CONTROL DEVICE FOR ELECTRONIC MUSICAL INSTRUMENTS

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ABSTRACT OF THE DISCLOSURE

A mechanical device adapted to be mounted on the bellows of electronic musical instruments and to be connected in the electric circuit in such a manner that movement of the bellows in either of two opposite directions from the same starting position will produce corresponding variations of volume or timbre.

The following detailed description refers to the accompanying drawings illustrating four different embodiments of the device comprising this invention, in which:

FIGURES 1, 2 and 3 are front views, with portions removed, illustrating a first embodiment of the device, applied to an accordion, respectively in three different operating positions;

FIGURES 4, 5 and 6 are front and partially sectional views of a second embodiment, applied to an accordion, respectively in three different operating positions;

FIGURES 7, 8 and 9 are front views of a third embodiment, applied to an accordion, respectively in three different operating positions;

FIGURE 10 is a perspective view showing an embodiment of the invention having volume and/or timbre variation in only one direction; and

FIGURES 11 and 12 are front views, with portions removed, showing the same embodiment of FIGURE 10, applied to an accordion, respectively in two different operating positions.

Referring to FIGURES 1, 2 and 3, device 1 is shown comprising a plate 2 secured at one end to side 3 of a manually movable part such as an accordion bellows 4 and having a projecting arm 8. About axis 5, carried by said plate 2, a circular plate 6 is rotatably mounted, said plate being provided at its periphery with a semi-circular notch 7 and a crank-like projecting arm 9 to the end of which a helical tension spring 19 is connected, the other end of the spring being connected to the end of projecting arm 8 of plate 2. A connecting rod 10 is pivotally connected to the other side 13 of accordion bellows 4 and to the middle of arm 9. A pin 14 projecting from plate 2 and extending through arcuate slot 15 of plate 6 has one end of a helical tension spring 16 connected to it, the other end of the spring being connected to a pawl 17 slidable in a guide member 18.

Mounted centrally upon plate 2 is a circular plate 20 provided with three projecting arms 21, located at 120° from one another, each arm carrying a lamp 22 at its end.

Underneath each lamp 22 are two registering rhombus-shaped openings 24 in plates 2 and 6 (see FIG. 2). Opposite each lamp there is a photo-resistor, which will pick up as much light as passes through openings in the two plates.

When pawl 17 is held by tension spring 16 in notch 7 of plate 6, bellows 23 are in their stoppage position (see FIG. 1). Tension spring 19 co-operates in retaining them in said position and tends to return them to that position when, as heretofore stated, they are moved to open or closed condition. Such a stoppage position is coincident with lowest electronic instrument volume, thus allowing a performer to play at the lowest volume without bellows being moved.

When the device is used to attain tone (timbre) variations of the type obtainable by means of the "Multitone Booster" device, said stoppage position corresponds to an extremity of the desired variation.

Bellows movement, both in opening direction according to FIGURE 3 and in closing direction according to FIGURE 2, causes the same effect, increasing volume or, where "Multitone Booster" or a similar device are used, modifying timbre. This occurs as follows:

Opening or closing movement of bellows, as shown respectively in FIGURES 3 and 2, causes plate 6 to be rotated with respect to plate 2, pawl 17 getting out of notch 7 by operation of crank mechanism 10—9. Since plate 20 remains fixed to plate 2, plate 6 on rotation moves the two openings 24 relative to the lamps and, due to the shapes of the openings, there is a variation of light flux upon photo-resistors (see also FIG. 10). This causes a variation in the electric parameters of the electronic instrument circuit by means of known electric or electronic members, not shown, inserted on said circuit and resulting in the above-mentioned volume or timbre variations.

According to a second embodiment illustrated in FIGURE 4, 5 and 6 the device 1' of the present invention includes a plate 32 attached to bellows side 3 on accordion 4. An axis 35 carried by plate 32 has a circular plate 36 rotatably mounted thereon, said plate being provided on its periphery with gear teeth 37 and 38 as well as a crank-like arm 39.

The end of the arm 39 is pivotally connected to an L-shaped connecting rod 40, the other end of which is pivotally mounted on an axis 34 secured to side 13 of the bellows. The same axis 34 also provides a pivotal support for the end of piston rod 41 carrying a piston 42 slidable in a cylinder 43 at the top of plate 32, the piston being positioned between two coiled springs 44 and 45 in the cylinder 43.

When piston 42 is in the center of cylinder 43, bellows 23 is in its stoppage position (see FIGURE 4), the two springs 44 and 45 balancing each other.

In order to return the parts to said stopping position as was done in FIG. 1, the springs actuate piston 42 and crank mechanism 39 and 40 to reset the bellows.

When this occurs in opening condition according to FIGURE 6 or in closing condition according to FIGURE 5, plate 36 is rotated in relation to plate 32 in either direction by operation of crank mechanism 40—39, causing teeth 38 or 37 to engage and rotate gear wheel 48 or gear wheel 47 respectively. Said rotations cause variations of electric parameters similar to the above mentioned one related to the embodiment of FIGURES 1, 2 and 3.

According to a third embodiment, shown in FIGURES 7, 8 and 9, the device 1" of the present invention includes a plate 52 secured to bellows side 3 of accordion 4. A circular plate 56 is mounted for rotation about an axis 55 on the plate 52 and carries a projection 57 on which a crank 59 is mounted. To the end of said crank a connecting rod 60 is pivotally connected at 53, the other end of the connecting rod being rotatable about a pivot axis 54 on the bellows side 13 of the accordion. Plate 52 has openings 61 and 62 in which pins 63 and 64 on the free ends of a scissor-like spring 65 are movable, the middle portion of the spring being coiled around the axis 55.

When arm ends of spring 65 are at a minimum of distance, from each other bellows 23 is in its stoppage position (see FIGURE 7). Preservation of said stoppage position, as in FIGURE 1, is effected by the operation of said spring through pins 63 and 64 acting on the adjacent
ends of the slots 61 and 62. When the bellows is moved into opening position as in FIGURE 9 or into closing position as in FIGURE 8 by operation of crank mechanism 60–58, plate 56 rotates relative to plate 52 counter-clockwise or clockwise, respectively.

As a consequence of said rotation, metallic strip 66, an end of which is carried by an arm 67 on the bellows side 3 of accordion, whereas the other end thereof is actuated by plate 56 through a pair of pins 68, bends leftwards with the latter end (FIGURE 8) in case of clockwise rotation of plate 56 and rightwards in case of counter-clockwise rotation (FIGURE 9).

Due to such bending, strip 66 approaches a strip 69 or 70, both strips 69 and 70 being shorter and bent initially in advance of strip 66, each of said strips having one end secured on said arm 67. Strips 66, 69 and 70 are included in the electronic instrument circuit and movement of strip 66 causes in said circuit variations in the electric parameters, which are similar to the above mentioned ones relating to the embodiment of FIGURES 1, 2 and 3.

Referring now to the embodiment of an electronic musical instrument with volume and timbre variation in only one direction, shown in FIGURES 10, 11 and 12, device 1" comprises a plate 71, secured at one end to a horizontal strip 3 of accordion, a plate carrying an axis 72 on which a circular plate 73 is rotatably mounted and having a crank-like projecting arm 74, to the end of which a connecting rod 75 is pivoted at 76, the other end of said connecting rod being pivoted at 77 on the other side 13 of bellows 23.

A piece 78, integral with plate 73, carries a helical tension spring 79, the other terminal of which is secured to plate 71.

Attached to plate 71 is a plate 80 provided with three projecting arms 81 located at 120° from one another, each of said arms carrying a lamp 82 at the end thereof. Underneath each lamp there are in the two plates 71 and 73 suitably shaped registering openings 83, shown comma-shaped in the drawing.

Opposite to the plates, a photo-resistor 94 is provided for each lamp, said photo-resistor picking up as much light as passes through the openings of the two plates. Bellows 23 is in its stoppage position (see FIGURE 11), tension spring 79 retaining it in said position and bringing it back to said position when, as hereinbefore stated, the bellows has been moved into opening position.

Said stoppage position is coincident with the lowest volume of the electronic instrument.

Therefore, said position allows a performer to play at the lowest volume without moving the bellows.

A strap 84, secured to the two bellows sides 3 and 13, provides a limit stop for the same.

When the device is used to attain tone (timbre) variations of the kind obtainable by means of the "Multitone-Booster" device, said stoppage position corresponds to an extremity of the desired variation.

Movement of bellows in opening position, according to FIGURE 12, is effective to increase volume or, where the "Multi-Booster" or a similar device are used, to modify the timbre. This occurs as follows:

Movement of bellows into open position as in FIGURE 12 causes plate 73 to be rotated relative to plate 71, thereby varying the corresponding openings 83 and hence, the light flux rate incident on photo-resistors, causing a variation in the electric parameters of the electronic instrument circuit, from which the above mentioned volume and timbre variations arise.

Further expedients are applicable to the device comprising the present invention besides those that have been described above by way of example and not by limitation, without departing from the protective range of the invention.

What is claimed is:

1. A mechanical device for operating an electric circuit of an electronic musical instrument having two manually operated relatively movable members, a lower plate connected to the lower plate and the upper plate rotatably mounted on the lower plate and connected to the other one of said members through crank mechanism, spring mechanism tending to retain said plates in or to bring them into their starting position, corresponding to a stoppage position of the relatively movable members, and devices connected to the lower plate and adapted as a consequence of upper plate rotation caused by said crank mechanism during movement of said relatively movable members to cause variations in the electric parameters of the electronic instrument circuit by means of known electric or electronic members inserted in the circuit itself, said variations causing variations in instrument volume and/or timbre, the lowest volume and/or an extremity of the desired variation being coincident with a stoppage position of said relatively movable members.

2. A mechanical device for operating an electric circuit of an electronic musical instrument in the nature of an electronic accordion, wherein said device includes two plates, a lower one of which is connected to one side of the accordion bellows and carries an axis about which the upper plate is rotatable, the upper plate being connected to the other side of the bellows through crank mechanism, a spring assembly tending to retain said plates in or to bring them into their starting position, corresponding to the bellows stoppage position, and members, connected to the integral plate, adapted as a consequence of circular plate rotation caused by said crank mechanism during bellows movement into open or closed positions to cause variations in the electric parameters of the electronic instrument circuit by means of known electric or electronic members inserted in the circuit itself, said variations causing variations in instrument volume and/or timbre, the lowest volume and/or an extremity of the desired variation being coincident with the bellows stoppage position.

3. A device according to claim 1, characterized in that the spring assembly comprises a helical spring connected to the lower plate and carrying at the other end thereof a pawl and retaining it resiliently in a notch of the upper plate, and a tension helical spring connected between the ends of two arms projecting respectively from said plates, where the members for causing variations in electronic parameters are composed of lamps, each lamp being carried by a circular plate and, and of photo-resistors, each of them being located in association with its respective lamp adjacent substantially rhombus-shaped openings in the lower and upper plates, movement of the upper plate causing, due to the shape of said openings, a variation in the light flux that is incident on the photo-resistors.

4. A device according to claim 1, characterized in that the spring assembly comprises two compression helical springs on opposite sides of a piston in a cylinder mounted on the lower plate and connected to one side of the bellows, the piston rod being pivotally connected with the crank mechanism to the other side of the bellows, the members adapted to cause variations in the electric parameters being composed of two series of teeth on the periphery of the rotatable plate and of gear wheels, one of which is adapted to engage one of said series of teeth when the plate is rotated in one direction and the other of which is adapted to engage the other series of teeth when said plate rotates in the other direction.

5. A device according to claim 1, characterized in that said spring assembly is composed of a scissorslike spring positioned on the upper plate and carrying at the end of each of its arms a pin adapted to slide in a slot formed in the lower plate, the members for causing variations in electric parameters being composed of three metal strips, one end of each being secured to an arm attached to a side of the accordion, the middle and longest one of the
three being bent in either direction into contact with either of the other strips by rotation of the upper plate.

6. A device according to claim 1, characterized in that said spring assembly comprises a helical spring connected between the lower plate and the upper plate, the members for causing variations in electric parameters being composed of lamps, each lamp being carried at the end of an arm extending from a plate mounted on the lower plate, and photo-resistors, each photo-resistor being located in association with each lamp on the other side of substantially comma-shaped openings in the lower and upper plates, the openings being so shaped that rotation of the upper plate will cause a variation in light flux incident on the photo-resistors.

References Cited

UNITED STATES PATENTS

2,586,664 2/1952 Knoblauch 84-1,28
2,736,223 2/1956 Seybold 84-376
3,049,957 8/1962 Krug 84-110

ARTHUR GAUSS, Primary Examiner.
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