Nov. 28, 1950 H. HISE ET AL 2,531,569

MULTIPLE ADJUSTMENT FOR STRINGED MUSICAL INSTRUMENTS

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Fig. 1

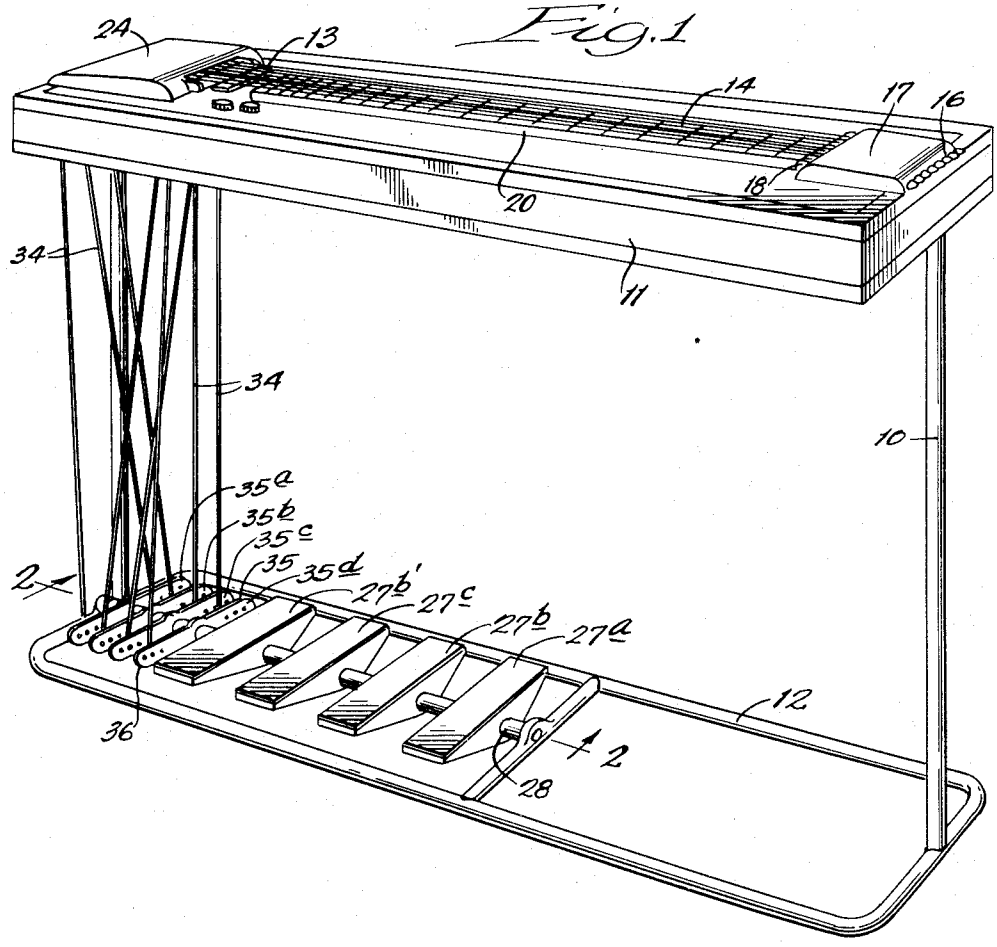
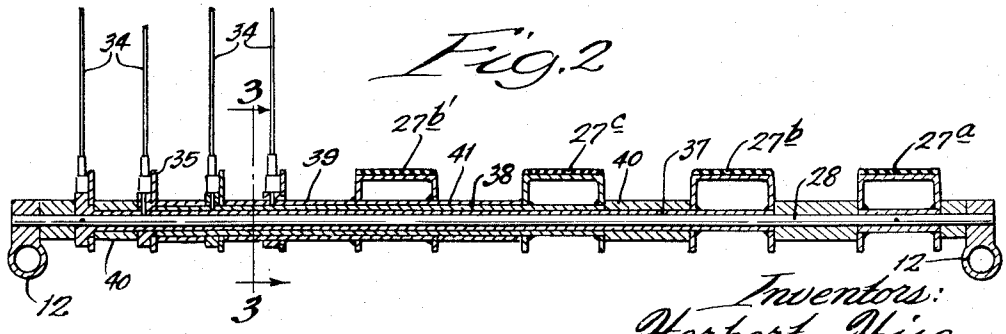


Fig. 2



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Fig. 3

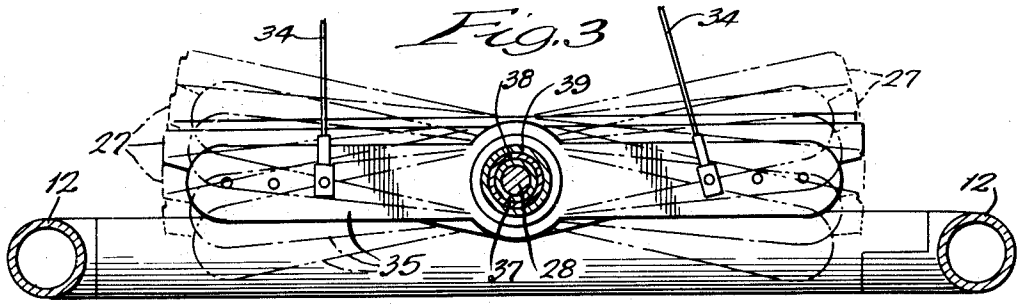


Fig. 4

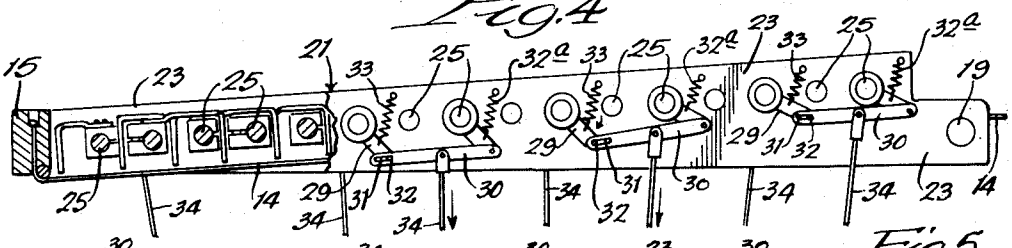
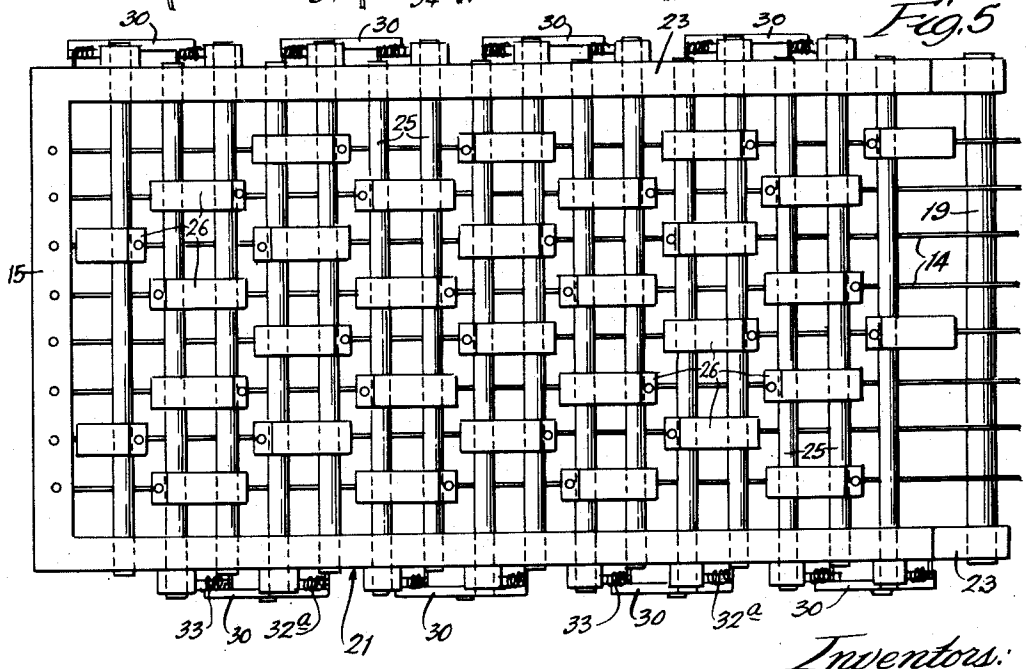


Fig. 5



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MULTIPLE ADJUSTMENT FOR STRINGED MUSICAL INSTRUMENTS

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Fig. 6

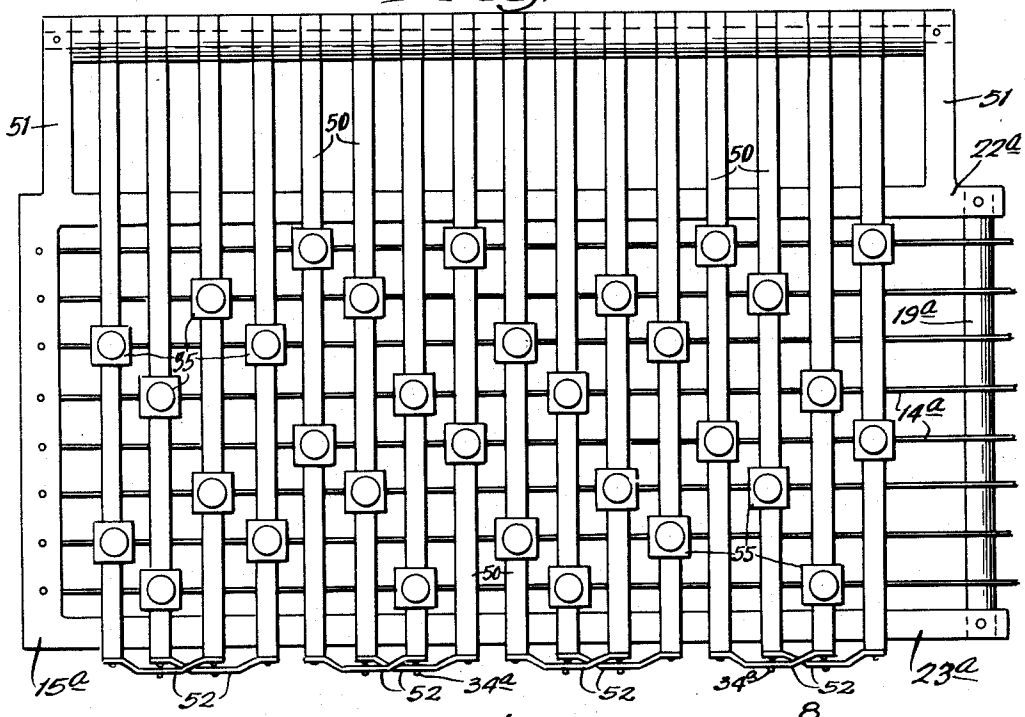


Fig. 7

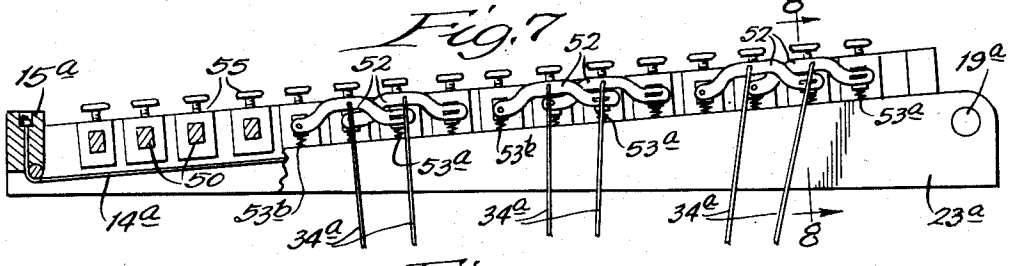


Fig. 8

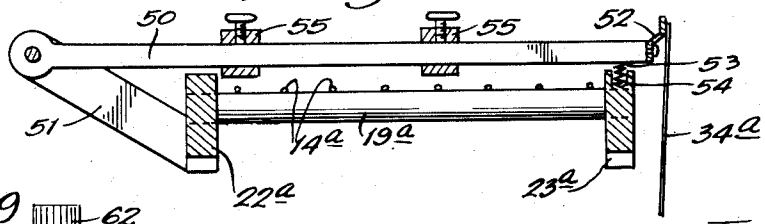
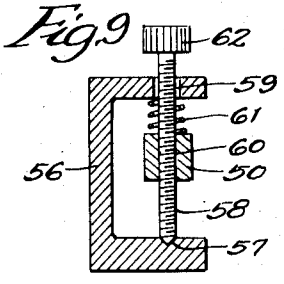


Fig. 9



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UNITED STATES PATENT OFFICE

2,531,569

MULTIPLE ADJUSTMENT FOR STRINGED MUSICAL INSTRUMENTS

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Application May 11, 1948, Serial No. 26,344

15 Claims. (Cl. 84—297)

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This invention relates to musical instruments and especially stringed musical instruments of the guitar type adapted to be played with a steel movable along the strings to change their effective length.

More particularly, invention resides in improvements in stringed musical instruments of the type described in our United States Patent No. 2,467,086, dated April 12, 1949. The described instrument is of the guitar type employing electrical amplification and which is played by plucking or strumming the tensioned strings adjacent one of the bridge members as the steel is longitudinally shifted to change the effective length of the strings. By changing the tension of one or more of the strings singly or in combination, the musical chord of the instrument may be varied; that is, it may be changed from a major chord to a minor chord, a seventh chord, an augmented chord, or other desired chord tuning. As described in the pending application, changes in tension in one or a group of the strings may be effected by string-engaging fingers secured to rotatable shafts, and in order to secure a wide range of chords without stopping to retune the instrument, a large number of string-engaging units is provided. Since each unit is operated by a separate foot pedal, it will be evident that as the range of the instrument is broadened, complexity of construction and playing of the instrument is proportionately increased.

It is an object of this invention to simplify the construction of a stringed musical instrument to provide a wide range of chord adjustments while playing without unduly complicating the instrument or the playing thereof.

Another object is to provide a stringed musical instrument in which a plurality of stringed tension adjustments may be effected from a single foot pedal thereby to enable a great number of chord changes to be easily and simply secured with a minimum of effort on the part of the player.

A further object is to provide an arrangement whereby relatively few foot-operating pedals are connected by lever and link means to operating fingers adapted selectively to vary the tension of the strings whereby a large number of chords are selectively secured while playing greatly to increase the range and versatility of the instrument in an effective and efficient manner.

A still further object resides in the construction of the operating fingers whereby adjustments thereof can be made independently of each other and the actuating means.

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These and other objects and advantages of the invention will hereinafter appear, and for purposes of illustration, but not of limitation, embodiments are shown in the accompanying drawing, in which

Figure 1 is a perspective view showing a console model of a stringed musical instrument of the guitar type embodying features of this invention;

Figure 2 is a sectional view taken along the line 2—2 of Fig. 1;

Figure 3 is a sectional view taken substantially along the line 3—3 of Fig. 2;

Figure 4 is a side elevational view with parts broken away to illustrate the arrangement of elements in the string tensioning mechanism;

Figure 5 is a top plan view of the string tensioning mechanism;

Figure 6 is a top view of a modified form of string tensioning mechanism;

Figure 7 is a side elevation partially in section of the operating parts in the tensioning mechanism of Fig. 6;

Figure 8 is a sectional view taken along the line 8—8 of Fig. 7; and

Figure 9 is a sectional elevational view of the string engaging element shown in Figure 8.

Briefly described, the present invention relates to a tuning instrumentality for stringed musical instruments of the guitar type. The tuning instrumentality is pedal operated by the performer while playing to increase or decrease the tension of one or a group of strings thereby to alter the tone of those strings and vary the chord of the instrument. A wide range of chords may be secured when means are provided for altering the tensioning of various combinations of strings, and such chord changes can be effected without stopping manually to alter the tuning by string readjustment at the tuning posts. In order to secure a wide range of chords without unduly complicating the instrument, new and novel arrangements are provided whereby a number of chord changes can be effected from a single foot pedal.

The illustrated embodiment of the invention, shown in Figs. 1 to 5 inclusive, is drawn to a stringed musical instrument of the console style wherein a pair of uprights 10 carry a rectangular box-like support 11 in spaced relation with a base 12 which is adapted to rest on the floor.

The support 11, which is hollow to provide a resonant chamber, may be formed with an opening 13 across which strings 14, tensionally arranged in parallel relation, extend to enable the resonant chamber to be fully effective. The

strings 14 are secured at their opposite ends to a connecting bar 15 and to tuning posts 16 mounted on the end of a casing 17. The tension of the strings 14 is initially adjusted at the tuning posts. The strings are held in spaced relation with the support throughout the major portion of their intermediate length by a pair of bridge members 18 and 19, the latter of which forms a part of the instrumentality by which the tension of the strings is varied while playing. When desired, a fretboard 20 may underlie the strings throughout a portion of their length.

The instrumentality for varying the tension of the strings while the performer is playing includes a mounting bracket 21 having spaced side walls 22 and 23 and a cover plate 24. The bridge member 19 connects the side walls at the front of the bracket and, intermediate the bridge member and connecting bar 15 to which the ends of the strings are attached, a plurality of shafts 25 are rotatably mounted between the side walls. Each shaft, sixteen of which are shown in the illustrated embodiment, is provided with one or more longitudinally extending, substantially horizontal fingers 26 which are axially adjustable on the corresponding shaft 25 to enable engagement with selected strings or combinations of strings 14. It will be evident that responsive to rotational movement of one or more of the shafts 25 in one direction or the other, the tension of the strings engaged by the respective finger members 26 will be varied. However, when the shafts are arranged positively to be actuated for rotational movement in one direction from their normal position of adjustment, as illustrated, it is desirable to arrange the finger members to extend from corresponding shafts in opposite directions thereby to enable some fingers to decrease string tension when one group of shafts is operated and to increase string tension when shafts having fingers extending in the opposite direction are actuated. In this manner, a large number of adjustments can be effected greatly to amplify the range of chords of the instrument while the performer is playing.

String tension, as varied by the rotational movement of shafts 25, is controlled by foot pedals 27 supported for rocking movement at floor level on a horizontally disposed shaft 28 journalled at its ends to the base 12. A feature of this invention resides in the operative connections whereby a plurality of the shafts 25 are controlled from a single foot pedal thereby greatly to simplify the construction and operation of the instrument. In the illustrated embodiment, each foot pedal 27 is operatively connected to four shafts so that the four foot pedals shown can be used to effect sixteen chord changes while the performer is playing.

Each shaft is provided on one of its ends with a downwardly inclined lever 29 lying adjacent the outer surface of one or another of the side plates 22 and 23. Adjacent pairs of levers 29, which may be secured, as shown, to alternate shafts 25, are pivoted at their ends to opposite ends of a horizontally disposed link or equalizer bar 30. Each link 30 has an elongate slot 31 at one end slidably to receive a stud 32 secured to the end of the levers 29 in the connected pair. Rocking movement of the levers between a normally raised position and a lowered position of adjustment, as regulated by suitable stops, is enabled, each lever being urged to its raised or normal position of adjustment by coil springs 32*a* and 33 secured at one end to the bracket 21 and anchored at the other end to an intermediate portion of the corresponding lever. The springs are of different weight; for example, spring 32*a* is of greater weight than spring 33 so that, responsive to downward forces on the equalizer bar 30, the tendency is to rock first one lever and then the other to its lower position of adjustment. Such separate movements are permitted by the coacting slot 31 and stud 32 associated with the lever having the lighter spring 33. Thus, each equalizer bar 30 is able to control two shafts 25.

A pair of equalizer bars or links 30 is connected to opposite ends of a rocker arm 35 by separate connecting rods or wires 34 pivoted at one end to an intermediate portion of the respective link and at their other ends to opposite end portions of the rocker arm 35. The end portion of each rocker arm is provided with a plurality of openings to enable adjustment of the connecting rods.

As shown in Fig. 2, the central shaft 28 operatively connects the foot pedal 27*a* with the rocker arm 35*a*. A concentric sleeve 37, freely rotatable on the shaft 28, operatively connects the next adjacent pedal 27*b* with the rocker arm 35*b*, and corresponding concentric sleeves 38 and 39 operatively connect pedals 27*c* and 27*d* with rocker arms 35*c* and 35*d* respectively. The arms and pedals are separated one from the other next adjacent by suitable spacers or sleeve extensions 40, 41 and the like.

Rocking movement of each foot pedal 27, responsive to heel and toe actuation, is directly imparted to the corresponding rocker arm 35 connected therewith. Thus, each rocker arm may be actuated between the extremes shown in Fig 3. Assuming that position 0 corresponds to the normal position of the rocker arm, it may be rocked to position 1 and position 2 below 0, in which instance, the connecting rod to the right in Fig. 3 will be effective for actuating the equalizer bar in a manner to rock first one lever and then the other to lowered position. Since the point at which the second spring 32*a* becomes tensioned can be definitely felt by the increased pressure required to so tension the spring, a clear demarcation exists, which indicates when position 1 has been reached, thereby to give two adjustments.

When the rocker arm 35 is actuated in the opposite direction to positions 1 or 2 above 0, the connecting rod to the left in Fig. 3 is rendered operative separately to adjust two other shafts 25. Thus, four separate adjustments are secured from each foot pedal, and more may be effected in a like manner by proper arrangement of parts.

Describing the actions more explicitly, responsive to the differences in spring forces constantly urging the pair of connected levers 29 toward their normal raised position, the lever having the lower weight spring and slidable at one end in the slot 31 is the first to respond to the initial downward displacement of the equalizer bar or link 30. In so responding, it is rocked to its lower position of adjustment, the stud 32 on the end of the lever shifting toward the opposite ends of the slot 31 while the link 30 is rocked, during such movement, about the end of the other connected lever 29. This relation, wherein one of the levers is rocked toward its lower position of adjustment while the other remains in its original or raised position of adjustment responsive to the initial actuation of the corresponding foot pedal 27, is shown by the pair of levers which is second from the right in Fig.

4. When this relationship exists, the rocker arm 35 is in position 1 in Fig. 3.

Further movement of the pedal 27 in the same direction directs additional forces to the link 30, which forces are sufficient to overcome both of the springs 32a and 33, whereupon the other lever 29 is rocked to its lower position of adjustment, as illustrated by the third set of levers in Fig. 4, and the rocker arm is in position 2 in Fig. 3. When this occurs, the free end of the first lever slides in the slot 31 to its original position of adjustment while the link 30 rocks thereabout as its pivot. As the foot pedal is released, the coil springs 32a and 33 operate to return the connected parts to their normal position of adjustment and, at the same time, return the foot pedal 27 to its original position of adjustment or 0 position. The differences in forces required to actuate the first and then the second lever toward the lower position of adjustment can be readily felt by the performer clearly to indicate when the first shaft has been rocked to its adjusted position and when the second shaft is rendered operative. As a result, it will be apparent that two chord adjustments may be effected by actuation of a single foot pedal in one direction and that two additional adjustments can similiarly be effected by actuation of the same foot pedal in the opposite direction. Thus, by the use of but four foot pedals, sixteen chord changes can be made by the performer while playing.

Figs. 6 to 9 inclusive illustrate a modified form of instrumentality for varying the string tension responsive to actuation by the foot pedals. In this form, instead of mounting the shafts 25 for rotational movement between the side walls 22 and 23 of the mounting bracket or frame 21, the corresponding shafts 50 are positioned above the frame for rocking movement in the vertical plane in the direction toward and away from the frame 21a, and the strings 14a are tensioned between the anchor bar 15a and the bridge 19a. One end of each shaft in the form of a bar is provided at one end to an inclined arm 51 rigid with a side wall 22a of the frame and extending outwardly therefrom. Link members 52 pivoted to the other free ends of the bars connect selected pairs thereof, such as alternate pairs, as described in connection with the link 30 of the previously-described modification, the link members being connected at their center to corresponding wires or rods 34a which lead to the foot-actuated members. The free ends of the bars are resiliently held in their upper position of adjustment by spring members 53 seated in corresponding sockets 54 formed in the side arm 23a of the frame to bear against the underside of the corresponding arm.

By arranging the spring members 53 so that a lighter spring 53a operates to tension one arm to its outer position of adjustment and a heavier spring member 53b operates to tension the other arm connected to the first by the link member 52, the desired order of arm actuation is effected. In other words, responsive to actuation of the connecting rod 34a, first the arm associated with the lighter spring member is actuated to its lowered position of adjustment, and on further movement of the link responsive to foot pedal operation, the heavier spring is flexed and the other arm is actuated to its lowered position of adjustment.

Another feature of this invention resides in the construction of the operating fingers 55, one or more of which are laterally adjustable on each

arm selectively to engage certain strings 14a as the arm or arms are actuated. As shown, each operating finger comprises a vertically disposed U-shaped member 56 having a recess in its lower wall 57 to receive the end of an adjusting screw 58 which is slidable through an opening through the upper spaced wall 59 of the U-shaped member. The threaded portion of the adjusting screw is operative in a threaded aperture 60 extending vertically through the corresponding bar 50. A coil spring 61 concentrically arranged about the adjusting screw between the bar 50 and the upper wall of the U-shaped member constantly urges the U-shaped member in the upward direction to effect a full seating relation of the adjusting screw in the recess. The adjusting screw is provided with a knurled knob 62 by which the screw is turned to position the U-shaped member with respect to the supporting bar, thereby adjustably to position the U-shaped member with respect to the string which it is adapted to engage on actuation. By proper adjustment, it is possible to regulate the amount of string tension effected when the corresponding bar is rocked to its lowered position of adjustment.

It will be manifest that the described string tensioning means may be operated to effect multiple adjustments in a successive manner responsive to actuation of a foot pedal or by other means including manual, electrical, or mechanical operation.

While two embodiments of the invention have been shown and described in detail, it will be understood that they are illustrative only and are not intended to be a definition of the scope of the invention, reference being had for this purpose to the appended claims.

What is claimed is:

1. In a stringed musical instrument, means for varying the tension of selected strings to regulate the chord of the instrument, said means comprising a plurality of shafts extending transversely across the strings and movable relative to the strings between operative and inoperative positions of adjustment, means constantly urging said shafts toward their inoperative positions of adjustment, string engaging fingers carried by each of said shafts for tensioning selected strings when said shaft is moved to its operative position of adjustment, actuators for operation by the player of the instrument, and an operative connection between each of said actuators and a plurality of shafts for selectively moving said shafts in predetermined order between their respective operative and inoperative positions of adjustment responsive to the operation of said actuator.

2. In a stringed musical instrument, means for varying the tension of selected strings to regulate the chord of the instrument, said means comprising a plurality of shafts extending transversely across the strings and movable relative to the strings between operative and inoperative positions of adjustment, fingers adjustably carried by said shafts for engaging selected strings when said corresponding shaft is moved to its operative position of adjustment, actuators on the instrument for operation by the player of the instrument, connections between each actuator and said shafts for operating a pair thereof when said actuator is moved in one direction, and separate resilient members constantly urging said shafts toward their inoperative position but with unequal force in each pair of connected shafts whereby first one shaft responds to the

movement of the actuator and then the other responds to the movement of the actuator in either direction.

3. In a stringed musical instrument, means for varying the tension of selected strings to regulate the chord of the instrument, said means comprising a plurality of shafts extending transversely across the strings and movable relative to the strings between operative and inoperative positions of adjustment, fingers adjustably carried by said shafts for engaging selected strings when said corresponding shaft is moved to its operative position of adjustment, actuators on the instrument for operation by the player of the instrument, connections between said actuators and said shafts for operating a pair thereof responsive to the movement of one of said actuators in one direction and for operating another pair of said shafts where the same actuator is moved in the opposite direction, and separate spring members of unequal weight urging each of said shafts in each pair in the direction towards the inoperative position whereby the shafts are shifted in successive order from one position of adjustment to the other responsive to shaft movements.

4. In a stringed musical instrument, means for varying the tension of selected strings to vary the chord of the instrument, said means comprising a plurality of shafts extending transversely across the strings and rotatably mounted for movement between operative and inoperative positions of adjustment, fingers adjustably carried by said shafts for tensioning selected engaged strings when the corresponding shaft is rotated to its operative position of adjustment, actuators for operation by the player of the instrument, operative connections between each actuator and a plurality of said shafts for actuating a group thereof toward operative position when said actuator is shifted in one direction and for actuating another group thereof when shifted in an opposite direction, and springs of unequal strength urging each of said shafts in each group towards their inoperative position whereby their movement is successively responsive to the movement of the corresponding actuator.

5. In a stringed musical instrument, means for varying the tension of selected strings to change the chord of the instrument, said means comprising a plurality of parallelly arranged shafts extending transversely across the strings and rotatably mounted for movement between operative and inoperative positions of adjustment, fingers adjustably carried by each of said shafts for engaging selected strings when the corresponding shaft is in its operative position of adjustment, links connecting pairs of said shafts in a manner to enable their relative turning movement responsive to actuation of said link between two positions of adjustment, resilient members of unequal weight respectively urging said shafts in each connected pair toward inoperative position whereby responsive to link movement the shafts are successively actuated to their respective positions, and means controlled by the operator for adjusting the movements of said links between the two positions of adjustment.

6. In a stringed musical instrument, means for varying the tension of the instrument, said means comprising a plurality of parallelly arranged shafts extending transversely across the strings and rotatably mounted for movement between

operative and inoperative positions of adjustment, fingers adjustably carried by each of said shafts for engaging selected strings when the corresponding shaft is in its operative position of adjustment, levers connected to the ends of the shafts, links pivotally connecting pairs of said levers enabling rocking movement of one lever relative to the other during link movement between two positions of adjustment, springs of unequal weight urging said levers in each pair to position the corresponding shafts in their inoperative position of adjustment, and pedal operating means for controlling the movement of at least two of said links whereby the corresponding shafts are separately operated to the desired position of adjustment.

7. A stringed musical instrument, as claimed in claim 6, in which each link is pivotally connected at one end to the lever associated with the heavier spring and pivotally connected at the other end through a slot in the link to the lever associated with the lighter spring whereby responsive to movement of the link to actuate the shafts toward operative position, first the latter lever and then the former lever is rocked to effect the desired adjustment.

8. A stringed musical instrument, as claimed in claim 6, in which the operating means comprises a rockable foot pedal indirectly connected at one end with one lever and at the other end with another lever whereby said pedal is adapted to operate four shafts.

9. In a stringed musical instrument having a plurality of strings tensioned over spaced bridges positioned intermediate the respectively fastened ends of the strings, means for varying the tension of the strings to adjust the chord of the instrument, said means comprising a plurality of longitudinally spaced rotatable shafts extending transversely across the strings between one of the bridges and the adjacent fastened ends of the strings, fingers on the shafts adjustably arranged to engage certain of the strings to vary their tension as the shafts are turned, levers fixed at one end to the ends of the shafts, links pivoted at one end to the free end of one lever and having a slotted portion in the other end in which another lever is pivotally connected thereby to enable relative turning movement between the connected shafts when the link is shifted between two positions of adjustment, and means for controlling the shifting movements of said links between the two positions of adjustment.

10. In a stringed musical instrument, means for varying the tension of selected strings to change the chord of the instrument while it is being played, said means comprising a plurality of shafts extending transversely across the strings and mounted for rocking movement between operative and inoperative positions of adjustment, fingers adjustably carried by each of said shafts for engaging selected strings when the corresponding shaft is in its operative position of adjustment, links connecting a pair of said shafts in a manner to enable their relative rocking movement between operative and inoperative positions of adjustment, resilient means urging each shaft in said pair to its inoperative position with unequal force whereby responsive to the movement of said link, the shafts are separately rocked to the desired position of adjustment, and actuator means controlled by the player for controlling the movement of said links.

11. In a stringed musical instrument, means for varying the tension of selected strings to change the chord of the instrument while it is being played, said means comprising a plurality of shafts extending transversely across the strings and pivotally connected at one end for rocking movement between operative and inoperative positions of adjustment, fingers adjustably carried by each of said shafts for engaging said strings when the corresponding shaft is rocked to its operative position of adjustment, links connecting pairs of said shafts at their free ends in a manner to enable one to rock with respect to the other, spring means constantly urging said shafts toward inoperative position with unequal force whereby the shafts move in successive order in response to link movement, and means for controlling the movements of said links.

12. A stringed musical instrument, as claimed in claim 11, in which the spring means resiliently urging each of said shafts toward inoperative position comprises a coil spring interposed between the instrument and the free end portion of the corresponding shaft.

13. A stringed musical instrument, as claimed in claim 11, in which the link is slotted in one end portion operatively to connect with the free end portion of the shaft having the spring means exerting the lesser force while the other end is in pivotal engagement with the other shaft of the connected pair.

14. An adjustable finger adapted to be carried on a movable shaft of a stringed musical instrument comprising a rigid block apertured to enable the shaft to extend transversely therethrough, a threaded member operatively engaging the rigid block and threadably engaging said through-extending shaft whereby turning movement of said threaded member enables relative movement of said block substantially perpendicularly to said shaft, and resilient means constantly urging said block vertically relative to said shaft toward the adjusted position.

15. An adjustable finger adapted to be carried by a movable arm of a stringed musical instrument for tensioning the strings upon engagement, said finger comprising a U-shaped member having an aperture through one arm in alignment with a recess in the other arm, a threaded member extending through said aperture and into said recess and threadably engaging the shaft which is adapted to extend transversely between the arms of said U-shaped member when in the assembled relation, and resilient means constantly urging said threaded member fully to seat within said recess.

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