April 1, 1969 K. V. PAUL ET AL 3,435,722

STRINGED MUSICAL INSTRUMENT

Filed Aug. 5, 1964 Sheet 1 of 3

Fig. 1

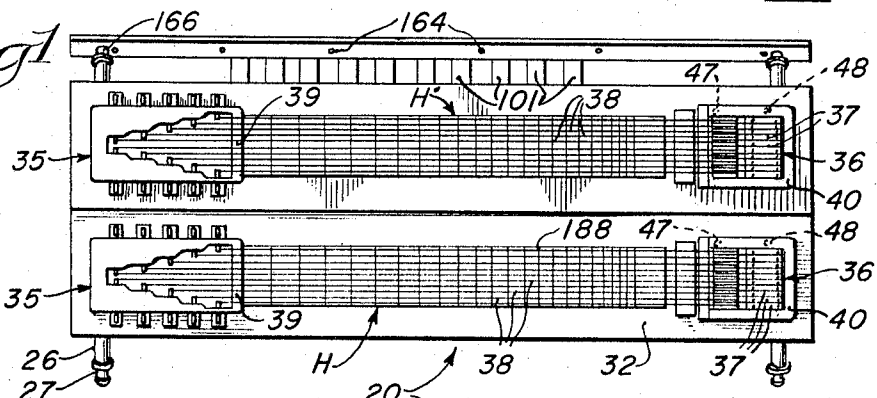


Fig. 2

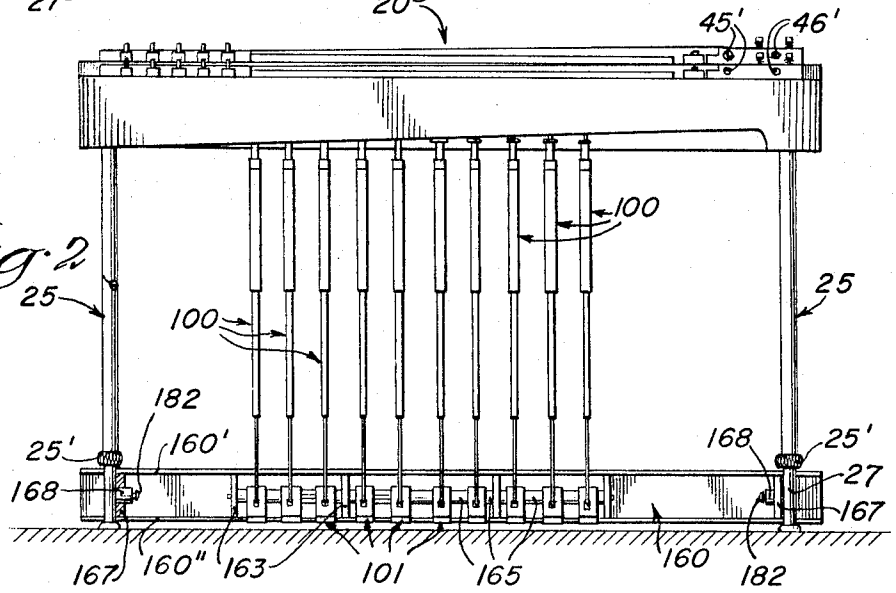


Fig. 3

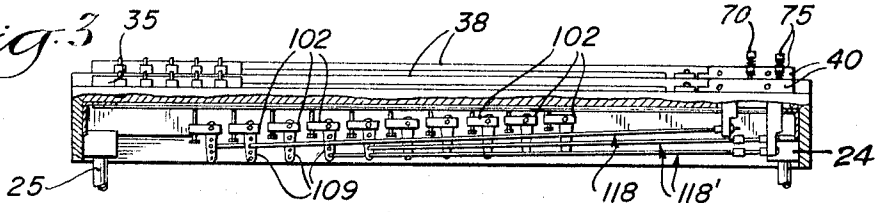


Fig. 15

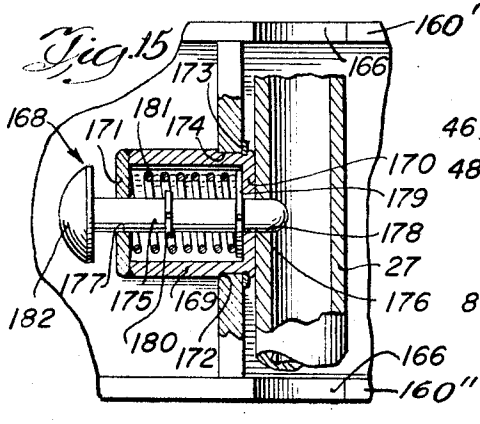
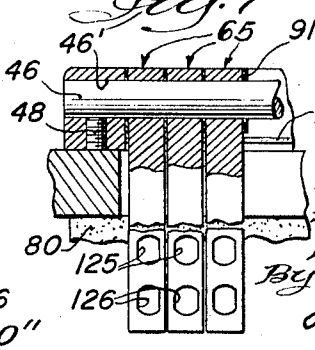


Fig. 7



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STRINGED MUSICAL INSTRUMENT

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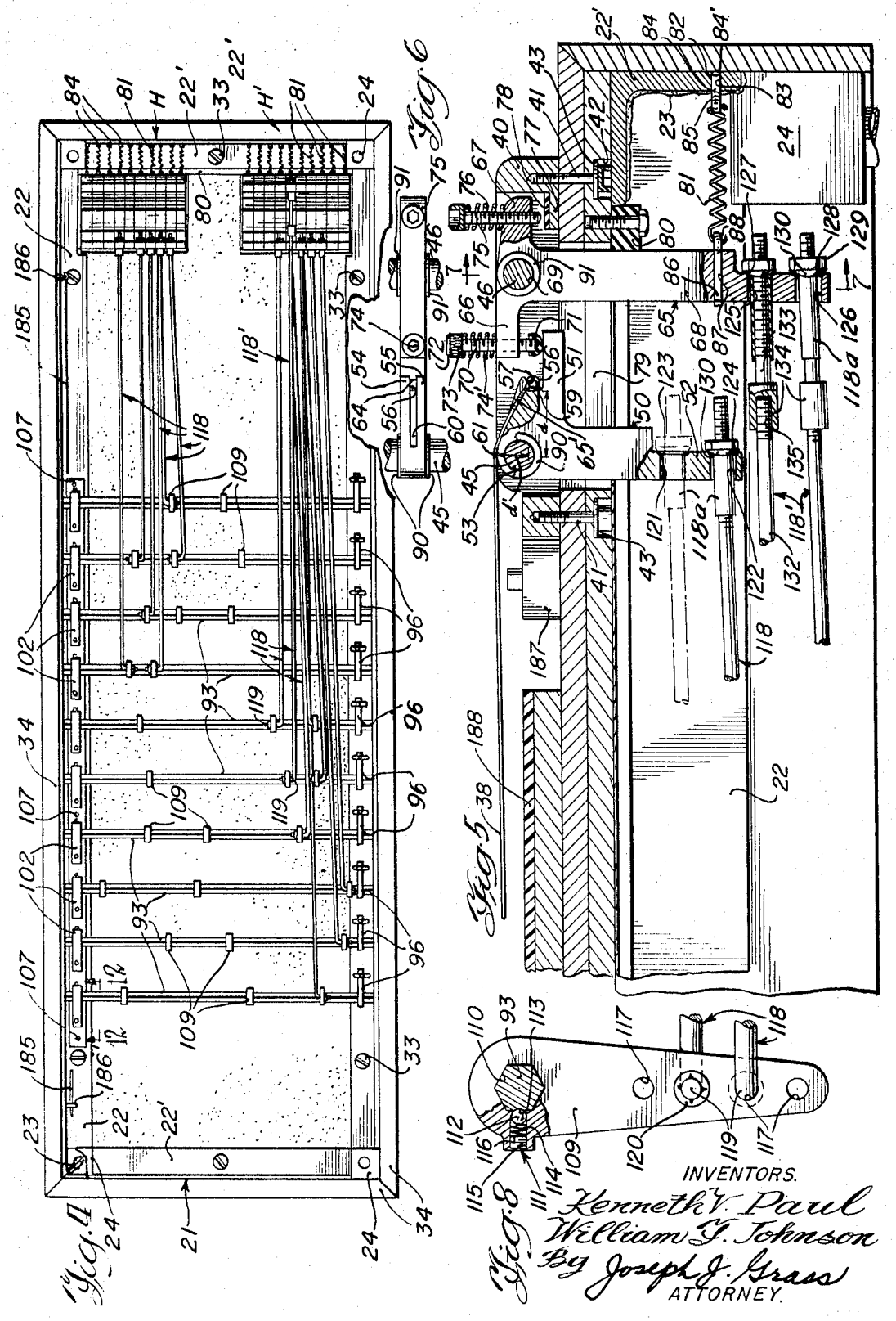


Fig. 4

Fig. 5

Fig. 6

Fig. 8

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STRINGED MUSICAL INSTRUMENT

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Fig. 9

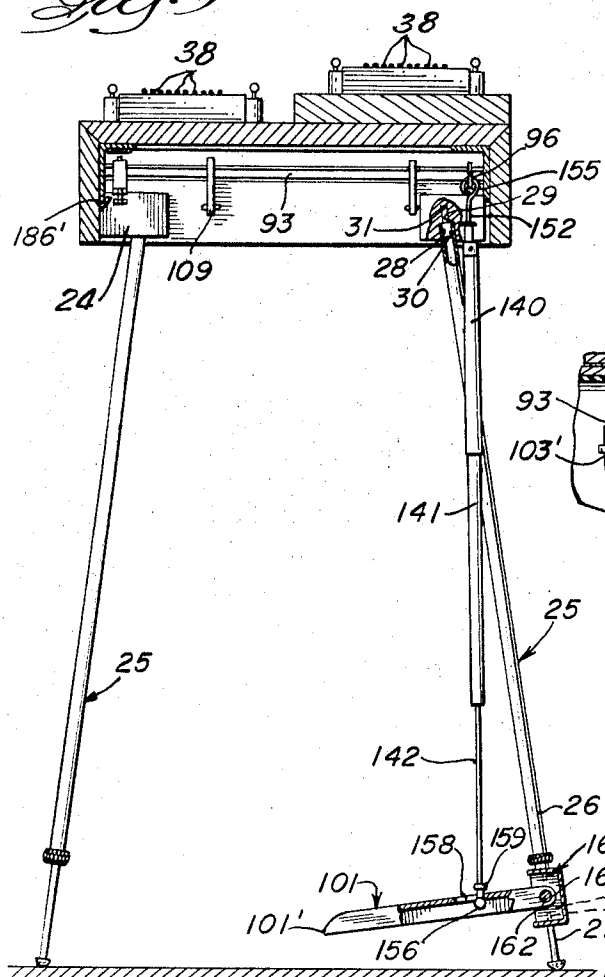


Fig. 11

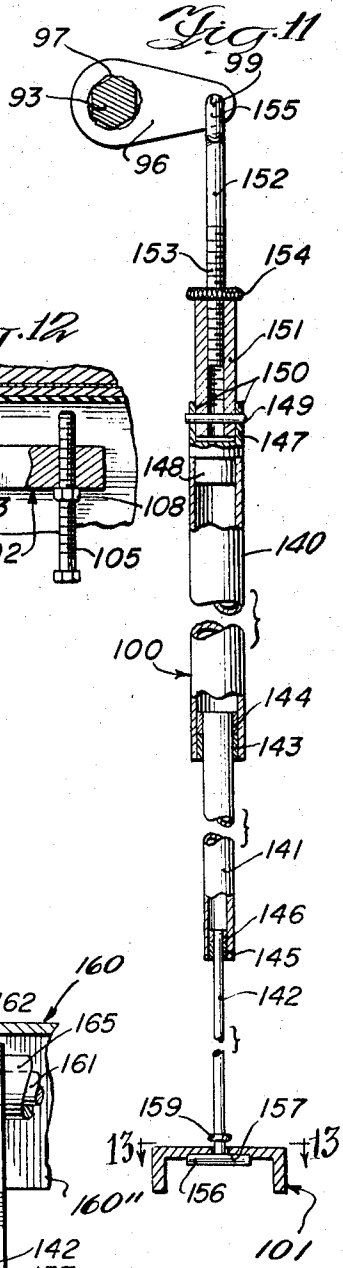


Fig. 12

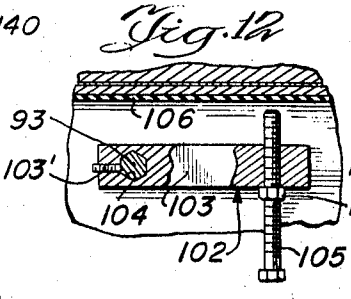
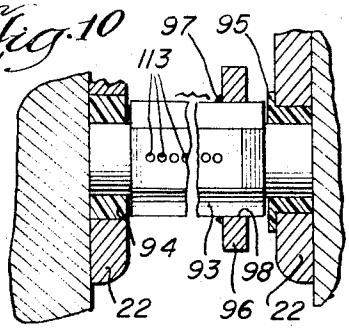


Fig. 10



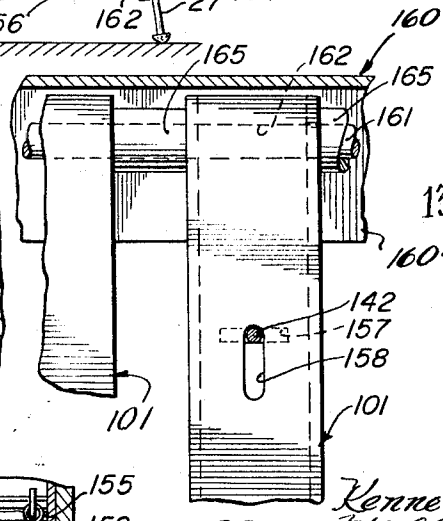


Fig. 14

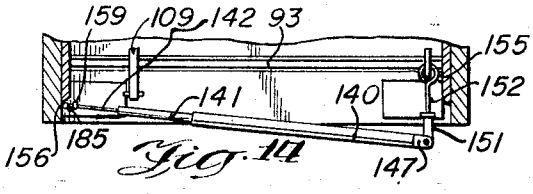


Fig. 13

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United States Patent Office

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STRINGED MUSICAL INSTRUMENT

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Int. Cl. G10d 3/14

U.S. Cl. 84—312

24 Claims

ABSTRACT OF THE DISCLOSURE

There is disclosed a stringed musical instrument of the pedal guitar type. Foot operated pedals pivot pivotally mounted shafts, and one or more arms shiftable along and secured to each shaft are connected by connectors to selected lever mechanisms. The lever mechanisms are operable to increase or decrease tension on the respective strings. Each lever mechanism includes cooperating levers, one of which is adapted to be connected to an associate string. Each lever may be connected to one of the arms by the connectors. The lever mechanisms and arms can be connected in any desired musical arrangement.

This invention relates in general to a stringed musical instrument and in particular to a stringed musical instrument of the guitar type.

It is a feature of the invention to provide an improved stringed musical instrument having great versatility which, among other things, includes provision for raising and/or lowering any selected string or strings, which is relatively inexpensive to construct, and which does not inherently possess lost motion which would result in slow string response upon operation of a foot pedal.

In accordance with a specific embodiment of the invention, there is provided a plurality of sets of lever mechanisms, with each set of lever mechanisms having a first lever pivotal in one direction from a rest position to increase the tension on a string and in an opposite direction from the rest position to decrease the tension on the string, a second lever operatively connected to the first lever and movable away from a rest position against the force of urging means, with the pitch of each string being regulatable at the operative connection between the first and second levers, a plurality of pivotally mounted shafts operated by foot pedals, arms shiftable along and secured to the shafts, and connectors, each of which is selectively connectable to one of the arms and one of the first or second levers.

In the illustrative drawings:

FIGURE 1 is a top plan view of a musical instrument in accordance with the invention;

FIGURE 2 is a rear elevation view of the musical instrument shown in FIGURE 1;

FIGURE 3 is a rear elevational view of the instrument showing certain parts broken away for clarity;

FIGURE 4 is a bottom plan view of the instrument with certain parts broken away for clarity;

FIGURE 5 is a fragmentary sectional view showing a marginal end of the instrument with one of its lever mechanisms connected to a string;

FIGURE 6 is a top plan view showing two levers of a lever mechanism;

FIGURE 7 is a partly broken away sectional view taken along line 7—7 of FIGURE 5;

FIGURE 8 is an enlarged elevational view showing two rods connected to an arm mounted on a shaft;

FIGURE 9 is a transverse sectional view through the musical instrument, but showing only one of the pivotal shafts;

FIGURE 10 is a broken away elevational view of one of the shafts shown mounted in a frame;

FIGURE 11 is an elevational view showing in detail a telescoping connector connected at its upper end by an arm to a shaft and connected at its lower end to a foot-operated pedal;

FIGURE 12 is an enlarged sectional view taken along line 12—12 of FIGURE 4;

FIGURE 13 is a fragmentary view taken generally along line 13—13 of FIGURE 11;

FIGURE 14 is a fragmentary sectional view showing one of the connectors disposed in compact relationship with respect to the frame and held in that position; and

FIGURE 15 is an enlarged sectional view showing in detail a construction by which a leg can be quickly locked and unlocked from a crossbar which pivotally mounts the pedals.

Referring now to the drawings, there is shown a stringed musical instrument generally indicated at **20**. The musical instrument **20** has a rigid rectangular frame generally indicated at **21**. The frame **21** is shown to have longitudinal and transverse metal angle members **22** and **22'**, composed, for example, of aluminum, joined by weldments **23**. Leg mounting members **24** are joined to the frame **21** for example by welding. Legs **25** are each shown to have two telescoping sections, **26** and **27**. Each section **26** is received in a bore **28** which communicates with a threaded bore **29** as best shown in FIGURE 9. A plug **30** is secured in the upper end of each section **26** and has a threaded portion **31** which is received in the threaded bore **29**. The upper end of the section **26** is rotatable in, but makes a close fit with, the bore **28**. The legs **25** at each end of the frame **21** are inclined downwardly and outwardly and extend in generally vertical planes.

A stepped top **32** is shown to be secured to the frame **21** by screws **33**. Sides **34** which abut the side of the frame **21** are secured by glue and other suitable means to the top **32**. Heads generally indicated at H and H' are disposde at different levers on the stepped top **32** as is known in the art. Each head H and H' is provided with a conventional string anchoring and adjusting mechanism generally indicated at **35** and a plurality of sets generally indicated at **36** of lever mechanisms **37**. Strings **38** of each head H and H' are connected at their one ends to the anchoring and adjusting mechanism **35** and pass over a bridge **39**, while the other ends of strings **38** are shown to be connected to the lever mechanisms **37**.

A rigid mounting frame **40** is employed to mount each set **36** of lever mechanisms **37**. Each mounting frame **40** is securely mounted to the top **32** by screws **41**, one of which penetrates each corner of the frame **40**. The head of each screw **41** is recessed in a bore **42** and bears against a washer **43**.

Pivots **45** and **46**, which are shown to be parallel to each other, are received in bores **45'** and **46'**, respectively, in the mounting frame **40**. Pivots **45** and **46** are held in place in their bores **45'** and **46'** by set screws **47** and **48**, respectively.

Each lever mechanism **37** includes a lever **50** connectable to one of the strings **38**. Various types of constructions for connecting a movable member to a string to increase or decrease the string tension are shown in the art. One such type provides for anchoring each string at each of its ends, passing the strings over a fixed bridge or rollers near their one ends, and exerting or relieving a force against a selected string or strings between the bridge or rollers and their said one ends. Another such type provides for anchoring each string at one end and passing the strings over a fixed bridge or rollers near their other ends, and exerting a greater or lesser force on one or more strings at their said other ends to increase or de-

crease the string tension. Another such type provides for anchoring each string at one end and employing a lever for each string to serve both as a bridge and as the means for holding the string under tension and either increasing or decreasing the string tension; this last-mentioned type is shown to be employed in the present invention.

A lever **50** is shown to be generally inverted L-shaped and to have an arm **51** extending generally away from or outwardly of the string **38** and a generally downwardly extending arm **52**. The lever **50** has a bore **53** near its forward upper end. The pivot **45** is received in the bore so that the lever **50** can be rocked or pivoted about the pivot **45**. The lever **50** has two cantilever projections **54** and **55** which extend outwardly of an outwardly facing wall **56**. The projections **54** and **55** have aligned lower surfaces **57** lying in a plane. The intersection of the lower surfaces **57** and the wall **56** is indicated at **59**. A gradual downwardly and outwardly inclined groove **60** starts at a top or bridge portion **61** and terminates approximately at or slightly below the upper end of the wall **56**. The intersection **59** is a substantially greater distance *d* outwardly from the high point of the bridge portion **61** than it is downwardly from the high point of the bridge portion **61** as indicated by distance *d'* (FIGURE 5). The string **38** is shown to pass around a fastener **64** in the form of a short tube and is preferably braided upon itself as indicated at **65'**. The fastener **64** exerts a force against the lower surfaces of the cantilever projections **54** and **55** and against the wall **56** when the string **38** is under tension. It is apparent that not only is the string **38** quickly connectable to and disconnectable from the lever **50**, but the string is not required to undergo abrupt changes in direction as it flexes upon pivotal movement of the lever **50**.

A lever generally indicated at **65** is shown to be generally T-shaped and to have an arm **66** extending inwardly toward the string, an outwardly extending arm **67**, and a downwardly extending arm **68**. The lever **65** has a bore **69** at its upper end where the arms **66**, **67** and **68** are joined. The pivot **46** is received in the bore **69**. The levers **50** and **65** are operatively connected to each other as best shown in FIGURE 5 where they are shown in their rest positions. A regulating screw **70** is shown to be threaded through the arm **66** and to exert a force against the arm **51** of the lever **50**. Sound deadening material **71** in the form of a hard rubber cup is securely held to the end of the screw **70** and engages the arm **51**. The screw **70** has a head **72** which is externally roughed for example by knurling as indicated at **73** and has an internal socket **74**. Thus, the screw **70** can be regulated by gripping roughed surface **73** of the head **72** between the thumb and index finger of one hand and then turning the head **72** or by fitting a suitable tool into the socket **74** and then turning the screw **70**. A spring **74'** encircles the screw **70** and abuts against the underside of the head **72** and abuts against the arm **66** to hold the screw **70** in its regulated position. A regulating screw **75**, like the regulating screw **70**, is threadably received in the arm **67**. A spring **76** encircles the screw **75** and holds the screw **75** in its regulated position.

The mounting frame **40** has an internal elongated flange **77**. A strip of relatively hard sound deadening material **78** such as hard rubber is suitably secured to the upper surface of the flange **77**. The lever **65** is shown in its rest position and the end of the screw **75** is shown to be spaced from the sound deadening material **78**.

The levers **50** and **65** are shown to extend downwardly through a cutout **79** in the top **32**. An elongated strip of relatively hard sound deadening material such as hard rubber provides a common stop **80** for all the levers **65**. Each one of the levers **65** is urged into its rest position against the stop **80** by a spring **81**. The downwardly extending leg of one transverse angle member **22'** has an elongated groove **82** and spaced apart apertures **83** opening into the groove **82**. Cotter pins **84**, having eyes **85** for receiving hook ends of springs **81**, traverse apertures **83** and their ends **84'** are bent over to lie 180 degrees apart in the groove **82**. The groove **82** is deep enough so that the bent over ends **84'** lie flush with the outer surface of the downwardly extending leg of the transverse angle member **22'**. A cotter pin **86** traverses each aperture **87** in each arm **68** of the lever **65**. The cotter pins **86** have eyes **88** which receive the other hook ends of the springs **81**.

The spring **81** for each lever **65** is strong enough to counteract the moment exerted on the lever **65** by the lever **50**, due to the tension on the string **38** and to return the lever **65** to its rest position against the stop **80**. Each regulating screw **70** regulates the rest position of its lever **50**, while each regulating screw **75** regulates the amount of pivotal movement of its lever **65**. There is easy access to the regulating screws **70** and **75**.

As best shown in FIGURES 6 and 7, washers **90** and **91** are disposed on pivots **45** and **46** between adjacent levers **50** and between adjacent levers **65**, respectively, to obviate the possibility of adjacent levers **50** and **65** binding and thus moving one another. The washers **90** and **91** are preferably composed of plastic material such as a polytetrafluoroethylene sold commercially under the name "Teflon" by E. I. du Pont and Co.

Shafts **93** are spaced from each other in a generally longitudinal direction and are pivotally mounted in longitudinal angle members **22** by Teflon bearings **94** and **95**. One set of bearings **94** and **95** is shown in detail in FIGURE 10 of the drawings. Each shaft **93** is secured to an arm **96** near one of its ends, and all the arms **96** are aligned. Each arm **96** is suitably secured at the one end of its respective shaft **93** for example by brazing as indicated at **97**. The arms **96** have hex-shaped openings **98** which receive the respective shafts **93** which are also shown to be hex-shaped. Each one of the arms **96** has an aperture **99** to provide a pivotal connection with a connector generally indicated at **100**. Each connector **100** is actutable by a foot-operated pedal generally indicated at **101**. The other end of each shaft **93** has a stop generally indicated at **102** secured to it. Each stop **102**, as best shown in FIGURE 12, is provided with an arm **103** having a hex-shaped opening **104** which receives the shaft **93**. A set screw **103'** prevents the arm from shifting. A screw **105**, threadably received by the arm **103**, is capable of abutting the surface of a strip of relatively hard sound deadening material **106** such as hard rubber. Sound deadening material **106** is suitably secured to the substantially horizontal leg of the longitudinal angle member **22**, for example by screws **107**. A lock nut **108** is threadably received by each regulating screw **105** and can be tightened against its arm **103**.

Each of the shafts **93** is shown to be provided with three arms **109**, although a lesser or greater number can be provided. The arms are preferably constructed as shown in detail in FIGURE 8 and are preferably identical. Each arm **109** has a hex-shaped bore **110** which receives the shaft **93**. Each of the arms **109** is shiftable or movable to different positions along its shaft **93**, there being just enough clearance for this purpose. It is preferred to provide means for preventing the arms **109** from rotating relative to their shafts **93**. One such means, as shown, is to make the rod **93** and the bore **110** non-circular and in particular, hex-shaped. Each arm **109** is thus effectively keyed against rotation relative to its related shaft **93**. To prevent the accidental shifting of each arm **109** relative to its respective rod **93**, suitable means generally indicated at **111** are provided. Each such means is shown to have a ball **112** which can extend into one of the closely spaced recesses **113** in the shaft **93**. A spring **114** acts at one end against an end of a screw **115** which is threadably received in a bore **116**. As any arm **109** is shifted along its respective shaft **93** the ball **112** moves in and out of the recesses **113**. The arms **109** are thus frictionally held in any position along their shafts **93** by action of spring **114**.

Each of the arms 109 is shown to have four radially spaced bores 117. Connectors generally indicated at 118 and 118', shown to take the form of substantially rigid rods, are selectively connectable at their one ends to arms 109 and are selectively connectable at their other ends to levers 50 and 65. The ends of the connectors 118 and 118' which are connected to the arms 109 are each bent at 90 degrees to form short studs 119. The ends of the studs 119 which project through the arms 109 have removable fasteners 120, in the form of sheet metal clips, secured to them. These fasteners 120 are removable by using the fingernails but otherwise retain the studs 119 in position on the irrespective arms 109.

The other ends of the connectors 118 and 118' are connectable to levers 50 and 65, respectively. Each of the levers 50 is preferably provided with two apertures 121 and 122 which terminate at radiused seats 123 and 124, respectively. Similarly, each of the levers 65 is preferably provided with two apertures 125 and 126 which terminate at radiused seats 127 and 128, respectively. The apertures 125 of each of the links 65 are disposed slightly below the lower ends of links 50 to obviate interference.

Although the pivots 45 and 46 for the levers 50 and 65 of the head H' are disposed at a higher elevation on the top 32 than the pivots 45 and 46 for the levers 50 and 65 of the head H, the arms 52 and 68 are long enough and the apertures 121 and 125 are low enough so that all the levers 50 and 65 can be of the same length.

As best shown in FIGURE 5, the ends of connectors 118 and 118' are provided with nuts 129 having radiused faces 130. The nuts 129 are provided with frictional means for holding them in position during use but permitting movement along the connectors 118 and 118'.

Due to the fact the levers 50 and 65 are spaced longitudinally from each other and are at different distances from any particular shaft 93, the connectors 118' which extend to the levers 65 are longer than the connectors 118 which extend from the same shaft 93 to the levers 50. Each of the connectors 118' has sections 132 and 133. The section 132 can be identical in length to the connector 118, as shown. The section 133 can be considered to be an extension of the section 132. The section 133 has an internally threaded end 134 which receives an externally threaded end 135 of the section 132. Sound deadening material 118*a* in the form of plastic tubing is disposed between the marginal end of each connector 118 and 118' and its related aperture and there is clearance all around the material 118*a* to provide a loose fit.

Each of the connectors 118 and 118' is connected to one of the arms 109 and to one of the levers 50 and 65. A typical arrangement is shown in FIGURE 4 but any suitable arrangement is employable according to the requirements of a particular musician. As viewed in FIGURE 4, and with regard to head H, and counting shafts from the left side of FIGURE 4 and counting the lever mechanisms 37 from the lower side of its lever set 36, the seventh shaft 93 is operatively connected to the third and seventh levers 50, the eighth shaft 93 to the fourth lever 50, the ninth shaft 93 to the second and fifth levers 50, and the tenth shaft 93 to the third lever 50. With regard to head H, the first shaft 93 is operatively connected to the fifth lever 50, the second shaft 93 to the fourth lever 50, the third shaft 93 to the third lever 50, the fourth shaft 93 to the sixth lever 65, the fifth shaft 93 to the sixth lever 65, and the sixth shaft 93 to the sixth and seventh levers 50.

The sixth lever 65 of the head H', to which two connectors 118' are connected, is operated by the fourth and fifth shafts 93 which are operated by the fourth and fifth pedals 101. The stops 102 connected to the fourth and fifth shafts 93 can be regulated so that the fourth and fifth shafts 93 pivot through two different angles so that the tension on the related string 38 can be changed in a stepwise manner. For example, the stop 102 on the fourth shaft 93 can be set so that its related string 38 is decreased in pitch by one-half tone when the fourth pedal 101 is depressed and the stop 102 on the fifth shaft 93 can be set so that its related string 38 is decreased in pitch by one full tone when the fifth pedal 101 is depressed. Thus, the player can rock his foot back and forth between the fourth and fifth pedals to correspondingly change the tension on the related string one-half tone, or the fourth pedal can be operated alone to lower the pitch of the string one-half tone, or the fifth pedal 101 can be operated alone to lower the pitch of that string by a full tone. Such an arrangement is shown in FIGURE 5 for the lever 65. When the connector which is related to the fourth pedal 118' pivots the lever 65 to decrease the string tension and consequently the pitch of the related string 38 by one-half tone, the other connector 118' which is connected to the same lever 65 will move along with the lever 65 because the weight of its related connector 100 and foot pedal 101 will cause the shaft 93 to pivot as the nut 129 follows the lever 65. Thus, when the fifth pedal is depressed there is no lost motion between its related connector 118' and nut 129 and the lever 65. Similarly, two connectors 118 can be connected to the lever 50 to increase the string tension of a particular string 38 in a stepwise manner. A second connector 118 is shown by phantom lines in FIGURE 5. As there is no lost motion and the leverage is sufficient for the purpose, only slight movement of the pedals can bring about the desired change or changes in string tension.

Referring now in particular to FIGURES 9 and 11, one of the connectors 100 is shown in detail. Each connector 100 has telescoping sections 140, 141 and 142. The section 141 can be lapped, and in particular telescoped, relative to the section 140 by sliding it into the section 140, and the section 142 can be lapped, and in particular telescoped, relative to the section 141 by sliding it into the section 141. The sections 140 and 141 are circular tubes, while the section 142 is a circular rod. The lower end of the section 140 is shown to have a sleeve 143 secured to its inside, and the upper end of the section 141 is shown to have a sleeve 144 secured to its outside to prevent the sections 140 and 141 from coming apart; the lower end of the section 141 is shown to have a sleeve 145 secured to its inside, and the upper end of the section 142 is shown to have a sleeve 146 secured to its outside for the same purpose. A clevis 147 has a plug end 148 secured in the upper end of the section 140. A clevis pin 149 passes through arms 150, the clevis 147, and through an internally threaded tube 151. A stem 152, threaded for a considerable portion of its length as indicated at 153, is threadably received by the tube 151. A knurled lock nut 154 is shown to prevent the tube 151 from turning relative to the stem 152 during use. The upper end of the stem 152 has an end 155 which passes straight through the bore 99 in the arm 96.

The lower end of the section 142 has an outwardly extending projection 156 which is shown to take the form of a short circular rod. The projection 156 is shown to fit into an arcuate recess 157 in the underside of the pedal 101. The pedal 101 has an elongated opening 158 shown to take the form of a slot. The projection 156 is shorter than the length and longer than the width of the opening 158, and the projection 156 has a width which is less than the width of the opening 158. To connect with section 142 of the connector 100 to the pedal 101, the projection 156 is passed downwardly through the opening 158 and is turned until the projection 156 is able to seat in the recess 157. As the sections 140 and 141, and 141 and 142 can rotate relative to each other, turning the section 142 or the section 141 to align and then misalign the projection 156 with the opening 158, without changing the setting of the tube 151 relative to the stem 152, is easily accomplished. A projection 159 formed on the section 142 is disposed close to the upper surface of the pedal 101. The projection 159 is wider than the opening 158, at least at the place where the section 142 traverses

the opening 158. When the projection 159 is formed integrally with the section 142 by deforming the section 142 locally, the lower end of the projection 159 is disposed above the upper surface of the pedal 101 only a sufficient distance to permit the projection 156 to be passed through the opening 158 and be positioned in the recess 157. The projection 159 can take any other suitable form such as a clip, a threaded nut or the like. Should the foot of the player slip off the tip end 101' of the pedal 101, the related string 38 will tend to pivot the pedal 101 upwardly in an abrupt manner. The projection 159 will limit the momentary pivotal upward movement of the pedal 101, thus obviating noise and any change of pedal 101 becoming stuck in a raised position.

Each pedal 101 is pivotally mounted to a crossbar generally indicated at 160. Specifically a pivot 161 passes through bores 162 in each of the pedals 101. The crossbar 160 is shown to be channel shaped. Brackets 163 are secured in the crossbar 160 by screws 164. Spacers 165, preferably composed of plastic such as nylon, are received by the pivot 161 and occupy the spaces, with slight clearance, between the sides of adjacent pedals 101, and between a pedal 101 and its adjacent bracket 163.

Near each end of the crossbar 160 there are cutouts 166, the bottom of each of which has about the same radius of curvature as the section 27 of leg 25 which it receives. The cutouts 166 are formed in both the upper and lower flanges 160' and 160'' of the crossbar 160. A bracket 167, similar in construction to the brackets 163, near each end of the crossbar 160 mounts quick acting locking and unlocking device 168. FIGURE 15 shows one of the devices 168 in detail. Each device 168 includes a body 169 having closed ends 170 and 171. The body 169 has an external shoulder 172 which abuts against one side of the bracket 167 and a C-ring 173. The portion of the body 169 beyond the shoulder 172 is reduced and passes through a bore 174 in the bracket 167. A plunger 175 is slidably mounted in bores 176 and 177 in respective ends 170 and 171, and can fit through and move into and out of a bore 178 in the section 27 of the related leg 25. Secured to the plunger 175, between ends 170 and 171, are C-rings 179 and 180. A compression spring 181 bears against the end 171 and the C-ring 179 urges the plunger 175 outwardly into the position shown in FIGURE 15. The plunger 175 is provided with a head 182 by which the plunger can be quickly withdrawn from the bore 178 in the section 27 of the leg 25. The C-ring 180 limits the movement of the plunger upon contact with the end 171.

To connect the crossbar 160 to the sections 27 of the front legs 25, the cutouts 166 are aligned with those sections 27, and the outer surface of each section 27 will, by camming action, cause the plungers 175 to be depressed against the action of the springs 181, and when the plungers 175 reach the bores 178 of their related legs, they will slide into those bores. Alternately, the head 182 can be pulled and when the bore 178 has been found, the head 182 can be released so that the plunger 175 will slide into the bore 178. To release the plunger 175 from the bore 178, the head 182 is simply pulled and moved a sufficient distance.

The bore 178 in the front legs 25 can be easily brought into alignment by loosening the chucks 25' of the front legs 25 and rotating the section 27 of the leg 25. The chucks 25' can then be tightened to hold the sections 26 and 27 of each leg securely together.

When it is desired to change the tension of one or more of the strings 38, one or more of the related foot pedals can be depressed. Depression of a foot pedal 101 will cause a force to be exerted on its related connector 100 to pivot its related arm 96. All the pedals 101 can be placed at the same height, and are preferably pitched downwardly as best shown in FIGURE 9, by turning the tubes 151 relative to the stems 152 to change the effective length of connectors 100. Downward pulling action of a connector 100 will rotate the arm 96 and its shaft 93 and the arms 109 will also be rotated, until the end of the screw 105 of the stop 102 is brought into abutment with the strip of sound deadening material 106. Assuming one of the connectors 118 is connected to one of the levers 50, rotation of that shaft 93 will cause pivoting of that lever 50 (clockwise as is viewed in FIGURE 5) in one direction until the stop 102 becomes effective. That lever 50 will lose contact with the sound deadening material 71 at the end of its related regulating screw 70. Assuming that a shaft 93 is operatively connected by one of its arms 109 and a connector 118' to one of the levers 65, that lever 65 can be pivoted away from its stop 80 (clockwise as viewed in FIGURE 5) until the end of the regulating screw 75 abuts the sound deadening material 78. The moment exerted by the string 38 on the related lever will pivot that lever 50 (counterclockwise as viewed in FIGURE 5) in the opposite direction to decrease the string tension. When the lever 50 pivots in that opposite direction, its arm 51 follows the regulating screw 70. As the lever 50 pivots in that opposite direction the lever 50 pulls on the connector 118 and pivots its rotated shaft 93 in a direction which is opposite to its direction of pivot when a foot pedal 101 is depressed. Consequently, its related foot pedal 101 is raised a slight amount. That pedal which has been raised by the action of the lever 50 can also be depressed, if desired. If the pedal 101 which has been depressed is adjacent the pedal 101 which has been raised, the foot can be rocked to depress the raised pedal, thus pivoting the lever 50 from the position in which there is decreased tension on the string 38 and through its rest position until its stop 102 becomes effective. Thus, the string tension on that string can be changed in a stepwise manner by rocking the foot. If the raised pedal is not adjacent to the depressed pedal, two feet are required to achieve the same result.

When it is desired to store the instrument 20, it may first be turned up-side-down. The sections 142 of the connectors 100 can be turned and the projections 156 can be passed through the openings 158. The connectors 100 can then be telescoped and swung about their clevis pins 149, so that the connectors 100 lie in compart relationship to the frame 22. One such telescoped connector 100 is shown in FIGURE 14. The projections 156, of each of the telescoped connectors 100 are placed against the edge of the lower leg of the angle shaped member 22. When all the connectors 100 are thus positioned, a rod 185 can be hooked around over an inclined pin 186'. The rod 185 can be covered with rubber or plastic tubing for example to prevent the sections 142 from being marred. The rod 185 is pivotally mounted by an eye-bolt 186 secured to the side 34. The top 32, the sides 34 and the support for the fret marker strip 188 can be constructed of wood, preferably hardwood. As the ends 155 of the connectors 100 form closed loops, the ends 155 cannot accidentally become disconnected from arms 96. The crossbar 160 can be removed from the front legs 25 by merely pulling in the heads 182 of the locking devices 168 and by moving the sections 27 out of the cutouts 166. The legs 25 can then be unthreaded from the mounting members 24 and removed. The entire underside of the top 32 is preferably covered with sound deadening material such as felt 32'.

Each head H and H' is shown to be provided with an electromagnetic pickup 187 and a graduated fret marker strip 188, forming no part of the invention; but the invention described above and shown in the accompanying drawings is equally applicable to an instrument having a sound box.

Various modifications and embodiments will suggest themselves to those skilled in the art.

What is claimed is:

1. In a stringed musical instrument: a first pivotally mounted lever connectable to a string, said first lever

being pivotal in one direction from a rest position to increase the tension on the string and being pivotal in the opposite direction from the rest position to decrease the tension on the string, a second pivotally mounted lever pivotal in one direction from a rest position, a regulatable stop operatively connecting said first and second levers, said stop being constructed and arranged to enable relative movement between said first and second levers, said first lever being pivotal in its one direction away from said stop to increase the tension on the string, said second lever being pivotal away from its rest position to pivot said first lever in its opposite direction to decrease the tension on the string, a stop for establishing the rest position of said second lever, and a regulatable stop co-operating with said second lever for limiting the pivotal movement of said second lever away from its rest position.

2. In a stringed musical instrument, a rigid mounting frame, first and second pivots mounted in substantially parallel relationship in said mounting frame, and a plurality of sets of levers, each set of levers having a first lever having a first lever connectable with a string and pivotally mounted on said first pivot, said first lever being pivotal in one direction from a rest position to increase the tension on the string and being pivotal in the opposite direction from the rest position to decrease the tension on the string, a second lever pivotally mounted on said second pivot and pivotal in one direction from a rest position, a first regulating screw for operatively connecting said first and second levers, a second regulating screw for limiting the amount of pivotal movement of said second lever away from its rest position, stop means for establishing the rest position of said second lever, and means for urging said second lever into contact with said stop means, said first regulating screw being constructed and arranged for enabling said first lever to be pivoted in its one direction and for causing said first lever to be pivoted in its opposite direction when said second lever is pivoted away from its rest position.

3. In a stringed musical instrument: a first pivotally mounted lever connectable to a string, said first lever being pivotal in one direction from a rest position to increase the tension on the string and being pivotal in the opposite direction from the rest position to decrease the tension on the string, a second pivotally mounted lever pivotal in one direction from a rest position, means for urging said second lever towards its rest position, means operatively connecting said first and second levers for regulating the rest position of said first lever so that the string is placed under a preselected amount of tension and for enabling relative movement between said first and second levers, and means co-operating with said second lever for regulating the amount of pivotal movement of said second lever away from its rest position.

4. In a stringed musical instrument: a pivotally mounted lever for changing the tension on a string, said lever having a bridge portion for the string, said lever having an outwardly facing wall, two spaced apart cantilever projections extending outwardly beyond said wall, a gradual outwardly and downwardly inclined groove extending from said bridge portion to said wall and defining the space between said cantilever projections, the surfaces of said cantilever projections and said wall forming an intersection, the outward distance from said bridge portion to said intersection being substantially greater than the downward distance from said bridge portion to said intersection, said groove being adapted to receive a string, the string being connected to a fastener which exerts a force against said cantilever projections and against said wall when the string is under tension, an outwardly extending arm disposed below said cantilever projections, and a downwardly extending arm; means engageable with said outwardly extending arm for changing the tension on the string, and means engageable with said downwardly extending arm for changing the tension on the string.

5. In a stringed musical instrument: a first pivotally mounted lever connectable to a string and having a first arm and a second arm, means operatively connected to said first arm for pivoting said first lever in one direction from a rest position against the moment exerted by the string to effect increased string tension, a second pivotally mounted lever, a stop operatively connecting said second arm and said second lever to define a rest position for said first lever, means for moving said second lever for enabling the string to pivot said first lever in the opposite direction from the rest position to effect decreased string tension, said stop having means for regulating the rest position of said first lever, and stop means for limiting the pivotal movement of said second lever.

6. In a stringed musical instrument: a plurality of sets of lever means for selectively increasing and decreasing tension on their related strings, each set of lever means including a first pivotally mounted lever connectable to a string and being pivotal in one direction from a rest position to increase the tension on the string and being pivotal in the opposite direction from the rest position to decrease the tension on the string, a second pivotally mounted lever operatively connected to said first lever for decreasing the tension of the string and for enabling said first lever to be returned to its rest position, a first aperture in one of said first levers, a second aperture in one of said second levers, a substantially rigid first rod passing through said first aperture and being dimensioned to provide a loose fit in said first aperture so that said first rod can fit into said first aperture at different angles and said first lever can pivot relative to said first rod, a substantially rigid second rod passing through said second aperture and being dimensioned to provide a loose fit in said second aperture so that said second rod can fit into said second aperture at different angles and said second lever can pivot relative to said second rod, means on said first rod engageable with said first lever for pivoting said first lever when said first rod is moved to increase the tension on the string, and means on said second rod for pivoting said second lever and consequently said first lever when said second rod is moved to decrease the tension on the string.

7. In a stringed musical instrument: lever means for changing the tension on a string including a lever mounted for pivotal movement, an aperture in said lever, a substantially rigid rod passing through said aperture and being dimensioned to provide a loose fit in said aperture so that said rod can fit into said aperture at different angles and so that said lever can pivot relative to said rod, means on said rod engageable with an end face of said lever for pivoting said lever when said rod is operated, and sound deadening material between said rod and said aperture.

8. In a stringed musical instrument: lever means for changing the tension on a string including a lever mounted for pivotal movement, an aperture in said lever, a substantially rigid rod passing through said aperture and being dimensioned to provide a loose fit in said aperture so that said rod can fit into said aperture at different angles and so that said lever can pivot relative to said rod, and means on said rod engageable with said lever for pivoting said lever when said rod is operated.

9. In a stringed musical instrument: first means connectable with a first string for changing the tension on a first string, second means connectable with a second string for changing the tension on the second string, a pivotally mounted shaft, means for pivoting said shaft including a manually operated member, arm means on said shaft, means for enabling said arm means to be disposed at different positions along said shaft, and a connector pivotally connected to said arm means and selectively connectable to one of said first and second string tension changing means.

10. In a stringed musical instrument: first means con-

nectable with a first string for changing the tension on the first string, second means connectable with a second string for changing the tension on the second string, a pivotally mounted shaft, means for pivoting said shaft including a manually operated member, an arm shiftable along said shaft, means for preventing rotation of said arm relative to said shaft, means for frictionally holding said arm in position along said shaft, and means operatively connected to said arm and selectively connectable to one of said first and second string tension changing means for effecting change of string tension on a selected one of the first and second strings when said manually operated member is operated.

11. In a stringed musical instrument: first means connectable with a first string for changing the tension on the first string, second means connectable with a second string for changing the tension on the second string, pivotally mounted means providing operative connection at selected positions along its length, means for operating said pivotally mounted means including a foot-operated pedal, and means operatively connectable to said pivotally mounted means at a selected position along its length and selectively connectable to one of said first and second string tension changing means for effecting change of string tension on a selected one of said first and second strings when said foot-operated pedal is operated.

12. In a stringed musical instrument: first means connectable with a first string for changing the tension on the first string, second means connectable with a second string for changing the tension on a second string, a pivotally mounted shaft, means for pivoting said shaft including a manually operated member, means for regulating the amount of pivotal movement of said shaft, an arm shiftable along said shaft, means for preventing rotation of said arm relative to said shaft, and means operatively connected to said arm and selectively connectable to one of said first and second string tension changing means for effecting change of string tension on a selected one of said first and second strings when said manually operated member is operated.

13. In a stringed musical instrument: a rigid longitudinally extending frame, means mounted to said frame and connectable to a string for changing the tension on the string at least twice, at least two transversely extending spaced apart shafts pivotally mounted in said frame, means for pivoting one of said shafts including a manually operated member, means for pivoting another of said shafts including another manually operated member, an arm on each of said shafts, substantially rigid longitudinally extending rod means operatively connecting one of said arms to said tension changing means for effecting change of string tension on the string when said one manually operated member is operated, and substantially rigid longitudinally extending rod means operatively connecting another of said arms to said tension changing means for effecting change of string tension when the other manually operated member is operated.

14. In a stringed musical instrument: a first pivotally mounted lever connectable to a string, a second pivotally mounted lever pivotal in one direction from a rest position, said first lever being pivotal in one direction from a rest position to increase the tension on the string and being pivotal in the opposite direction from the rest position by said second lever to decrease the tension on the string, at least two pivotally mounted shafts, separate means for operating each shaft including a foot-operated pedal, an arm on each of said shafts, means operatively connecting said arm on one of said shafts to said one lever, and means operatively connecting said arm on another of said shafts to said second lever.

15. In a stringed musical instrument: a plurality of string tension changing means for selectively increasing and decreasing the tension on strings, a plurality of shafts, separate means for operating said shafts including a foot-operated pedal, at least one shiftable arm on each of said shafts, means connecting each arm to its related shaft for preventing relative rotation, means connected at one end to one of said arms and selectively connectable to one of said string tension means for increasing the tension on a string and means connected to another of said arms and selectively connectable to another one of said string tension changing means for decreasing the tension on another string.

16. In a stringed musical instrument: a plurality of string tension changing means each of which is connectable to a string, a plurality of pivotally mounted shafts, separate means for pivoting each of said shafts; each pivoting means including an arm secured to its related shaft, a pivotally mounted foot-operated pedal, and a connector connected at its upper end to said arm and at its lower end to said foot-operated pedal; and means connected to said shafts and selectively connectable to said string tension changing means for operating selected ones of said string tension changing means.

17. In a stringed musical instrument: at least two separate means connectable to at least two separate strings for changing the tension on their respective strings, at least two spaced apart pivotally mounted shafts, at least one of said string tension changing means having a place of connection above one of said shafts, separate means for pivoting each of said shafts including a foot-operated pedal, an arm on each of said shafts, means operatively connecting said arm of one of said shafts to one of said string tension changing means, and means operatively connecting said arm of another of said shafts to another of said string tension changing means, said one shaft which is closer to said place of connection being disposed above the level of said other shaft to obviate interference with said connecting means.

18. In a stringed musical instrument: a plurality of sets of lever means, each lever means including first and second pivotally mounted levers operable respectively to increase and decrease tension of a related string, a plurality of pivotally mounted shafts, arm means for each shaft, means for enabling each arm means to be positioned at different positions along its shaft, and means connectable to said arm means of said shafts and selectively connectable to selected first and second levers of said sets of lever means for effecting increase and decrease of the tension on their related strings.

19. In a stringed musical instrument: a longitudinally extending frame, means mounted to one marginal end of said frame and connected to a string for changing the tension on that string, a first pivotally mounted shaft operated by a first foot pedal, a second pivotally mounted shaft operated by a second foot pedal, said first and second shafts being longitudinally spaced and extending transversely of said frame, said first and second foot pedals being adjacent, and means operatively connected to said first and second shafts and said string tension changing means for effecting change of tension on that string in a stepwise manner when said first pedal and thereafter said second pedal are operated.

20. In a stringed musical instrument: a plurality of sets of string tension changing means each of which is operable to selectively increase and decrease tension on a string, each of said string tension changing means having a first lever and a co-operating second lever, a pivotally mounted shaft, means for pivoting said shaft including a manually operated member, connectors operatively connecting said shaft to a first lever of one set and to a second lever of another set, the length of said connector from the operative connection to said shaft to the operative connection to said first lever being less than the length of said connector from the operative connection to said shaft to the operative connection to said second lever, said longer connector having two sections, one of which is approximately equal in length to the length of the shorter connector.

21. In a stringed musical instrument: means for changing the tension on a string including a foot-operated pedal mounted for pivotal movement, an opening in said pedal, an upwardly extending rod passing through said opening, a projection on said rod engageable with the underside of said pedal for supporting said pedal, and a projection integral with said rod above said pedal for preventing excess upward movement of said pedal away from said projection with which the underside of said pedal is engageable.

22. In a stringed musical instrument: a frame, means mounted to said frame for changing the tension on a string, means for operating said tension changing means including a movably mounted foot-operated pedal and pedal-operated connector means extending upwardly from and removably connected to said pedal, said connector means having telescoping sections, means for enabling said connector means to be swung at its upper marginal end into compact relationship with said frame when said connector means has been disconnected from said pedal and said sections have been telescoped, and means for adjusting the effective length of said connector means.

23. In a stringed musical instrument: a frame, means mounted to said frame for changing the tension on a string, means for operating said tension changing means including a movably mounted foot-operated pedal and pedal-operated connector means extending upwardly from and removably connected to said pedal, substantially the entire length of said connector means comprising substantially rigid telescoping sliding sections, means for enabling said sections to be quickly moved relative to each other into telescoped relationship, and means for enabling said connector means to be swung at its upper marginal end into compact relationship with said frame when said connector means has been disconnected from said pedal and said connector means has been telescoped.

24. In a stringed musical instrument: a frame, means mounted to said frame for changing the tension on a string, means for operating said tension changing means including a movably mounted foot-operated pedal and pedal-operated connector means extending upwardly from and removably connected to said pedal, said connector means having substantially rigid telescoping sections, means for enabling said sections to slide telescopically relative to each other into lapped relationship, and means for enabling said connector means to be swung at its upper marginal end into compact relationship with said frame when said connector means has been disconnected from said pedal and said connector means has been lapped, and means for holding said lapped connector means in compact relationship to said frame.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,435,722 April 1, 19

Kenneth V. Paul et al.

It is certified that error appears in the above identified patent and that said Letters Patent are hereby corrected as shown below:

Column 5, line 61, "H" should read -- H' --. Column 9, line 18, "frame," should read -- frame: --; line 22, cancel "having a first lever".

Signed and sealed this 14th day of April 1970.

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER, J
Commissioner of Patent