May 16, 1967 S. L. HACKNEY 3,319,502

MUSICAL INSTRUMENT

Filed July 29, 1965 3 Sheets-Sheet 1

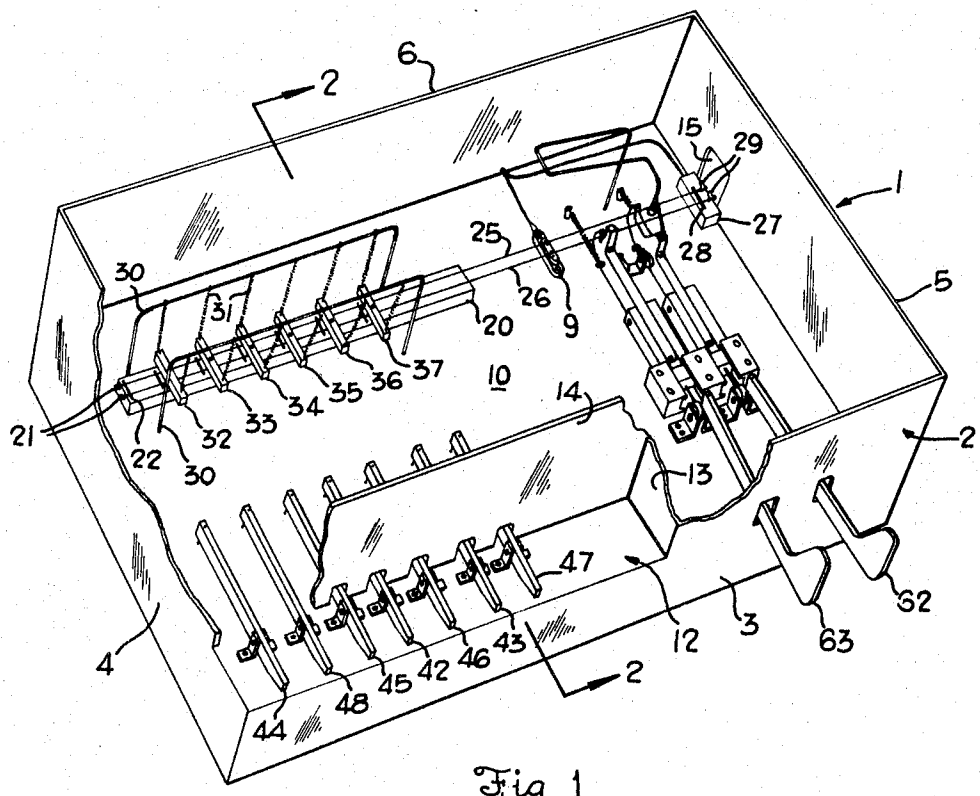


Fig 1

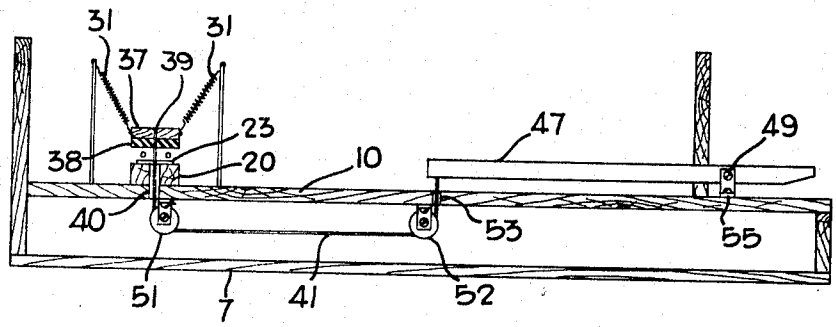


Fig 2

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MUSICAL INSTRUMENT

Filed July 29, 1965 3 Sheets-Sheet 2

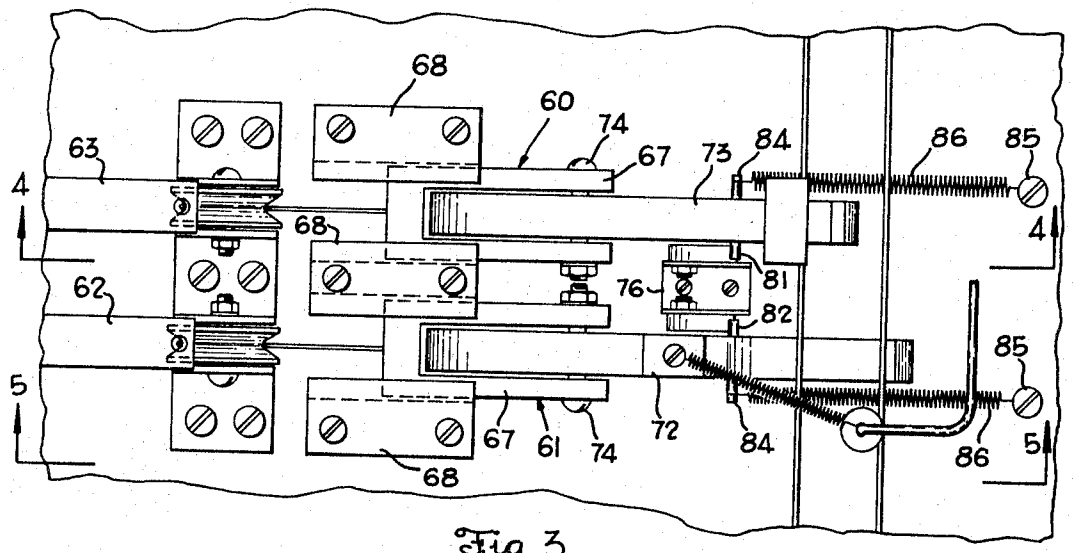


Fig 3

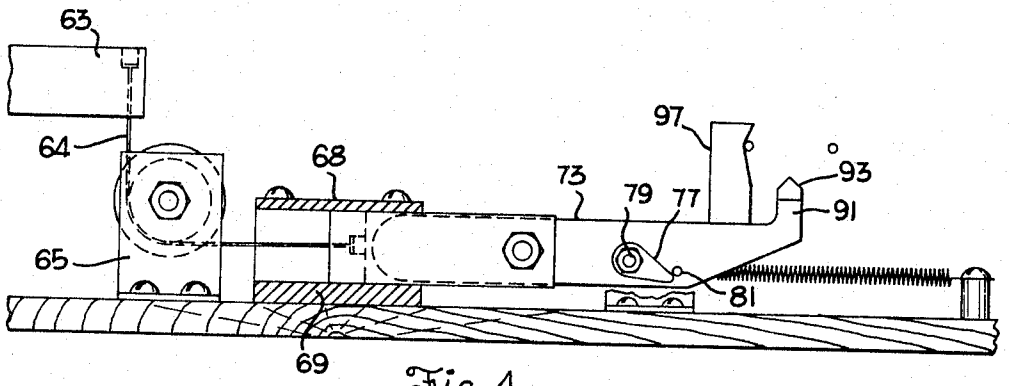


Fig 4

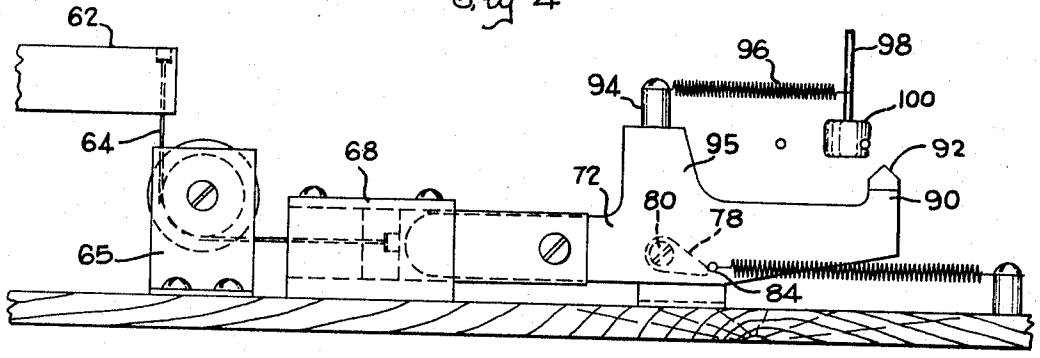


Fig 5

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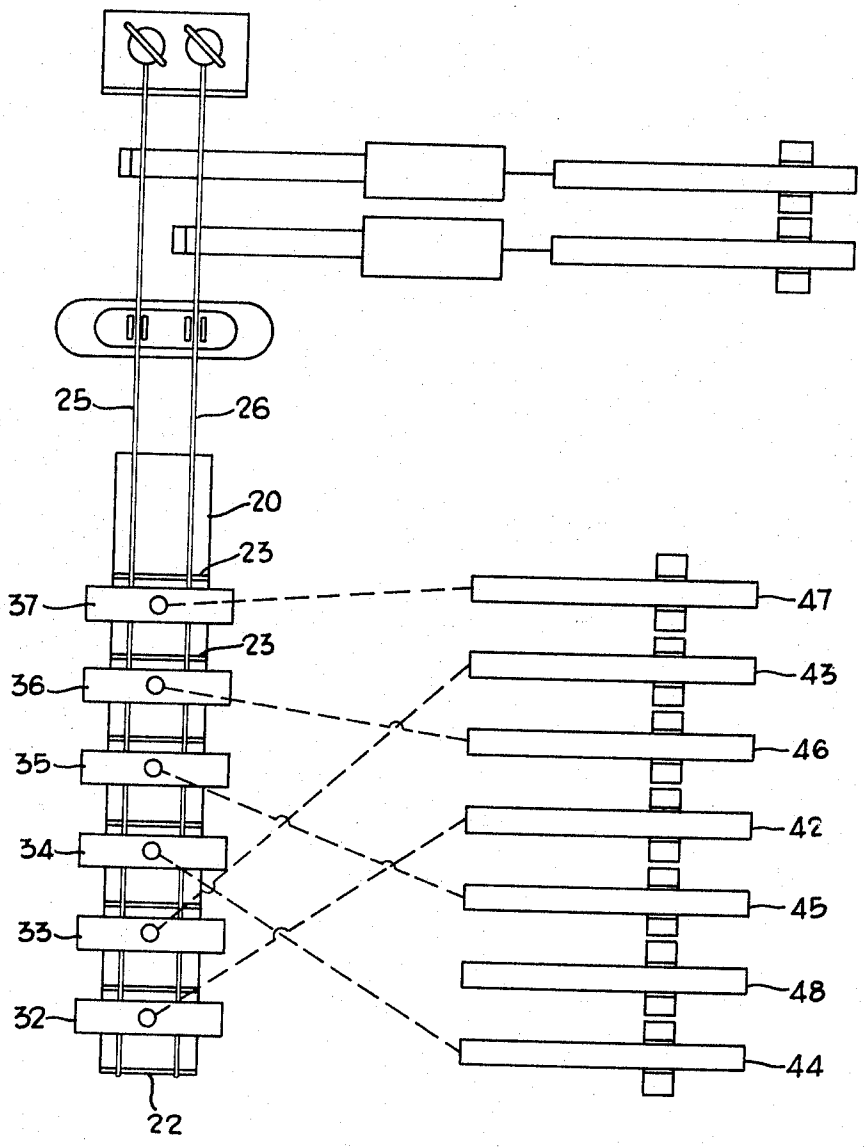


Fig 6

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3,319,502

MUSICAL INSTRUMENT

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12 Claims. (Cl. 84—173)

This invention relates to musical instruments, and in particular to a foot-operable stringed instrument.

So called popular and folk music is commonly accompanied by a string bass, bass guitar or the like. Under present conditions, if a melody is to be carried by some other instrument which requires the use of both of the player's hands, a second player is required for the accompaniment.

One of the objects of this invention is to provide a musical instrument in the nature of a string bass or bass guitar, which can easily be operated by foot.

Another object is to provide such an instrument with a plurality of strings, so arranged that various chords can easily be selectively produced.

Still another object is to provide such an instrument which is simple, rugged, inexpensive to manufacture and maintain, musically acceptable and easy to play.

Other objects will become apparent to those skilled in the art in the light of the following description and accompanying drawings.

In accordance with this invention, generally stated, a musical instrument is provided with a plurality of tuned strings, stop means for varying the effective lengths of the strings simultaneously in predetermined relation to one another, foot pedal means operatively connected to the stop means for selective operation of the stop means when the foot pedal means are manipulated, a plurality of separate plectrum assemblies, each movable relative to one of the strings, and including a plectrum for plucking a particular string, and foot pedal means by which the plectrum assemblies are selectively operated. Each of the plectrum assemblies includes by-pass means adapted to move the plectrum past its respective string out of engagement with the string in one direction of movement.

In the preferred embodiment, the instrument is housed in a case, the strings are stretched over a finger-board provided with frets, which finger-board and frets constitute a part of the stop means, and bars, also part of the stop means, extending transversely of the strings and above and normally spaced from the strings, are spring biased away from the strings. The bars are connected to foot pedals by means of a mechanical connection in such a way that depressing of the foot pedal causes the bar to be pulled down against the strings and finger board, adjacent a fret, to shorten the effective length of the strings, changing the pitch.

Also, in the preferred embodiment, the plectrum assembly includes a slide, reciprocating transversely of the string, a plectrum lever arm connected to the slide, and cam means, operative as a lever arm lifter in one direction of travel of the slide, so as to lift the plectrum into engagement with the string, in the course of travel of the slide and plectrum in one direction, and as a bypass means in the opposite direction of travel of the slide, so as to permit the plectrum to clear the string as it travels in the opposite direction.

In the drawing;

FIGURE 1 is a view in perspective, partly broken away, of one embodiment of instrument of this invention, with a cover removed;

FIGURE 2 is a sectional view taken along the line 2—2 of FIGURE 1;

FIGURE 3 is a fragmentary enlarged top plan view of the plectrum assembly end of the instrument shown in FIGURE 1;

FIGURE 4 is a sectional view taken along the line 4—4 of FIGURE 3;

FIGURE 5 is a sectional view taken along the line 5—5 of FIGURE 3; and

FIGURE 6 is a fragmentary top plan view, partly schematic in character, of the instrument shown in FIGURES 1–5.

Referring now to the drawing for one illustrative embodiment of instrument of this invention, reference numeral **1** indicates an instrument complete except for a plane rectangular cover, not here shown.

The instrument **1** includes a housing **2** made up, in this embodiment, of a front wall **3**, side walls **4** and **5**, a back wall **6**, and a bottom **7**. The cover, not here shown, completes the housing. Within the housing, a false bottom or platform **10**, spaced vertically from the bottom **7**, is secured in this embodiment, by being nailed to the walls **3**, **4**, **5** and **6**, as shown particularly in FIGURES 1 and 2.

In this embodiment, the front wall **3** and the side wall **4** are cut away, as indicated in FIGURE 1, to define an outer side and end of a pedal niche **12**, the other side and back of which are defined by a niche end wall **13** and a niche back wall **14** respectively, and the bottom of which is defined by a portion of the platform **10**. The cover is also cut away complementarily to the upper edges of the niche walls **13** and **14**, and the niche is closed, when the instrument is not in use, by a three sided "box," not here shown, which can also be used as foot rest when it is not serving as a cover for the niche.

Mounted on the upper surface of the platform **10** is a finger board **20**, which, in the embodiment shown, consists of an elongated flat sided piece of wood, positioned with one end near the side wall **4**, parallel with the back wall **6**, and terminating at a substantial distance from the side wall **5**.

At the end of the finger board **20** near the side wall **4**, two tail pins **21** are secured, with their ends projecting. The tail pins **21** are adapted to anchor one end of each of two strings **25** and **26**. A nut **22** extends transversely across the upper surface of the finger board **20** at the end of the finger board from which the tail pins **21** project. The strings **25** and **26** bear against the nut **22**. Frets **23**, spaced along the finger board **20**, also extend transversely across the upper surface of the finger board **20** and are secured thereto.

Aligned with the finger board **20**, spaced from it, and fastened to the platform **10** against the side wall **5**, is a bridge block **27**. The bridge block **27** has, on its top surface, a narrow bridge **28**, extending transversely under the strings **25** and **26** and, like the nut **22**, in constant engagement with the strings. Also mounted on the bridge block **27** are tuning keys **29**, to which the strings **25** and **26** are connected for selective tensioning, hence tuning. While for convenience, the tuning keys **29** are shown as positioned with wings and shanks projecting from the top of the block, in practice they are preferably mounted on the outboard side of the block, to insure that the strings are drawn down snugly onto the bridge **28**.

An access hole **15** in the side wall **5** permits tuning of the strings **25** and **26** without removal of the cover of the housing **2**.

Between the finger board **20** and the bridge block **27** are a magnetic head **9**, of a type commonly used as a pickup in electric guitars and the like, and parts of plectrum assemblies **60** and **61**. The magnetic head **9** is nearer the finger board than the plectrum assemblies, and is electrically connected to an amplifier, not here shown.

Mounted on the plectrum **10**, on either side of and extending along the finger board **20**, are bar spring arches **30**. Springs **31** are mounted at one of their ends, in spaced relation to one another, on the arches **30**, and

at their other ends to bars 32, 33, 34, 35, 36 and 37, as shown particularly in FIGURES 1 and 2. Each of the bars 32–37 is suspended by two springs 31 above the strings 25 and 26 transversely of the strings and finger board, parallel with a fret 23 and adjacent but slightly spaced from each fret toward the nut end of the finger board 20, as shown particularly in FIGURE 6.

In the embodiment shown, each of the bars 32–37 is made up of a wooden block with a resilient pad 38 secured to its under surface so as to be directly over the strings 25 and 26.

A pull rod 39 is connected to the center of each bar, and projects into a passage 40 through the finger board 20 and platform 10, as shown in FIGURE 2. At its lower end, the pull rod is connected to one end of a pull cord 41, the other end of which is connected to an inboard end of a pedal. Intermediate the two ends of the cord 41, the cord passes around pulleys 51 and 52. The pulley 51 has a sheave the bearing surface of which is tangent to the axis of the passage 40.

The pulley 52 has a sheave the bearing surface of which is tangent to the axis of a hole 53 through the platform 10, as shown particularly in FIGURE 2.

The cord 41 from the bar 32 is connected to a pedal 42; from the bar 33 to a pedal 43; from the bar 34 to a pedal 44; from the bar 35 to a pedal 45; from the bar 36 to a pedal 46; and from the bar 37 to a pedal 47. It will be observed in FIGURES 1 and 6 that a pedal 48 is unconnected to any bar. It will be noted also that, while the bars 32 through 37 are numbered consecutively from the nut end of the finger board, the pedals 42 through 48 are not in the same physical order. The reason for this arrangement will be explained later.

Each of the pedals is pivoted on a pivot pin 49 supported by a pivot bracket 55 mounted on the platform 10, as shown in FIGURES 1 and 2. The pedals extend through pedal openings in the niche back wall 14, which openings are high enough to accommodate the rocking of the pedals about the pivot pins 49.

In the embodiment shown, two plectrum assembly pedals, a bass pedal 62 and a counter bass pedal 63, are pivoted in the same manner as the pedals 42–47, but close to the front wall 3 of the housing, as indicated schematically in FIGURE 6. The pedals 62 and 63 project outside of the housing 2, so as to admit of a greater throw than that of the pedals 42–48, which are positioned directly over the platform 10. A foot-like part, at the projecting end of the pedals 62 and 63, facilitates the greater depression of the pedals 62 and 63 than is necessary with the pedals 42–48.

In the embodiment shown, a draw cord 64 is fastened at one of its ends to the inboard end of the bass pedal 62 and another draw cord 64 is fastened, at one of its ends, to the inboard end of the counter bass pedal 63. Each of the cords 64 tends around a sheave of a pulley 65 mounted on the platform 10 as shown particularly in FIGURES 3, 4 and 5. At its other end, each of the draw cords 64 is connected to a yoke-shaped slide 67, which is mounted for easy reciprocation in guide ways 68. The guide ways 68 are mounted on the platform 10, as indicated in FIGURES 3–5. Each of the slides 67 has a pair of arms defining a rectangular space between them. A bass plectrum lever arm 72 is pivoted, between the arms of the one of the slides 67 which is connected to the bass pedal 62, on a pin 74. A counter bass plectrum lever arm 73 is pivotally mounted between the arms of the slide 67 connected to the counter bass pedal 63 by means of a slide pin 74.

Between the lever arms 72 and 73, a cam block 76 is mounted on the platform 10. On the side of the cam block 76 next to the counter bass arm 73, a cam 77 is pivotally mounted on a cam pin 79. On the side of the cam block 76 next to the bass lever arm 72, a cam 78 is pivoted on a cam pin 80. The lever arm 73 has projecting from it toward the cam block 76, a counter bass lever arm cam follower 81. The lever arm 72 has projecting from it toward the cam block 76 a bass lever arm cam follower 82.

A spring mounting peg 84 projects from the side of each of the arms 72 and 73 away from the cam block 76. A spring 86 is connected at one end to the peg 84 of each of the lever arms, and at its other end to a spring post 85, to provide a constant bias of the lever arms, hence the slides, in the direction away from the front wall 3.

At its innermost end, the bass lever arm 72 has an upwardly extending, integral plectrum finger 90 upon which a plectrum 92 is securely mounted. In this embodiment, the plectrum 92 is a wedge-shaped piece of hard felt or other suitably resilient material. At its innermost end, the counter bass lever arm 73 has an upwardly extending integral plectrum finger 91 on which a plectrum 93 of the same type as the plectrum 92 is securely mounted.

Mounted on top of the counter bass lever arm 73, and near but spaced from the plectrum 93, is a counter bass string damper 97, which, as indicated in FIGURE 4, is normally biased into contact with string 96 by spring 86.

On the top of the bass lever arm 72, and integral with it, is a damper spring boss 95, supporting a damper spring post 94, to which one end of a damper bass pull spring 96 is connected. The other end of the bass damper pull spring 96 is connected to a downwardly directed leg of a U-shaped bass string damper pad spring 98, the other end of which is anchored to the platform 10, as shown in FIGURE 1. The anchored leg of the damper pad spring 98 is between the string 25 and the back wall 6, while the depending end of the damper pad spring 98 to which the spring 96 is connected, is between the string 25 and the string 26. A bass string damper pad 100, mounted on the free end of the U-shaped bass string damper pad spring 98, is normally biased against the bias of the pull spring 96, by the damper pad spring 98, into engagement with the string 25 as shown in FIGURE 5.

It has been noted heretofore that the pedals 42 through 47 are not connected to bars 32 through 37 in the same physical order. In other words, some of the pull cords 41 cross others, and, as has been noted, pedal 48 is not connected to any bar at all.

Preferably, the strings 25 and 26 are tuned to C and G respectively, so that if none of the bars is pulled down against the finger board, and the strings are plucked, they will produce the tonic and dominant notes of the C major chord. The pedal 48 is provided so that the player can position his foot properly for playing other cords, and to give the impression that he is causing a particular chord to be played when he presses the pedal.

The pedal 44, immediately adjacent the pedal 48 at the end 4, actuates the bar 34 which is so positioned along the string, with its accompanying fret, as to produce an F chord, i.e. the F tonic and C dominant notes of what, in a triad, would be properly denominated a second inversion. The pedal 45 is connected with the bar 35, which is positioned to produce the note G on the string 25 and D on the string 26. The pedal 42, next to the pedal 45, is connected to the bar 32 to produce the note D on the string 25 and A on the string 26. The pedal 46 is connected to the bar 36 to produce the note A on the string 25 and E on the string 26. The pedal 43 is connected to the bar 33 to produce the note E on the string 25 and B on the string 26. The pedal 47 is connected to the bar 37 to produce the note B on the string 25 and F on the string 26.

It will be seen that the arrangement of pedals shown in the illustrative embodiment of instrument is such that the dominant note of the chord produced by the first pedal 44 (C) is the tonic note of the chord produced by the next pedal 48; the dominant note (G) of the pedal 48 is the tonic note of the next pedal 45, and so down the line. This is the reason for the arrangement of pulleys and pedals shown in the illustrative example.

It will be immediately apparent that in order to encompass all of the keys, utilizing a diatonic scale, five additional pedals would be required, for the tonic C sharp, E flat, F sharp, G sharp and B flat. However, for purposes of illustration, and for most practical purposes, the arrangement shown, with seven chords and pedals, is sufficient.

In the operation of the plectrum assemblies, when the bass pedal **62** is depressed, the inboard end of the pedal is raised, pulling the slide **67** and the arm **72** toward the pedal. As the arm **72** moves toward the pedal, the cam follower **82** rides on the upper surface of the cam **78**, causing the lever arm **72** to pivot about the pin **74**, and raising the plectrum **92** into engagement, as the slide moves, with the string **25**. At the same time, the movement of the post **94**, acting through the spring **96**, has moved the damper pad **100** out of engagement with the string **25**, so that when a plectrum **92** is pulled past the string **25**, plucking the string, the string can vibrate undamped by the damper pad **100**. When the pedal is fully depressed, as signaled by its striking the platform **10** or the edge of the wall **3** defining the lower margin of the hole through which the pedal extends, the cam follower **82** will have cleared the end of the cam **78**, and the lever arm **72** will have assumed its horizontal position. When the pedal is released, the bias of the spring **86** pulls the lever arm **72**, hence the slide **67** back toward the post **85**. The cam follower **82** engages the under surface of the cam **78**, rocking the cam **78** upwardly to permit the cam follower to pass beneath the cam. When the cam follower **82** has cleared the inner end of the cam **78**, the cam falls to the position shown in FIGURE 5, and the cycle is completed.

When the counter bass pedal **63** is depressed, its slide **67** is also moved, by the action of the cord **64**, in the direction of the pedal. As the arm **73** moves toward the pedal, the cam follower **81** rides on the upper surface of the cam **77**, raising the plectrum **93** in a position to pluck the string **26** as it passes. The damper **99** moves away from contact with the string **26** as the lever arm **73** moves back, permitting the string **26** to vibrate when it is plucked. As the pedal **63** reaches its fully depressed position, the cam follower **81** clears the cam **77**, permitting the lever arm **73** to fall to its straight position, at which, when the pedal is released, the cam follower **81** engages the under surface of the cam **77** raising the cam and permitting the cam follower to pass beneath the cam until it clears its inner end.

It will be observed that, in both lever arms **72** and **73**, a considerable span of lever arm extends within the yoke between the arms of the slide **67** on the side of the pivot pin **74** toward the pedals. This span of arm serves to counterbalance to some extent the span of the lever arms on the string side of the pivot **74**. In order to accommodate the rocking of the lever arms about the pivot pins to a position to which the plectra engage the strings, the guide ways **68** are provided with lower guide walls **69**, which support the slides **67** a distance above the platform **10** sufficient to permit the yoke ends of the levers **72** and **73** to move down toward the platform without interfering with the upward movement of the plectra and the camming action of the cams and the cam followers.

The pedals **62** and **63** are spaced laterally sufficiently to permit their being depressed individually without difficulty, but are close enough together to permit their being depressed simultaneously if that is desired.

As is apparent from the description, in playing the instrument of the invention, the desired note or chord is obtained by depressing with one foot the appropriate pedal and while the pedal is depressed with that foot, depressing one of the plectrum pedals with the other foot to play one note. The vibrations of the plucked note in the embodiment shown are picked up by the magnetic pickup **95** and electrically amplified and broadcast through a speaker. If desired, both plectrum pedals can be depressed at once to produce a chord or they can be depressed in succession, or only one of the two may be depressed. If desired, the magnetic pickup head can be left unenergized, the note then being unamplified but audible.

It can be appreciated that instead of a continuously plane-surfaced finger board, a series of spaced blocks or the like could be used. The term "finger board" as used in the specification and claims encompasses such arrangements.

Numerous other variations in the construction and arrangement of the instrument of this invention, within the scope of the appended claims, will occur to those skilled in the art in the light of the foregoing disclosure. Merely by way of example, different kinds of springs can be utilized in each of the places in which springs are shown; a direct lever linkage can be provided between the pedals and the bars; the positions of the strings, bars and finger board can be reversed, with the bars and strings beneath a finger board; different orders of chords, different intervals, additional strings and pedals may be provided. However, the general arrangement shown has many advantages of simplicity, economy of manufacture and dependability.

Having thus described the invention, what is claimed and desired to be secured by Letters Patent is:

1. A foot-operable musical instrument comprising a plurality of tuned strings; stop means for varying the effective lengths of said strings simultaneously in predetermined relation; foot pedal means operatively connected to said stop means for selective operation thereof when said foot pedal means is manipulated; a plurality of separate plectrum assemblies for said strings movable relative to separate of said strings including a plectrum for plucking each of said strings, each of said plectrum assemblies including by-pass means adapted to move said plectrum past its respective said string out of engagement therewith in one direction of movement thereof and plectrum assembly foot pedal means operatively connected to said plectrum assemblies for selective operation thereof upon manipulation of said foot pedal means.

2. A foot-operable musical instrument comprising a plurality of tuned strings; a plurality of stop means in the form of bars extending transversely of said strings and a finger board in complementary relation to said bars on the opposite side of the strings therefrom for varying the effective lengths of said strings simultaneously in predetermined relation when said bars are moved against the strings and finger board; a plurality of foot pedal means each operatively connected to an individual of said bars for selective operation thereof when one of said foot pedal means is manipulated, said bars being normally biased away from said strings; separate plectrum assemblies for said strings movable relative to separate of said strings including a plectrum for plucking each of said strings, each of said plectrum assemblies including by-pass means adapted to move said plectrum past its respective said string out of engagement therewith in one direction of movement thereof and plectrum assembly foot pedal means operatively connected to said plectrum assemblies for selective operation thereof upon manipulation of said foot pedal means.

3. The instrument of claim **2** wherein the finger board is provided with a fret adjacent but spaced, lengthwise of the string, from each bar.

4. The instrument of claim **2** wherein the said foot pedal means are directly mechanically connected to said bars.

5. The instrument of claim **2** wherein each plectrum assembly foot pedal means is directly mechanically connected to said plectrum assembly.

6. The instrument of claim **5** wherein each of the plectrum assemblies includes a slide adapted to reciprocate transversely of the string, a plectrum lever arm connected to said slide, and cam means operative as a lever arm lifter in one direction of travel of said slide and as a by-pass means in the opposite direction of travel of said slide.

7. The instrument of claim 6 wherein each of the plectrum assemblies includes a damper and a damper biasing means adapted to bias said damper toward engagement with said string, said damper being operatively connected to said slide whereby movement of said slide toward a position at which said plectrum engages said string moves said damper against the bias of said damper biasing means out of engagement with said string.

8. A foot-operable musical instrument comprising two strings tuned a musical fifth apart, a plurality of stop means in the form of bars extending transversely of and above said strings and a finger board in complementary relation to said bars below said strings for varying the effective length of said strings simultaneously in predetermined relation when said bars are moved against the strings and finger board; bar biasing means connected to said bars and adapted to bias said bars away from said strings; foot pedal means directly mechanically connected to said bars and each adapted, when depressed, to move one bar against the bias of the bar biasing means, to engagement with said strings; separate plectrum assemblies for said strings movable relative to separate of said strings including a plectrum for plucking each of said strings, each of said plectrum assemblies including a slide adapted to reciprocte transversely of the string, a plectrum lever arm connected to said slide, cam means operative as a lever arm lifter in one direction of travel of said slide and as a by-pass means to move said plectrum past its respective said string out of engagement therewith in the opposite direction of travel of said slide, and plectrum assembly foot pedal means directly mechanically connected to said plectrum assemblies for selective operation thereof upon manipulation of said foot pedal means.

9. The instrument of claim 8 wherein each of the plectrum assemblies includes a damper and damper biasing means adapted to bias said damper toward engagement with said string, said damper being operatively connected to said slide whereby movement of said slide toward a position at which said plectrum engages said string moves said damper against the bias of said damper biasing means out of engagement with said string.

10. The instrument of claim 8 wherein each foot pedal means connected to a bar is pivotally mounted and is connected to the bar by a cord attached to an inboard end of said foot pedal means and to said bar, said cord extending downwardly from said foot pedal means, around a pulley, laterally to another pulley, around the latter pulley, and upwardly to said bar.

11. The instrument of claim 8 wherein each of the plectrum assembly foot pedal means is connected to one of the plectrum assemblies by a cord and pulley assembly, said cord and pulley assembly comprising at least one pulley and a cord attached to an inboard end of said pedal and to said plectrum assembly said cord engaging the sheave of said pulley.

12. A foot-operable musical instrument comprising a plurality of tuned strings; stop means for varying the effective lengths of said strings simultaneously in predetermined relation; foot pedal means operatively connected to said stop means for selective operation thereof when said foot pedal means is manipulated; plectrum assembly for said strings movable relative to said strings including at least one plectrum for plucking said strings, said plectrum assembly including by-pass means adapted to move said plectrum past at least one said string out of engagement therewith in one direction of movement thereof and plectrum assembly foot pedal means operatively connected to said plectrum assembly for operation thereof upon manipulation of said foot pedal means.

No references cited.

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