July 27, 1965 J. O. BURNS ETAL 3,196,729

MUSICAL INSTRUMENTS

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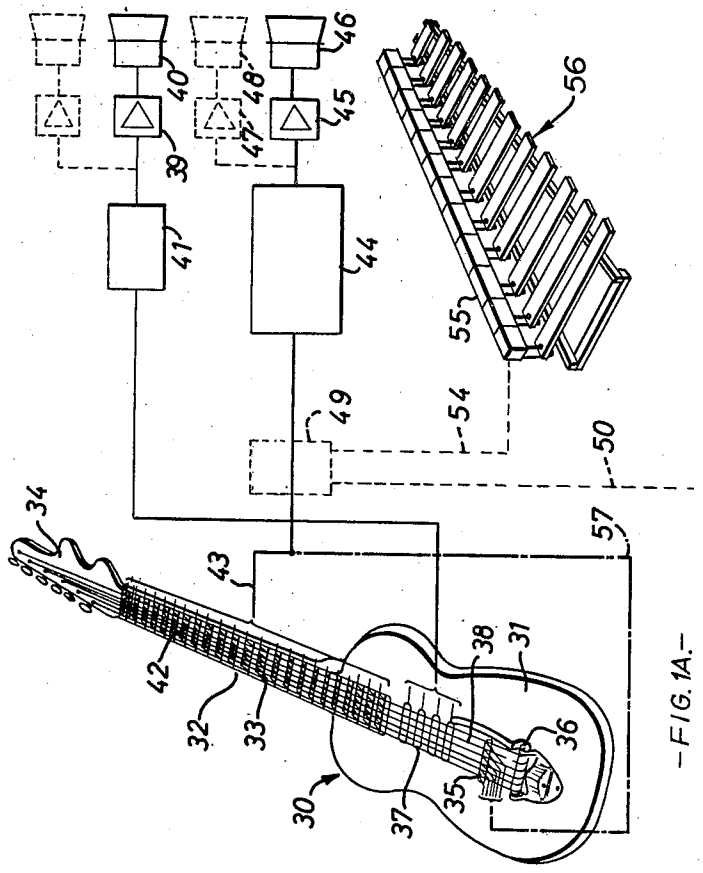

FIG. 1A.

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MUSICAL INSTRUMENTS

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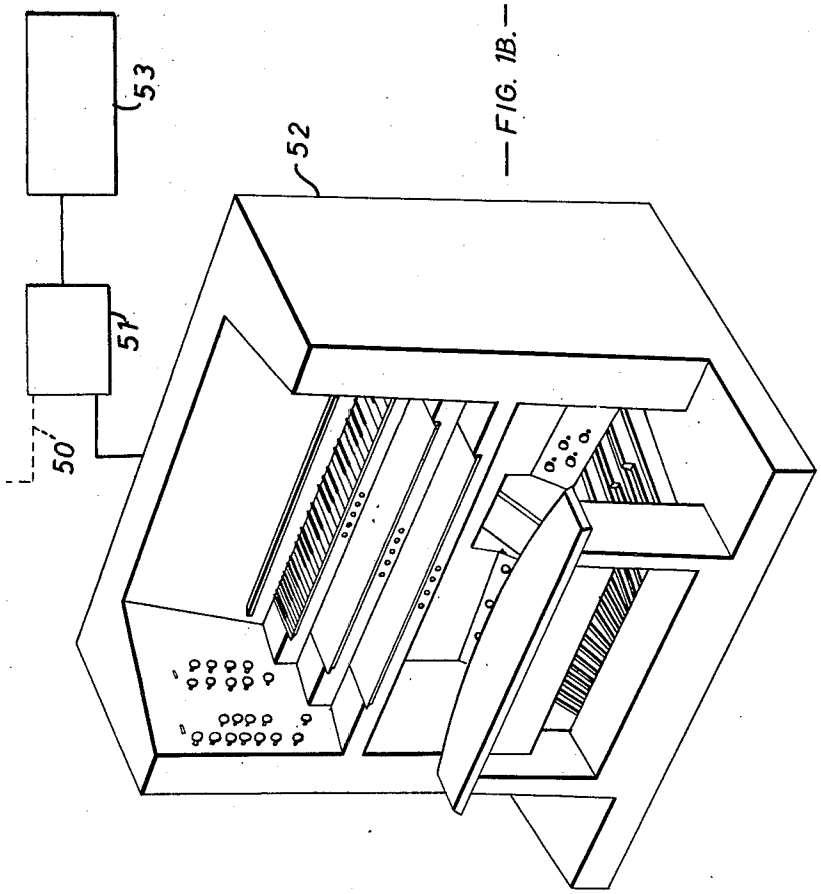

FIG. 1B.

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MUSICAL INSTRUMENTS

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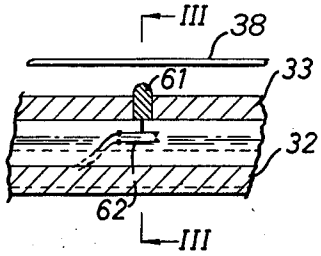
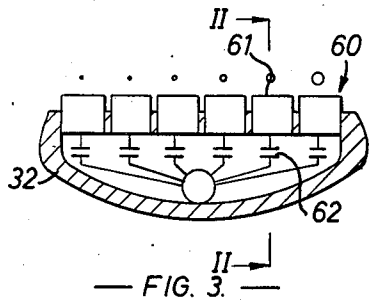
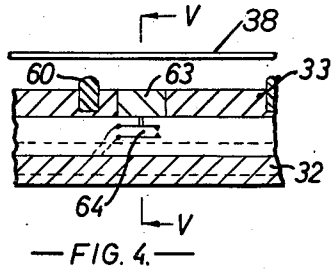


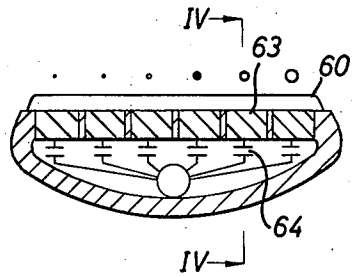
— FIG. 2. —



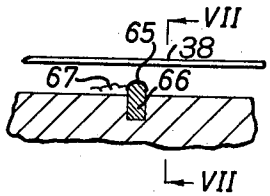
— FIG. 3. —



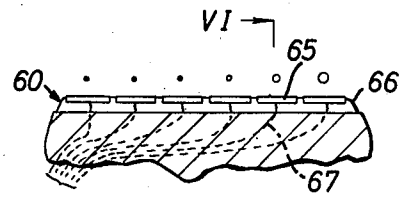
— FIG. 4. —



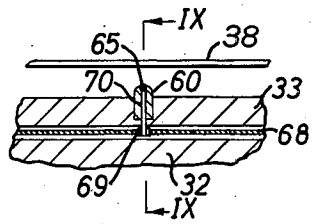
— FIG. 5. —



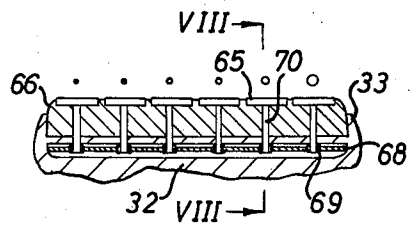
— FIG. 6. —



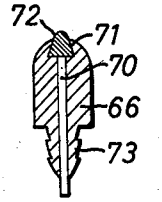
— FIG. 7 — VI



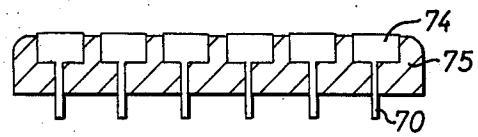
— FIG. 8. —



— FIG. 9. —



— FIG. 10. —



— FIG. 11. —

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July 27, 1965 J. O. BURNS ETAL 3,196,729

MUSICAL INSTRUMENTS

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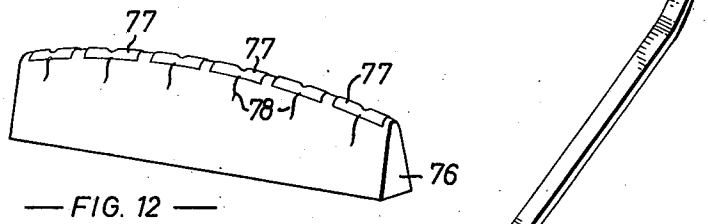
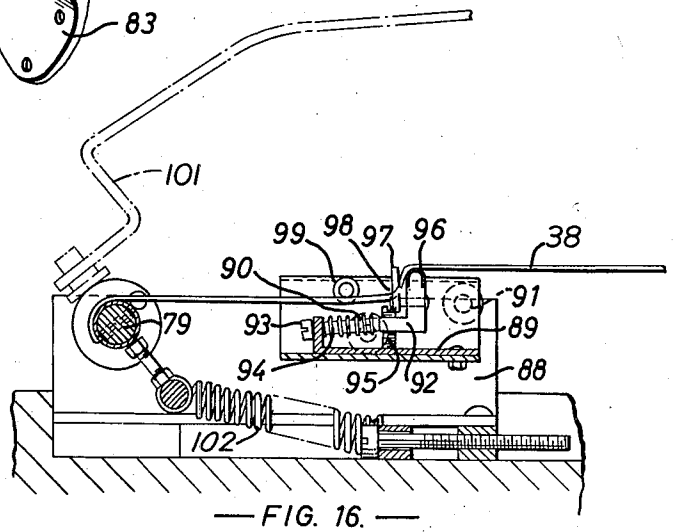


— FIG. 12 —

— FIG. 14. —



— FIG. 16. —

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MUSICAL INSTRUMENTS

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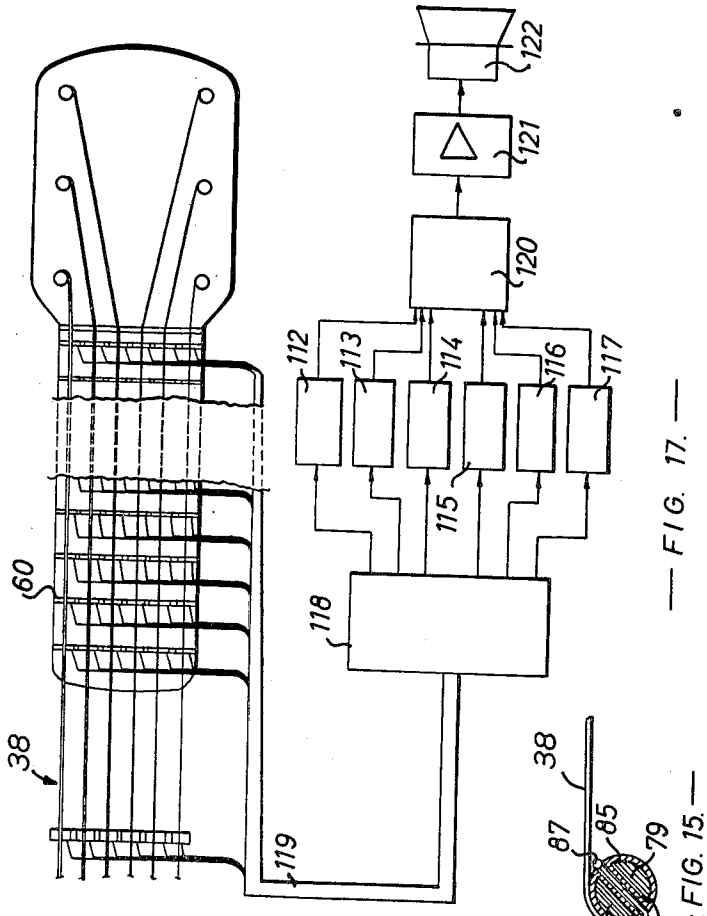

— FIG. 17. —

— FIG. 15. —

— FIG. 13. —

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United States Patent Office

3,196,729

Patented July 27, 1965

3,196,729

MUSICAL INSTRUMENTS

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Filed Feb. 5, 1963, Ser. No. 256,363
Claims priority, application Great Britain, Feb. 5, 1962, 4,434
15 Claims. (Cl. 84—171)

The present invention relates to musical instruments and is more particularly concerned with stringed instruments especially those having a fretted finger board such as guitars.

The utility of a guitar as a solo instrument or in combination with other instruments is well known, and at the present time there is considerable demand for an electric guitar which customarily has a solid body carrying one or more pick-up units for deriving electrical signals from vibrations of the strings which are usually of metal, the signals from the pick-up units being applied to one or more amplifier and loudspeaker systems for the production of audible sounds.

The present invention envisages utilizing the strings and finger board as a selector switch for controlling the operation of one or more other musical instruments or sound-producing devices.

Thus according to one feature of the present invention a stringed musical instrument, such as a guitar, includes switching means adapted for selective operation upon the fingering of one or more strings on the finger board for controlling the operation of at least one other sound-producing device.

The switch means may be in the form of a plurality of switches having normally open contacts and each responsive to pressure applied to a particular fret when a particular string is stopped against the finger board adjacent thereto, or to the application of digital pressure to a particular string against a particular locality of the finger board. Either of such arrangements can be used with either metallic or non-metallic strings, and moreover, the latter of such said arrangements can be utilized in a stringed instrument provided with a fingerboard having a continuous outer surface, that is to say a fingerboard on which no frets are provided.

In a preferred arrangement, however, it is envisaged providing the frets with metal string-engaging portions and providing metal strings, so that each string and each of the frets with which it may come in contact serve as switching contacts.

In a multiple-stringed instrument it is necessary that each of the strings should be electrically insulated from the other strings, and this may readily be achieved either by providing the instrument with a bridge of non-conducting material or a bridge having metallic string-engaging portions electrically insulated from one another, by anchoring the ends of the strings below the bridge either in an anchorage or in a tremulant device in such a manner that they are insulated from one another, and by electrically insulating from one another the spindles of the winding mechanisms for the strings at the machine head.

In order to avoid cross-feed from one string to another, it is desirable that each fret in the finger boards should include a number of metallic string-engaging portions equal to the number of strings, the individual metallic string-engaging portions in each fret being insulated electrically from one another. For example, a fret may be in the form of a moulded base of a plastic material such as nylon and having at one edge a slot or groove to receive, at spaced intervals from one another, a series of metallic inserts of good electrically conducting material such as silver or nickel-silver to serve as string engaging portions. The separation between adjacent inserts in a fret base moulding can be maintained by the insertion of insulators therebetween. Such a construction has the advantage that it is possible to replace the string-engaging inserts without necessitating the replacement of the fret base moulding. Electrical connections to the string-engaging portions of the frets may conveniently be made by means of a printed circuit board interposed between the neck of the instrument and the finger board. Such printed circuit boards may be provided with miniature pin sockets to receive miniature pins projecting from the fret base mouldings and connecting with the metallic inserts therein.

In another envisaged construction, each fret comprises a plurality of fret segments, each formed such as by casting in a suitable electrically conducting material such as nickel silver and each having, at one end, a miniature pin for insertion in a miniature socket in the printed circuit board. To form a complete fret, the approprate number, for example four or six, fret segments are compression moulded in, for example, a phenolic resin, to form a unit wherein the segments are spaced from one another and insulated from one another.

A suitable bridge can be constructed in a somewhat similar manner to a fret and can comprise a base moulding of a plastic material such as nylon and having at its upper edge a groove to receive a plurality of metal inserts in spaced relationship to one another. Whilst a bridge constructed entirely of insulating material could be used, it is preferable for metallic string-engaging elements to be provided and an improvement in the tone and in the decay time of oscillation of a string can be obtained by tensioning a string at a location as near as practical behind the bridge. For this purpose the bridge may be provided with a plurality of apertured plate units disposed at and spaced a little from the side thereof remote from the finger board and having their apertures at localities nearer to the base of the bridge than its associated string-engaging metal inserts.

The ends of the strings behind the bridge may be anchored in a conventional anchoring plate and insulated therefrom and from one another by providing inserts of an insulating material in the normal string-receiving bores of the anchoring plate. Alternatively the ends of the strings may be anchored in a tremulant unit. Such a tremulant unit is often provided with a metal spindle having a series of diametral bores therethrough, each string passing around a portion of the outer periphery of the spindle and then through a bore and being anchored by being wound around a toggle element and twisted around itself. With such a tremulant unit the strings can conveniently be insulated from one another by providing the spindle with an external sheath of an insulating material such as nylon and by lining each of the bores with a sleeve of insulating material such as nylon and having at one end a recess to receive a toggle element. Electrical connections to the strings may conveniently be made by leads connecting with the metal string-engaging inserts on the bridge.

In a simple embodiment, the stringed instrument has a single metallic string, or if multi-stringed, has a single metallic string, the others being non-metallic. Electrical connection is made to the metallic string and to each of the frets, so that signals can be derived corresponding to the fingering of that string. In such an arrangement it is not necessary for the frets to have a segmented construction and thus each fret can be a suitably shaped piece of metal. In an instrument provided conveniently with twenty-four frets, the single string in combination with the frets can serve as a twenty-four way selector switch. Signals derived therefrom may be used to control any other musical instrument capable of being op-

erated by remote control or may be used to control an electronic sound-producing device. The signals produced may thus be applied to part of the control circuitry of an organ having electric or electro-pneumatic action, or may be applied to a series of devices for operating a vibraphone or a xylophone, or yet again be applied to control the pitch or frequency of an electric oscillatory circuit system connected to an amplifier and loudspeaker system so that audible sounds having a fundamental pitch corresponding to the fundamental or a harmonic or a sub-harmonic of the note for which the string is fingered can be produced independently of vibration of the string. Since, under conditions where a string is not fingered, i.e. where the string is used as an open string, the string would normally make contact with the fret nearest the machine head, auxiliary switch means may be provided in series with that fret to obivate the continuous production of a sound at a pitch corresponding thereto when the instrument is not being played or fingered. Such auxiliary switch may conveniently be in the form of a foot switch.

It will of course be understood that signals derived from any or all of the pick-up units in response to vibration of the string or strings can also be applied to an amplifier and loudspeaker system in a conventional manner so that many combinations of sounds of differing tone, timbre and quality can be obtained.

By employing more strings and providing metal string-engaging segments on the frets a greater number of switch signals can be derived; for example, with a six-stringed guitar provided with twenty-four frets, a maximum of six times twenty-four switches is available. Although in most cases such individual switches will be operated in chord combinations of six in dependence on the fingering of individual strings, in order to make full use of all such switches an external multi-core lead having a number of cores at least equal to the number of strings multiplied by one more than the number of frets, for example six multiplied by twenty-five which is equal to one hundred and fifty in the example selected, is required.

The switches formed by the fret segments and the strings can be utilized in low voltage control circuits or for direct switching or may be utilized to control a bank of relays having contacts which can be connected in any desired manner to control other apparatus. In one embodiment it is envisaged that additional sound-producing apparatus may take the form of a number of variable frequency oscillators, each associated with an individual string and that the switches provided by that string and its associated fret segments be embodied in a frequency control circuit.

There is at the present time some demand for a vibraphone in combination with a guitar and the present invention envisages that the switching network may be employed for controlling percussive operating mechanism for a vibraphone.

The invention will be further described by way of example with reference to the accompanying drawings, in which:

FIGS. 1A and 1B are block schematic diagrams showing a guitar provided with a selector switch means responsive to fingering of the strings on the finger board for controlling another sound-producing device or devices,

FIG. 2 is a section along the line II—II of FIG. 3 and is a detail view of the neck and finger board according to one embodiment in which fret segments are movable and have an individual switch associated therewith,

FIG. 3 is a section along the line III—III of FIG. 2,

FIG. 4 is a section along the line IV—IV of FIG. 5 and is a detail view of the neck and finger board according to another embodiment in which finger board parts are movable and have individual switches associated with them,

FIG. 5 is a section along the line V—V of FIG. 4,

FIG. 6 is a section along the line VI—VI of FIG. 7 and is a detail view of the neck and finger boards according to another embodiment in which frets have metal string engaging covers,

FIG. 7 is a section along the line VII—VII of FIG. 6,

FIG. 8 is a section along the line VIII—VIII of FIG. 9 and is a detail view of the neck and finger board according to a further embodiment including a printed circuit board for connecting with the fret segments,

FIG. 9 is a section along the line IX—IX of FIG. 8,

FIG. 10 is a detail section to an enlarged scale of one form of fret,

FIG. 11 is a transverse section of another form of fret in which fret segments are moulded into a unit,

FIG. 12 is a perspective view of one form of bridge,

FIG. 13 is a transverse section of the bridge shown in FIG. 12,

FIG. 14 is a perspective view of one form of tremulant unit in which the strings can be insulated from one another,

FIG. 15 is a detail sectional view of the spindle of the tremulant unit shown in FIG. 14,

FIG. 16 is a sectional view of a combined bridge and tremulant unit in which the strings can be insulated from one another,

FIG. 17 is a block diagram of one arrangement in which an oscillator is associated with each string of a guitar and in which external connection is made with each string and fret segment.

Referring initially to FIG. 1, a guitar 30 comprises a body 31, a neck 32 having a finger board 33 and a machine head 34, a bridge 35, a tremulant unit 36, strings 38, and pick-up units 37. In a conventional construction the body 31 of an electric guitar is solid, and up to four sets of pick-up units 37 are provided. Signals from the pick-up units, selected and mixed at 41 as desired, are fed to an amplifier 39 and loudspeaker 40 for producing sounds derived from the vibrations of the strings.

A guitar according to the present invention is provided with a plurality of switching means indicated generally at 42 each associated with a particular string and a particular fret on the finger board. The switching means may be in the form of small switches located below the finger board and mechanically operated either by movable portions or segments of the frets upon application of pressure thereto by a string or by movable portions of the finger board itself upon application of digital pressure thereto through a string, as will be hereinafter described. A multi-core lead 43 connects the switching means to control the operation of one or more other sound-producing devices or instruments such as a variable frequency oscillatory system 44 feeding an amplifier 45 and loudspeaker 46. The system 44 may be a single oscillator or a plurality of oscillators and produce either a single note which corresponds to the highest or the lowest note fingered on the strings on the finger board, or a chord combination corresponding to all the notes fingered on all the strings, some or all of the notes being passed additionally or alternatively to a second amplifier 47 and loudspeaker 48.

A switching network 49 such as a relay bank, may be interposed between the switching means 42 and any devices controlled thereby and arranged to provide signals in a form acceptable to the control system of any other electrically operated or controlled musical instrument such as an organ having electric or electropneumatic action or a vibraphone. A lead 50 can extend from the switching network 49 to a control relay bank 51 between a console 52 and organ chamber 53. Fingering the finger board 33 of the guitar can effectively be equivalent to playing upon one or more manuals of the organ which may be blown and have pipes or may be electric or electronic. A lead 54 can be extended from the switching network 49 to a striking mechanism 55 for operating a vibraphone 56.

In another arrangement the frets of the finger board

are provided with metal string-engaging portions and these in combination with metal strings serve as the switches of the switching means. A multicore lead 57 connects the strings to the oscillatory system 44 directly or through the switching network 49.

One arrangement of a guitar neck in which switches are provided is illustrated in FIGS. 2 and 3. Each fret 60 comprises a plurality of fret segments such as 61, one for each string, slidably mounted in the finger board 33. Between the finger board and the neck is a set of small switches, one for each fret segment, such as switch 62 for the segment 61. When digital pressure is applied to a string adjacent a selected fret, pressure of the string on the fret segment concerned displaces the fret segment and operates the switch associated therewith.

Another arrangement is illustrated in FIGS. 4 and 5. Adjacent each fret 60 the finger board is provided with a plurality of small displaceable sections such as 63, the number of sections being equal to the number of strings. Below each section is a small switch, such as 64 which is associated with the section 63. When digital pressure is applied to a string adjacent a selected fret, pressure is also applied to the relevant section which is thereby displaced and effects actuation of the associated switch.

Arrangements of the neck and finger board in which metal string engaging portions are provided are illustrated in FIGS. 6 and 7, 8 and 9, 10, and 11. In the construction shown in FIGS. 6 and 7 each fret 60 is provided with a plurality of metal string engaging segments 65 of good electrical conductivity and with easy solderability. Silver and nickel-silver are suitable examples. The segments may be electro-deposited, or in the form of films or thin sheets adhesively secured or moulded onto a base 66 of insulating material such as nylon. Connection is made to the segments by soldered leads, such as lead 67 soldered to the segment 65. When it is desired to replace a fret in the course of normal wear and tear it is necessary to unsolder the connections, remove the existing fret, insert a fresh fret and solder the connections to the segments of the new fret. This is time consuming and involves the risk that connections may not be soldered to the correct segments. These difficulties can be obviated in the construction illustrated in FIGS. 8 and 9, or 10, or 11. A printed circuit board 68 is interposed between the neck 32 and the finger board 33 and for each fret is provided with a number of miniature pin sockets 69 equal to the number of strings 37. A fret 60 is provided with an equal number of moulded-in pins 70 which connect with metal string engaging segments and are receivable in the sockets 69. To facilitate the replacement of the string engaging segments 65 a fret can be constructed as illustrated in FIG. 10 with a base moulding 66 of an insulating material such as nylon embodying the requisite number of spaced pins 70. At its outer edge the base has a dovetail groove 71 into which the pins project slightly. Wire-like segments 72 can be slid into the grooves 71 to project slightly thereabove and at the same time engage the appropriate pin 70 whilst the segments 72 can be separated from one another by inserting insulators between adjacent segments. The base moulding 66 can be provided with a barbed projection 73 which can extend substantially throughout its length or be in the form of a series of rod-like sleeves enclosing parts of the pins to assist in retaining the fret in the fingerboard. In the construction illustrated in FIG. 11 the string engaging segments 74 are constructed integrally with the pins 70 and the requisite number of segments are assembled together into a composite moulding 75 such as of a phenolic resin or nylon.

When the strings themselves form part of the switches of the switching means in the guitar, it is necessary for the strings to be insulated from one another electrically and for connection to be made to each of them. Connection can be most conveniently made at the bridge. One form of bridge 35 is illustrated in FIGS. 12 and 13

and comprises a base moulding 76 of an insulating material having at its upper edge a number of metal string engaging portions 77 equal to the number of strings. The portions 77 are of good electrically conducting material to which connections can readily be soldered, such as silver or nickel-silver, and are preferably notched for string location purposes. Connections such as 78 are soldered to the portions 77.

Whilst the ends of the strings can be anchored in a conventional anchorage provided that they are insulated from one another, it is preferable for them to be anchored in a tremulant unit 36. One form of such unit is illustrated in FIG. 14 and comprises a spindle 79 journalled in bearings 80, 81 carried on a base plate 82 which can be secured directly to the guitar body 31 or can be attached thereto by a flap 83 extending over the bottom edge of the body and secured to the bottom thereof. The spindle 79 may be of an insulating material but is preferably of metal and is provided with an outer sleeve-like coating 85 of an insulating material. Transverse bores 84 for receiving the strings are each lined with sleeves 86 of insulating material. A string end passes around part of the periphery of the coated spindle 79, through a sleeve 86 and is wrapped around a toggle element 87 as illustrated in FIG. 15. Spring 100 exerts on the spindle 79 a torque to balance the torque exerted on the spindle by the strings 38 when tensioned and the spindle can be angularly displaced manually by handle 101.

The bridge and tremulant unit can be combined together into a single composite unit as illustrated in FIG. 16. The spindle 79 is journalled in side members 88 of which only one is shown and a carriage 89 is slidably mounted on rollers 90, 91, between the side members. The carriage 89 carries for each string a bridge member 92 which is adjustable in position thereon in a longitudinal direction by means of an adjustment screw 93 and spring 94, and in an up-and-down direction by means of a pair of screws of which one 95 is shown. Each bridge member has a metal string engaging portion 96 insulated from the rest of the composite unit; this is conveniently achieved by constructing each bridge member of an insulating material such as nylon. Secured to each bridge member and located on the tremulant spindle side thereof is an apertured plate 97 having an aperture 98 through which a string 37 passes, the apertured plate causing the string to be bent over the string engaging portion of the bridge unit at an angle greater than if it were to pass from the bridge unit directly to the spindle 79 or under a grooved roller 99 of insulating material or of metal and coated with an insulating material such as nylon. Spring 102 exerts in the spindle 79 a torque to balance the torque exerted on it by the strings 38 when tensioned and the spindle can be angularly displaced manually by a handle 101.

FIG. 17 illustrates in block form an arrangement including six oscillators 112, 113, 114, 115, 116, 117, each associated one with each of the strings of a six stringed guitar. Connections to the string engaging portions of the bridge and to all the string engaging segments of the frets are extended to a frequency control system 118 by a multi-core lead 119 having a number of cores equal to the number of strings 37 multiplied by the number of frets 60. The switches formed by the fret segments associated with any one string and that string cause the frequency control system 118 to select the frequency of the oscillator associated with that string in accordance with the fingering on the finger board and signals from all the oscillators are passed to a mixer 120 and thence to an amplifier 121 and loudspeaker 122.

We claim:

1. A stringed musical instrument comprising a fingerboard, a plurality of metallic strings extending over said fingerboard and normally spaced therefrom, a plurality of spaced transversely extending frets along said fingerboard, each fret comprising a base moulded of a plastic

material and having at its outer edge a groove, a plurality of metallic inserts received in said groove in spaced relationship to one another, the number of inserts in each fret corresponding to the number of strings and corresponding inserts in all the frets being associated with an individual string, the application of digital pressure to any particular string at a region above a fret bringing that string into engagement with the associated insert on that fret, means for electrically insulating said strings from one another, electrical connecting means connected with each of said strings and electrical connecting means extending through the frets and connected with each of said string-engaging inserts, said strings and said string-engaging inserts serving as switching means for controlling the operation of at least one other sound-producing device.

2. A stringed musical instrument comprising a fingerboard, a plurality of metallic strings extending over said fingerboard and normally spaced therefrom, a plurality of spaced transversely extending frets along said fingerboard, each fret comprising a base moulded in a plastic material and having at its outer edge a groove, a plurality of metallic inserts received in said groove in spaced relationship with one another, the number of inserts corresponding to the number of strings and corresponding inserts in all said frets being associated with an individual string, the application of digital pressure to any particular string at a region above a fret bringing that string into engagement with the associated insert on that fret, and a plurality of spaced pins moulded into said base, one end of each pin extending into said groove to engage electrically with one of said inserts and the other end projecting from said base, means for electrically insulating said strings from one another, electrical connecting means connected with each of said strings individually and with the other ends of each of said pins individually, said strings and said string-engaging portions serving as switching means for controlling the operation of at least one other sound-producing device.

3. A stringed musical instrument comprising a neck, a fingerboard on said neck, a plurality of metallic strings extending over said fingerboard and normally spaced therefrom, a plurality of spaced transversely extending frets along said fingerboard, each fret having a plurality of electrically conducting string-engaging portions associated one with each string and a plurality of pins each connected electrically with an individual string-engaging portion and having one end projecting from said fret below said fingerboard, means for electrically insulating said strings from one another, electrical connecting means connected with each of said strings individually, and electrical connecting means connected with each of said string engaging portions, said last-mentioned connceting means comprising a printed circuit board in said neck adjacent said fingerboard and a plurality of sockets in said board for receiving ends of said pins for connecting with said string-engaging portions individually, said strings and said string-engaging portions serving as switching means for controlling the operation of at least one other sound-producing device.

4. A stringed musical instrument comprising a neck, a fingerboard on said neck, a plurality of metallic strings extending over said fingerboard and normally spaced therefrom, a plurality of spaced transversely extending frets along said fingerboard, each fret comprising a plurality of fret segments assembled in spaced relationship to one another in a plastic moulding to form a composite unit, each segment being generally T-shaped including a bar serving as string-engaging portion and a shank projecting from said moulding to extend below said fingerboard and forming a connecting pin, means for electrically insulating said strings from one another, electrical connecting means connected with each of said strings individually, and electrical connecting means connected with each of said string engaging portion, said last-mentioned connecting means comprising a printed circuit board in said neck adjacent said fingerboard and a plurality of sockets on said board for receiving said connecting pins to make electrical connection with each of said string-engaging portions individually, said strings and said string-engaging portions serving as switching means for controlling the operation of at least one other sound-producing device.

5. A stringed musical instrument such as a guitar comprising a body, a neck connected to said body, a fingerboard on said neck, a machine head on said neck, a combined bridge and tremulant device on said body, said machine head and said device being adapted to receive a plurality of metallic strings extending over said fingerboard in normal spaced relationship thereto, a plurality of spaced transversely extending frets along said fingerboard, each fret having a plurality of electrically conducting string-engaging portions for association one with each string, said device including a spindle, means for journalling said spindle, an outer coating of insulating material on said spindle, said spindle having a plurality of string-receiving bores, one for each string, a lining of insulating material within each bore, spring means for exerting a torque on said spindle, a handle for manually angularly displacing said spindle, a plurality of bridge members, one for each string, each bridge member being of insulating material and each having a metal string-engaging portion, means for mounting all of said bridge members for longitudinal movement upon variation of tension in strings upon angular displacement of said spindle, electrical connecting means connected with the metal string-engaging portion of the bridge members individually, and electrical connecting means extending through said frets and connected with the metal string-engaging portions of said frets individually, the strings and string-engaging portions of the frets being adapted to serve as switching means for controlling the operation of at least one other sound-producing device.

6. An instrument according to claim 5 in which said other sound-producing device comprises an electric oscillatory circuit system and amplifier and loudspeaker system, said switching means controlling the pitch or frequency of said oscillatory circuit system.

7. An instrument according to claim 5 in which said other sound-producing device comprises a plurality of variable frequency oscillators, each associated with an individual string and in which said switching means provided by each string and its associated fret string-engaging portions are embodied in a frequency control circuit for the oscillator associated with that string.

8. An instrument according to claim 5 in which said other sound-producing device is a vibraphone and in which said switching means is applied through a switching network to control percussive operating mechanism for such vibraphone.

9. An instrument according to claim 5 in which said other sound-producing device is an organ having electric or electropneumatic action and in which said switching means is adapted to control a said organ through a switching network.

10. An instrument according to claim 5 including at least one pick-up for deriving electrical signals from vibrations of the strings and feeding signals to an amplifier and loudspeaker system.

11. A stringed musical instrument such as a guitar comprising a body, a neck connected to said body, a fingerboard on said neck, a machine head on said neck, a combined bridge and tremulant device on said body, said machane head and said device being adapted to receive a plurality of metallic strings extending over said fingerboard in normal spaced relationship thereto, a plurality of spaced transversely extending frets along said fingerboard, each fret having a plurality of electrically conducting string-engaging portions for association one with each string, said device including a spindle, means for journalling said spindle, an outer coating of insulating material

on said spindle, said spindle having a plurality of string-receiving bores, one for each string, a lining of insulating material within each bore, spring means for exerting a torque on said spindle, a handle for manually angularly displacing said spindle, a plurality of bridge members, one for each string, each bridge member being of insulating material and each having a metal string-engaging portion, means for mounting all of said bridge members for longitudinal movement upon variation of tension in strings upon angular displacement of said spindle, electrical connecting means connected with the metal string-engaging portions of the bridge members individually, and electrical connecting means connected with each of said string engaging portions, said last-mentioned connecting means comprising a printed circuit board in said neck adjacent said fingerboard and pin-like connections extending from said printed circuit board through said frets and connecting with the metal string-engaging portions of said frets individually, the strings and string-engaging portions of the frets being adapted to serve as switching means for controlling the operation of at least one other sound-producing device.

12. A stringed musical instrument such as a guitar comprising a body, a neck connected to said body, a fingerboard on said neck, a machine head on said neck, a combined bridge and tremulant device on said body, said machine head and said device being adapted to receive a plurality of metallic strings extending over said fingerboard in normal spaced relationship thereto, a plurality of spaced transversely extending frets along said fingerboard, each fret comprising a base moulded of a plastic material and having at its outer edge a groove, a plurality of metallic inserts received in said groove in spaced relationship to one another, the number of inserts in each fret corresponding to the number of strings and corresponding inserts in all the frets being associated with an individual string, said device including a spindle, means of journalling said spindle, an outer coating of insulating material on said spindle, said spindle having a plurality of string-receiving bores, one for each string, a lining of insulating material with each bore, spring means for exerting a torque on said spindle, a handle for manually angularly displacing said spindle, a plurality of bridge members, one for each string, each bridge member being of insulating material and each having a metal string-engaging portion, means for mounting all of said bridge members for longitudinal movement upon variation of tension in strings upon angular displacement of said spindle, electrical connecting means connected with the metal string-engaging portions of the bridge members individually, and electrical connecting means extending through said frets and connected with the metal string-engaging portions of said frets individually, the strings and string-engaging portions of the frets being adapted to serve as switching means for controlling the operation of at least one other sound-producing device.

13. A stringed musical instrument such as a guitar comprising a body, a neck connected to said body, a fingerboard on said neck, a machine head on said neck, a combined bridge and tremulant device on said body, said machine head and said device being adapted to receive a plurality of metallic strings extending over said fingerboard in normal spaced relationship thereto, a plurality of spaced transversely extending frets along said fingerboard, each fret comprising a base moulded in a plastic material and having at its outer edge a groove, a plurality of metallic inserts received in said groove in spaced relationship with one another, the number of inserts corresponding to the number of strings and corresponding inserts in all said frets being associated with an individual string, the application of digital pressure to any particular string at a region above a fret bringing that string into engagement with the associated insert on that fret, and a plurality of spaced pins moulded into said base, one end of each pin extending into said groove to engage electrically with one of said inserts and the other end projecting from said base, said device including a spindle, means for journalling said spindle, an outer coating of insulating material on said spindle, said spindle having a plurality of string-receiving bores, one for each string, a lining of insulating material within each bore, spring means for exerting a torque on said spindle, a handle for manually angularly displacing said spindle, a plurality of bridge members, one for each string, each bridge member being of insulating material and each having a metal string-engaging portion, means for mounting all of said bridge members for longitudinal movement upon variation of tension in strings upon angular displacement of said spindle, electrical connecting means connected with the metal string-engaging portions of the bridge members individually, and electrical connecting means connected with each of said string-engaging portions, said last-mentioned connecting means comprising a printed circuit board in said neck adjacent said fingerboard and a plurality of sockets in said board for receiving the said projecting ends of said pins for connecting with said string-engaging portions individually, the strings and string-engaging portion of the frets being adapted to serve as switching means for controlling the operation of at least one other sound-producing device.

14. A stringed musical instrument such as a guitar comprising a body, a neck connected to said body, a fingerboard on said neck, a machine head on said neck, a combined bridge and tremulant device on said body, said machine head and said device being adapted to receive a plurality of metallic strings extending over said fingerboard in normal spaced relationship thereto, a plurality of spaced transversely extending frets along said fingerboard, each fret comprising a plurality of fret segments assembled in spaced relationship to one another in a plastic moulding to form a composite unit, each segment being generally T-shapd including a bar serving as string-engaging portion and a shank projecting from said moulding to extend below said fingerboard and forming a connecting pin, said device including a spindle, means for journalling said spindle, an outer coating of insulating material on said spindle, said spindle having a plurality of string-receiving bores, one for each string, a lining of insulating material within each bore, spring means for exerting a torque on said spindle, a handle for manually angularly displacing said spindle, a plurality of bridge members, one for each string, each bridge member being of insulating material and each having a metal string-engaging portion, means for mounting all of said bridge members for longitudinal movement upon variation of tension in strings upon angular displacement of said spindle, electrical connecting means connected with the metal string-engaging portions of the bridge members individually, and electrical connecting means connected with each of said string-engaging portions, said last-mentioned connecting means comprising a printed circuit board in said neck adjacent said fingerboard and a plurality of sockets in said board for receiving ends of said pins for connecting with said string-engaging portions individually, the strings and string-engaging portions of the frets being adapted to serve as switching means for controlling the operation of at least one other sound-producing device.

15. A stringed musical instrument comprising a body, a tremulant device on said body, a neck connected to said body, a bridge on said body, a fingerboard on said neck, a machine head on said neck, said instrument being adapted to receive a plurality of metallic strings extending from said machine head over said fingerboard in normal spaced relationship therefrom, over said bridge to said tremulant device, a plurality of spaced transversely extending frets along said fingerboard, each fret having a plurality of electrically conducting string-engaging portions associated one with each string, said bridge having

a plurality of electrically conducting string-engaging portions each for engagement by an individual one of said strings, electrical connecting means connected with each of said string-engaging portions of said bridge individually, electrical connecting means extending through the frets and connecting with each of said string-engaging portions individually, said device including a spindle, means for journalling said spindle, an outer coating of insulating material on said spindle, said spindle having a plurality of string-receiving bores, one for each string, a lining of insulating material within each bore, spring means for exerting a torque on said spindle, a handle for manually angularly displacing said spindle, said strings and said string-engaging portions of said frets being adapted to

serve as switching means for controlling the operation of at least one other sound-producing device.

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