A stringed instrument with electronic organ tone generators selectively actuated with fingerboard switches and including a silicon controlled rectifier between strings and a battery. The fingerboard supports spaced divided frets against which the strings may be engaged by finger pressure in the normal manner. The under side of the fingerboard is grooved to provide a groove beneath each string. Switch blades are supported in overlapping relation in each groove, the blades being held in place by transversely extending retaining pins. A push button is supported above each switch blade. When the string is pressed against a fret, the corresponding push button is depressed. The switch blades are normally in contact, and current is supplied to each row of switch blades. A circuit board is positioned below the finger board and includes contacts connected to corresponding tone generators. When a push button is depressed, the corresponding blade is flexed out of engagement with the next adjacent switch blade and into engagement with a tone generator contact.

This invention relates to an improvement in electronic guitar or similar instrument, and deals particularly with a string instrument which may be connected to a series of tone generators capable of producing tones like or unlike the tones produced by the instrument itself. In other words, the tones produced may be similar to those produced by an electronic organ or other such instrument.

Various types of devices have been produced for electric amplifiers for amplifying the tones produced by the playing of a string instrument such as a guitar. In some instances, the fingerings of the strings of the instrument has served to actuate tone generator or the like to produce a tone which may be quite dissimilar to that produced by the instrument itself. One of the obstacles to the production of instruments of the type described lies in the high cost of production. Instruments produced for musicians who have established a reputation are not critical as to cost, as high cost of production has little effect upon the sales to a musician who is well known in a certain field. However, in order to make the instrument available to musicians who are less skilled, a low cost of production is an extremely important factor.

It is an object of the present invention to provide a stringed instrument including a fingerboard and cooperating circuit board which may be produced at an extremely low cost and which accordingly lends itself to the field of musicians of ordinary means. The fingerboard and circuit board may be used in place of the fretted board usually provided in musical instruments and may be produced and sold for a cost much less than the cost of comparable electronic instruments capable of accomplishing somewhat similar results.

A feature of the present invention resides in the provision of a stringed instrument having a finger board positioned beneath the spaced strings of the instrument, this finger board being provided with transversely extending frets against which the strings may be urged by the fin-
ends of the previously inserted switch arms. A second retaining pin is inserted to anchor the second series of switch arms in place. This process is continued until all of the switch arms are in place. As a result, the entire assembly of the finger board may be accomplished in a short period of time, and as a result the cost of production is low.

A further feature of the present invention resides in the fact that a manually operated switch is connected to the outer end of the previously inserted switch arms. A second retaining pin is inserted to anchor the second series of switch arms in place. This switch is manually operable when the open string tone of the string is desired.

These and other objects and novel features of the present invention will be more clearly and fully set forth in the following specification and claims.

In the drawings forming a part of the specification:

FIG. 1 is a longitudinal sectional view through a portion of the neck of a stringed instrument, showing the general arrangement of certain of the switches therein.

FIG. 2 is a transverse section through the neck of the instrument and through a series of switches, the switch operating plungers being indicated beneath the strings of the instrument.

FIG. 3 is a bottom plan view of the finger board, showing the grooves therein and showing the spring switch arms anchored in position in these grooves.

FIG. 4 is a wiring diagram showing in general the arrangement of the circuit leading to the tone generators.

FIG. 5 illustrates a portion of the circuit shown in FIG. 4, showing relays arranged in the circuits to the various tone generators.

FIG. 6 is a perspective view of one of the switches used in conjunction with the structure illustrated.

In general, the device comprises a guitar-like instrument which is illustrated as having six strings, but which may have more or less. In view of the fact that instruments of this type are well known in the art, the instrument is illustrated diagrammatically in the drawings. The strings are indicated in general by the numeral 10, and are diagrammatically illustrated in FIG. 4 of the drawings as extending from a bridge segment 8 to a lower-more open string fret or nut 9, the bridge and nut being near opposite ends of the instrument neck 13. As is usual in structures of this type, frets 11 are provided extending transversely across the neck, these frets being engageable with the strings to produce a tone depending upon the position of a finger pressing against the string and forcing the same against the predetermined fret.

In the present arrangement, the finger board 12 of plastic or other material over-lies the neck 13 of the instrument and provides a mounting for the various frets 11. Behind each fret is provided an aperture 12a in which is slidably supported a push button or switch plunger 14. Each push-button 14 is provided with a peripheral flange 14a at its inner end to limit the outward movement of the push button. The push buttons are preferably formed of material which is a non-conductor of electricity.

One of the important features of the present invention resides in the particular manner in which the instrument is made, this construction contributing very materially to the low cost at which the instrument may be produced. The under surface of the finger board 12 is provided with a series of longitudinally extending grooves 12b which underlie the strings 10. In other words, a groove 12a is centered immediately beneath each string 10, and the finger board comprises merely the elongated member having the frets 11 extending across its upper surface, and the grooves 12b extending longitudinally of its under surface. The finger board 12 also supports the push buttons or switch plungers 14 which are aligned with the strings 10, and which are located between each adjacent pair of frets 11.

The grooves 12b each support a series of overlapping switch arms 15 which are all of similar construction. As indicated in FIG. 6, each of the switch arms 15 includes a bearing portion 15a designed to engage the base of a corresponding protruding nut 18, an upwardly arched intermediate portion 15b which is designed to extend into a corresponding transverse groove 12c on the underside of the finger board, and an elongated contact arm 15c which under lies the bearing portion 15b of an adjoining contact arm and is resiliently urged into contact therewith. The variously transversely extending pins 16 which are of plastic or other insulating material so as to prevent electrical contact between the laterally spaced switch arms 15 in the spaced grooves 12a. The elongated contact end 15e of each switch arm underlies one of the switch plungers or push buttons 14 so that pressure on the push button will flex the switch arm out of electrical connection with the next adjacent switch arm in the same row. It should be mentioned that the size and thickness of the contacts 15 is materially exaggerated in the drawings, as the contacts are actually formed of thin metal of high electrical conductivity which may or may not be provided with the precious metal contact points so as to insure good electrical conductivity throughout the entire row of contacts located in each groove 12a when the device is in operation.

The simplicity of the structure and the ease with which it may be assembled is of importance. With the finger board in inverted position and the grooves 12a uppermost, a series of push buttons or switch plungers 14 are dropped into a row of transversely aligned apertures 12b between a pair of spaced frets 11. A series of spring arms 15 are dropped into the spaced grooves 12a with the arched intermediate portions 15b thereof extending into the corresponding transverse groove 12c at the base of the grooves. A pin 16 is inserted to intersect the grooves 12a, and to hold switch arms 15 in place in each of the grooves. A second row of push buttons 14 is inserted in the next series of apertures 12b, a second series of spring fingers 15 are positioned in the side by side grooves 12a, and a second retaining pin 16 is inserted to hold the second row of contacts in proper position. This operation is merely continued until all of the push buttons 14 and springs 15 are in place.

A circuit board 17 is positioned beneath the finger board 12, and is sandwiched between the finger board and the instrument neck 13. The circuit board is not shown in detail, but preferably includes a printed circuit including contacts 16 positioned beneath the flexible ends 15c of the switch arms 15. When any of the push buttons 14 are depressed, they flex the corresponding end 15c of a switch arm 15 out of contact with the anchored end 15e of the next adjacent switch arm 15 and engage a corresponding contact 18 on the circuit board 17. Each circuit board contact 18 is connected to a corresponding tone generator or to a relay controlling corresponding tone generator.

As the push buttons 14 are located between the frets, there is no push button 14 for controlling the open string tone of the instrument. The corresponding contact 18a on the circuit board 17 is connected to a tone generator designed to produce a tone of similar frequency to the open string tone. An open string push button 19 is slidably supported on the instrument neck 13. An angular contact arm 20 extends from the contact 18a into a recess 19a in a convenient part of the neck which is normally closed by a cover plate 19b through which the push button 19 extends. A curved switch 21 is connected by a conductor 22 to the last switch arm 15 of each row. By depressing the push button 19, the spring arm 21 is engaged with the contact 20 closing the circuit to the open string tone generator.

As indicated in FIG. 4 of the drawings, a voltage source 30 of suitable voltage has its negative terminal connected to the cathode of a silicon controlled rectifier 31. The rectifier 31 is connected by a conductor 32 to a metal bridge segment 8 and to the metal string 10. As
previously stated, the string 10 is stretched between the bridge segment 8 and the open string fret or nut 9 near the opposite end of the instrument neck.

An electrically conductive pick 33 is connected by a conductor 34 to the gate of the rectifier 31. As a result, when a circuit to any of the tone generators controlled by the string is closed, and when the pick 33 momentarily engages the string 10, current will flow through the rectifier to a conductor 31a leading to a single string control switch 35a. When the switch 35a is closed, a current may flow through a conductor 35b to the row of overlapping switch arms 15 in one of the grooves 12a controlled by the push buttons 14. When a push button is depressed, a corresponding switch arm 15 is flexed into engagement with a corresponding circuit board contact 18 each of which is connected by a suitable conductor such as 36 to an output conductor.

A switch 35 is arranged in series with the rectifier 31. When the switch 35 is closed, the actuation of the push buttons 14 will energize a corresponding tone generator without the sound first being initiated by the action of plucking the string by the pick 33. The open string tone may be produced by closing the switch 21 and plucking the string by the pick 33.

FIG. 5 of the drawings indicates the open string switch 21 as energizing a relay coil 37 operable, when actuated, to close contacts 38 closing a circuit to the tone generator 39 to produce a tone of the same frequency as the open string. The depressing of any of the push buttons 14 acts to flex the corresponding switch arm 15 out of contact with the next adjacent switch arm and into engagement with a corresponding circuit board contact 18. The contact 18 is either directly connected to a corresponding tone generator 42, or to a relay coil 40 capable of actuating relay contacts 41 closing a circuit from an independent current supply to the tone generator 42. The use of independent relays as shown in FIG. 5 serves mainly to provide a different source of current to the tone generators from that used in the push button circuits described.

In accordance with the patent statutes, we have described the principles of construction and operation of our instrument in electric guitar or similar instrument, and while we have endeavored to set forth the best embodiment thereof, we desire to have it understood that changes may be made within the scope of the following claims without departing from the spirit of our invention.

We claim:

1. A musical instrument including:
   an instrument neck,
   a bridge at one end of said neck and an open string fret at the other end thereof,
   a finger board overlying said neck and including a series of spaced intermediate frets mounted thereupon,
   a plurality of strings extending between said bridge and said open string fret and engageable with said intermediate frets upon the presence of finger pressure between said frets,
   switch plungers beneath each string between each pair of adjacent frets,
   a series of switches supported by said finger board beneath said plungers,
   a circuit board adjoining said finger board and including a series of contacts,
   tone generators secured to said contacts to produce a tone of a predetermined frequency,

   each of said switches being operable upon energization of a corresponding switch plunger to flex the switch into engagement with said circuit board to energize one of said tone generators.

2. The structure of claim 1 and in which said switches comprise normally overlapping flexible arms.

3. The structure of claim 1 and including a series of grooves underlying said strings and in which said switches are located.

4. The structure of claim 3 and in which said switches comprise electrically conductive arms flexibly supported in said grooves.

5. A musical instrument including:
   a finger board,
   a series of spaced intermediate frets on said finger board and an open string fret, at the other end thereof,
   a series of strings extending from said bridge to said open string fret,
   a series of push buttons slidably supported by said finger board intermediate said frets,
   a series of grooves in the under surface of said finger board underlying the strings,
   a series of switch arms in said grooves,
   said switch arms including an anchoring end and an elongated flexing end, and an arched intermediate portion between said ends,
   pins intersecting said grooves and engaging in the arched intermediate portions of a plurality of switch arms positioned in said grooves,
   a circuit board beneath said finger board and including contacts underlying the elongated flexing end of each of said switch arms and normally spaced therefrom,

   said flexing ends of said switch arms being operable when flexed by depression of a corresponding push button to engage a corresponding contact on said circuit board.

6. The structure of claim 5 and including tone generators secured to said contacts on said circuit board.

7. The structure of claim 5 and including a current supply source connected to the switch arm underlying the fret nearest to said bridge, and including tone generators connected to said circuit board contacts.

8. The structure of claim 7 and including a switch controlling the current supply source to each series of switch arms in one of said grooves.

9. The structure of claim 5 and including a current supply source to the switch arms in each of said grooves, a tone generator connected to each of said circuit board contacts and to said open fret, and a normally open switch controlling the flow of current to said tone generator connected to said open string fret.

10. The structure of claim 5 and in which the flexing ends of said switch arms operate when flexed to open connection with the next adjacent switch arm in the corresponding groove.

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