodiment of our invention provision is made for three similar switches for each individual playing-key and we find it convenient to arrange these in a vertical series in which the switches of each separate series will occupy a space not in excess of the normal width of the associated key which is approximately one-half inch.

By this simple, yet highly practical method, a unitary assembly or organization will consist of eighteen switches arranged in six vertical rows, each comprising three switches, as shown to advantage at Figures 3 and 4.

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In carrying the invention into practice, we find it expedient to provide a flat, rectangular strip 11a of hard insulating material, measuring about three and a half inches in length, six-sixteenths inches in thickness and about one inch in width, which strip is affixed to the back edge portion 10a of the base member 10.

Mounted on the rear flat face of the strip 11a are thin rectangular strips 14 of hard insulating material and secured in slots 15 in the vertical edges of these strips are signal output bus-bars 16' and grounding bus-bars 17, such that there will be for each separate switch a bus-bar 16' and a bus-bar 17, the latter spaced apart vertically from and disposed parallel to bus-bar 16'.

For each series of three similar switches, the strip has three horizontally disposed passageways 18, 19 and 20. These are equi-distantly related, and as shown, passageways 18 and 19 are in the same general vertical plane, whereas and with respect to passageway 19, same is slightly laterally related to said plane. For and coactive with each passageway and respective bus-bars 16' and 17 is a laterally resilient contactor 21 which consists of a single length of wire of suitable kind and gauge, formed into a coil whose separate wound portions or convolutions are in abutting relation. The coil thus formed comprises (1) a rearwardly projecting portion which tends normally to assume a substantially perfectly horizontal position and to project through the space between a respective pair of bus-bars 16 and 17 as clearly shown at Figures 3 and 4, and (2) a vertical portion B, through which there passes a terminal pin 22. These pins, surrounded by the portions B of the coil are set in vertical grooves C in the front face of strip 11a. A piece of adhesive cloth D is applied to said front face of said strip 13 to hold said terminal pins in their applied positions.

To the back end of each playing-key K and secured thereto for vertical adjustment as by the slot and screw means 23 is a flat strip E of hard insulating material, the width of which is approximately the same as that of the key. The strip extends downwardly from the key and has holes 24, 25 and 26 therein through which the rearwardly extended portions of the respective contactors for each series of three switches extend. The upper and lower walls of said holes are slightly rounded at 27, such that when the strip is moved vertically the free ends of said contactors will be flexed vertically, whereby and when the key is elevated, electrical engagement of the contactors will be made with the grounded bus-bars 17, and when lowered, engagement thereof will be made with the signal output bus-bars 16'.

Adjustment of the strips E enables proper adjustment of the contactors so as to insure their intended operation and alternate coaction with their bus-bars 16' and 17.

Normally, or under the urge of the spring 12 a respective key K will be raised. In consequence thereof the three contactors of the switches common to said key will be simultaneously advanced into engagement with the grounded bus-bars 17, thereby causing current that is on said contactors to pass to ground. In like manner, the contactors will engage bus-bars 16' when the key is depressed.

The construction enables a great number of like switches to be accommodated in a small space. The individual switches are fast acting

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and by reason of the flexure of the contactors, there is just enough wiping action between them and the respective bus-bars to render the switch self-cleaning and to cause removal of fine particles of foreign matter.

The materials comprising the metal elements of the individual switch may be of any well known kind and same can be silver plated or otherwise treated to insure obtaining a good electric contact between the effective surfaces.

What we claim as our invention is:

1. An electric switch comprising a substantially flat member of electrical insulating material having a horizontally disposed aperture passing therethrough, said member having a groove formed in one face thereof and opening onto one end of said aperture, a closely wound coil spring having a portion extending through said aperture and providing an effective electrical contactor and a portion set into said groove and secured therein, and a fixed contact element on said member, said fixed contact element situated for electrical engagement with the aforementioned effective electrical contactor portion of said spring, and actuating means for moving said contactor portion on to and off of said contact element as desired.

2. The combination with a key and means supporting same for vertical tilting motion and spring means for tilting the key in one direction; of an electric switch embodying a member of electrical insulating material secured to said supporting means and provided with a horizontally disposed aperture, a fixed contact element carried by said member, a resilient contactor coactive with said fixed contact element and supported by said member and having an effective portion extending through said aperture and provided with a free end projecting therefrom and disposed relative to said fixed contact element so that under the tendency of said spring, said free end is disengaged from said fixed contact element, and an actuator adjustable vertically as desired on said key and connected with and electrically insulated from the free end of said contactor to move said free end into electrical engagement with said fixed contact element when the key is tilted in an opposite direction.

3. The combination as set forth in claim 2 wherein said member of electrical insulating material is formed with a groove communicating with said aperture and angularly related thereto, and wherein said resilient contactor comprises a closely wound coil spring having angularly related branches in which one thereof provides said effective portion of said contactor, the other angular branch of said coil spring being received and confined in said groove and having a terminal for connection to a signal conductor.

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