

June 9, 1953

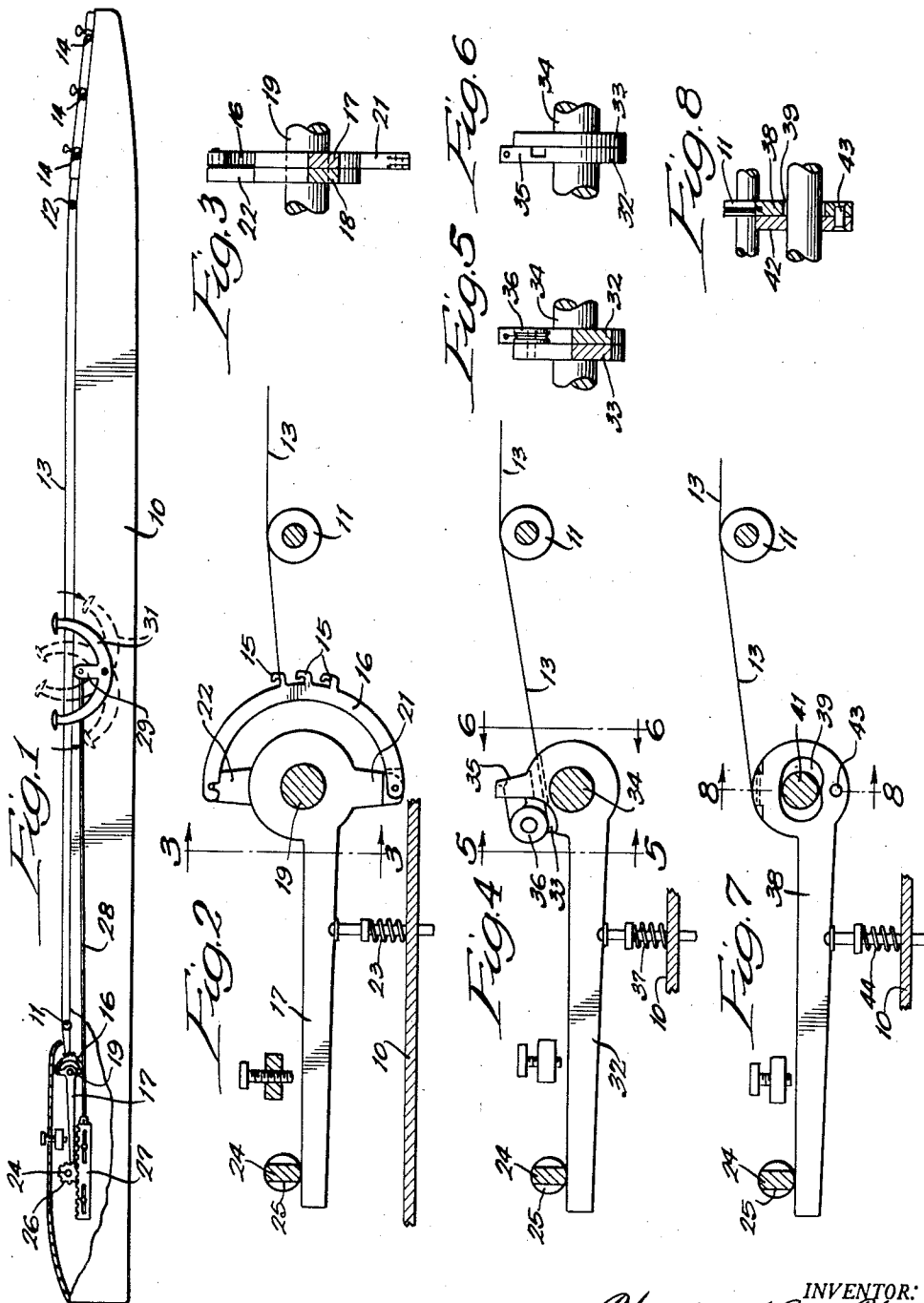
H. M. HISE

2,641,152

STRINGED MUSICAL INSTRUMENT

Filed July 15, 1949

2 Sheets-Sheet 1



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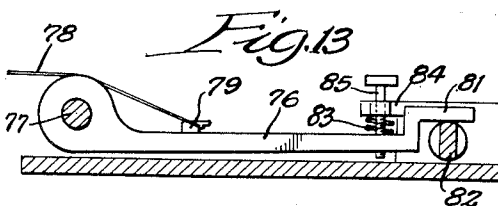
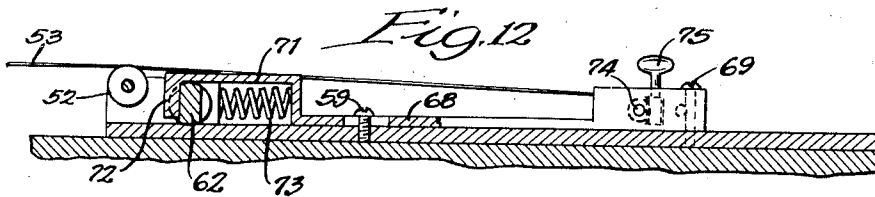
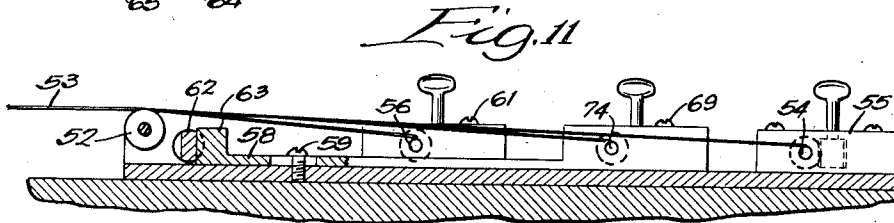
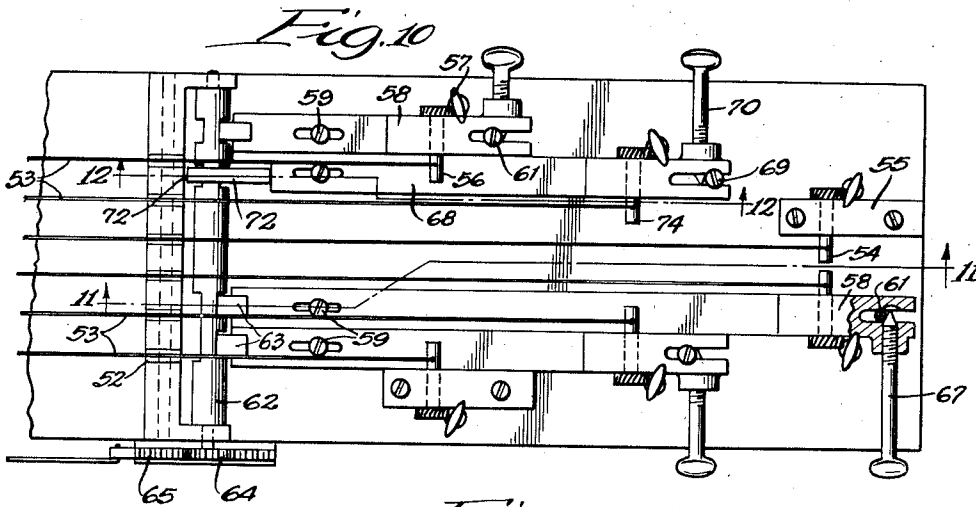
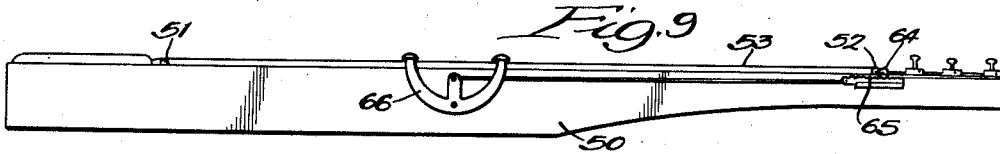
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STRINGED MUSICAL INSTRUMENT

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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STRINGED MUSICAL INSTRUMENT

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10 Claims. (Cl. 84—312)

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This invention relates to stringed musical instruments and more particularly to chord tuning means for guitars and the like.

It has heretofore been proposed to change the chord tuning of guitars by providing members shiftable transversely of the strings between one of the bridges and the adjacent anchor point to change the string tension. Such devices cause relatively sharp bending of the strings which results in string breakage. Furthermore, devices of this type are relatively complicated and expensive to construct and make the basic tuning of the instruments difficult.

It is one of the objects of the present invention to provide an instrument in which bending of the strings is eliminated or minimized to minimize string breakage.

Another object is to provide an instrument in which control of the chord tuning is effected by a rotatable shaft having cam surfaces engaging the string control members to change the tuning. According to one feature, the shaft has a pinion at one end meshing with a rack shiftable by a control lever to control the tuning.

Still another object is to provide an instrument in which each string is controlled by a pair of levers, movement of one of which increases the string tension while movement of the other in the same direction relaxes the string.

A further object is to provide an instrument in which each string is connected to a member shiftable longitudinally of the instrument body and controlled by cam means to control the string tension. According to one feature an adjustable stop is provided to limit movement of the member in one direction, and the cam means urges the member in the other direction.

The above and other objects and advantages of the invention will be more readily apparent when read in connection with the accompanying drawings, in which—

Figure 1 is a side elevation with parts broken away and in section of an instrument embodying the invention;

Figure 2 is an enlarged partial section showing the variable string tuning means of Figure 1;

Figure 3 is a section on the line 3—3 of Figure 2;

Figure 4 is a view similar to Figure 2 of an alternative construction;

Figures 5 and 6 are views on the lines 5—5 and 6—6 respectively of Figure 4;

Figure 7 is a view similar to Figure 2 of an other alternative arrangement;

Figure 8 is a section on the line 8—8 of Figure 7;

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Figure 9 is a view similar to Figure 1 illustrating still another arrangement;

Figure 10 is an enlarged plan view of the forward end of the instrument of Figure 9 with parts broken away;

Figure 11 is a section on the line 11—11 of Figure 10;

Figure 12 is a section on the line 12—12 of Figure 10; and

Figure 13 is a view similar to Figure 2 showing an alternative lever arrangement.

The instrument as shown in Figures 1 to 3 comprises an elongated resonant body 10 which may be of any desired construction and which is provided at one end with a rear bridge 11 and at its opposite end with a forward bridge 12. A plurality of strings 13 are stretched across the bridges and are anchored at the forward end of the body to adjustable pins 14 in the usual manner.

At the rear end of the body the strings are connected to adjustable chord tuning mechanism, as best seen in Figures 2 and 3, it being understood that certain of the strings whose tuning need not be changed for the particular chord combinations desired may be fixedly secured to the body in any desired manner. Those strings which are to be changed to change the chord tuning are secured to one or the other of a plurality of spaced fastening devices 15 carried by an accurately curved yoke 16. The yoke is supported just to the rear of the rear bridge 11 and is adapted to be shifted to increase or decrease the tension of the string thereby to vary its tuning.

For this purpose a pair of levers 17 and 18 are provided which are pivotally supported in side by side relationship on a pivot rod 19. The lever 17 is provided with a downwardly extending ear 21 to which the lower end of the yoke is pivoted, and the lever 18 has a similarly upwardly extending ear 22 to which the upper end of the yoke is pivoted. The lever 18 is normally urged upwardly by tension of the string, but the lever 17 is normally urged downwardly and a spring 23 is accordingly provided to urge the lever 17 upwardly.

To control the levers a shaft 24 extends across the body of the instrument toward its rear end and is formed with cam portions such as the cut out portions 25 shown in Figure 2 registering with the levers in the manner desired to obtain the desired chord changes. Both levers normally press against the shaft and are held thereby in fixed position.

To turn the shaft to change the chord tuning,

a pinion 26 is carried by one end thereof and meshes with a rack 27 slidably supported on the instrument body. The rack is shifted by a link 28 extending along the body substantially to the central part thereof where it is connected to an arm 29 on a U-shaped lever 31 which is pivoted on the body. In its normal position for basic chord tuning, the lever may occupy the position shown in Figure 1 at which time certain of the tuning levers may engage the outer periphery of the shaft while others thereof may fall into cam recesses such as 25 in the shaft. To change the tuning the lever 31 is rocked in one direction or the other to turn the shaft 24 in one direction or the other so that the cam surfaces will produce the desired movement of the levers. If the lever 11 of a pair is rocked downwardly, as seen in Figure 2, the lower end of the yoke will move forward to release the tension on the connected string 12 thereby to reduce its pitch. Similarly, if the lever 18 of a pair is rocked downward, it will pull back on the upper end of the yoke to tighten the string and increase its pitch. By properly selecting the positions of the cam notches 25 and by properly designing the depth thereof, the amount of movement of the several levers and accordingly the change in tuning of the connected string can be properly controlled. It will be noted that with this construction the yoke, in effect, shifts back and forward on the body to change the string tension without substantially bending the string so that it will not be damaged.

Figures 5 and 6 show an alternative construction including a pair of levers 32 and 33 pivoted on a shaft 34 and controlled by a cam shaft 24, as in Figures 2 and 3. The lever 32 has an upwardly extending projection 35 to which the end of the string is anchored and the lever 33 carries a roller 36 over which the string is threaded before going to the bridge 11. A spring 37 is provided to urge the lever 32 upward against the shaft 24.

In this construction, when the lever 32 is rocked downwardly by the shaft 24, the ear 35 will move counterclockwise to relax the string and lower its pitch. Similarly, when the lever 33 is rocked counterclockwise, the roller 36 will be swung away from the bridge 11 to increase the string tension and raise the pitch. In this construction the only bending of the string is that produced by the roller 36 which can be relatively large and which does not abrade the string so that breakage is minimized.

Figures 7 and 8 show still another construction in which the string is anchored to one end of a lever 38 which has an enlarged opening 39 therein fitting loosely over a pivot shaft 41. A lever 42 is pivoted on the shaft 41 and is pivotally interconnected to the lever 38 by a pin 43 spaced from the shaft. The lever 42 is urged upward by a spring 44 into engagement with the cam shaft 24.

With this construction when the lever 38 is swung downward by the cam shaft it pivots about the pin 43 and increases the tension of the string to raise its pitch. When the lever 42 is swung downward by the cam shaft, it rocks about the shaft 41 causing the pivot pin 43 to move forward so that the lever 38 can shift forward bodily and the string tension will be relaxed. Thus by rocking one or the other of the levers in the same direction the string can be either tensioned or relaxed to vary its tuning without producing any bending of the string.

Figures 9 to 11 illustrate a different construction in which the chord tuning mechanism is provided at the head end of the instrument. As shown, the instrument comprises an elongated body 50 having a rear bridge 51, a forward bridge 52, and strings 53 stretched over the bridges. At the rear end of the instrument the strings may be anchored to the body in any desired manner. At the forward end certain of the strings whose tuning is not to be changed may be connected to rotatable pins 54 carried by blocks 55 fixed to the body. Each of the strings whose tuning is to be changed may be connected to a longitudinally shiftable member which is moved one way or the other to vary the string tension.

As shown, the top and the two bottom tunable strings are connected to rotatable pins 56 which are rotatably mounted for adjustment through manual tuning pins 57 in block members 58 slidable longitudinally of the body. As shown, each block member is formed with an elongated opening receiving a fastening pin or screw 59 adjacent one end and with an elongated slot in its opposite end receiving a similar fastening pin or screw 61. In this way the block is guided accurately for movement longitudinally of the body to vary the string tension.

To control the position of the block members a rotatable cam shaft 62 is mounted on the body and is formed with cam recesses to receive up-turned ends 63 on the block members. The shaft 62 carries a pinion 64 at one end meshing with a rack 65 which is slidable on the body and which is controlled by a lever 66 in the same manner as described above in connection with Figure 1.

Movement of the block members on the body is adapted to be variably limited to satisfy the basic tuning, and for this purpose each block member carries a screw 67 having a tapered point engageable with the guide pin 61. By threading the screw 67 more or less into the block member the portion of the tapered tip thereof which engages the guide pin 61 can be adjusted thereby to limit the movement of the block member in response to tension of the spring. Therefore, even though the cam recesses are not accurately formed, the instrument can be accurately tuned and the amount of change which will be produced by rotation of the cam shaft 62 can be determined. As the shaft is rotated the members will be selectively cammed outward to increase the string tension or will be permitted to move into the cam recesses to relax the string tension. It will be noted that in this construction there is no bending of the strings in response to chord tuning movements so that breakage of the strings is minimized.

The second string from the top, as seen in Figure 10, is intended to work oppositely from the other tunable strings and for this purpose employs a tuning mechanism as best seen in Figure 12. This mechanism includes a slidable member 68 mounted on the body by means of screws or pins 69 extending through slots in the slidable member. In the end adjacent the rotatable shaft 62 the member 68 is formed with an upstanding portion 71 extending over the shaft and terminating in a downwardly extending end part 72 engageable with the shaft. A compression spring 73 urges the member 68 away from the bridge to tension the string, and the string is fastened to an adjustable pin 74 adjusted through a worm mechanism through a handle 75 to set the initial string tension.

Movement of the member 68 away from the

bridge is limited by a tapered threaded pin 70 engaging the rearmost guide pin 69 in the same manner as the threaded pins 67 cooperate with the guide pins 61.

With this construction when the shaft 62 is turned, as shown in Figure 12, the spring 73 will urge the member 68 forwardly to increase the string tension, engagement of the pin 70 with the pin 69 limiting movement in this direction. As the shaft 62 is turned the member 68 will be slid forwardly due to the cam action to relax the string tension. Thus this string works oppositely to the other tunable strings, being relaxed by the same cam action which increases the tension of the other strings.

Figure 13 illustrates a modified lever construction which can be used with any of the lever mechanisms described above to produce an opposite tuning effect so that one or more of the strings may be relaxed by the same cam action which increases the tension of the remaining strings. As shown, a lever 76 is pivoted on a shaft 77 carried by the body and has an enlarged end portion adjacent the shaft over which the string 78 may pass. Intermediate the ends of the lever an anchor member 79 is provided for securing the end of the string to the lever. It will be noted that with this construction as the lever turns about the shaft 77 the string tension will be varied.

At its free end the lever is upwardly offset as indicated at 81 to extend above the cam shaft 82, and a spring 83 is provided acting between the upper surface of the lever and a fixed bracket 84 to urge the lever downwardly against the cam shaft. An adjustable stop screw 85 is carried by the lever and engages the instrument body to limit downward movement of the lever.

With the cam shaft in the position shown in Figure 13 the free end of the lever is elevated so that the string is in a condition of minimum tension. As the cam shaft is turned the spring 83 will urge the lever downward to increase the string tension, the amount of increase being limited by the adjustable stop screw 85.

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

What is claimed is:

1. A stringed musical instrument comprising an elongated body, a plurality of strings extending along the body, means for securing the end portions of the strings to the body adjacent to its opposite ends, the means for securing at least a part of the strings at one end including parts movably mounted on the body and to which the strings respectively are fastened, a rotatable shaft mounted on the body and having cam notches therein engaging said parts to position said parts, a pinion secured on the shaft, a rack mounted on the body and slidable longitudinally of the body and meshing with the pinion, a U-shaped lever pivoted in its central part to the body to rock in one direction or the other as one end or the other is depressed, and a link connected at one end to the rack and at its other end to a point on the lever spaced from its pivot.

2. A stringed musical instrument comprising an elongated body, a plurality of strings extending along the body, means for securing the end portions of the strings to the body adjacent to its opposite ends, the means for securing at least

one of the strings at one end of the body including a pair of parallel levers coaxially pivotally mounted on the body, means on the levers engaging the string so that when one of the levers is rocked in one direction the string will be tightened and when the other lever is rocked in said direction the string will be loosened, a rotatable shaft mounted on the body and having cam surfaces engaging the levers, a pinion secured on the shaft, a rack mounted on the body and slidable longitudinally of the body and meshing with the pinion, a U-shaped lever pivoted in its central part on the body and a link connected at one end to the rack and at its other end to a point on the lever spaced from its pivot.

3. A stringed musical instrument comprising an elongated body, a plurality of strings extending along the body, means for securing the end portions of the strings to the body adjacent to its opposite ends, the means for securing at least one of the strings at one end to the body including a pair of parallel levers pivoted to the body, a yoke pivoted at its ends to the levers respectively of points on opposite sides of the pivot, means intermediate the ends of the yoke for connection to the string, a rotatable shaft mounted on the body and having cam surfaces engaging the levers, a pinion secured on the shaft, a rack mounted on the body and slidable longitudinally of the body and meshing with the pinion, a U-shaped lever pivoted in its central part to the body to rock in one direction or the other as one end or the other is depressed, and a link connected at one end to the rack and at its other end to a point on the lever spaced from its pivot.

4. A stringed musical instrument comprising an elongated body, a plurality of strings extending along the body, means for securing the end portions of the strings to the body adjacent to its opposite ends, the means for securing at least one of the strings at one end to the body including a lever pivoted on the body, a second lever pivoted on the first lever eccentric to its pivotal axis, means on the second lever to connect the string thereto, a shaft rotatably mounted on the body and extending across the ends of the levers and having cam surfaces thereon engaging the levers, a pinion secured on the shaft, a rack mounted on the body and slidable longitudinally of the body and meshing with the pinion, a U-shaped lever pivoted in its central part to the body to rock in one direction or the other as one end or the other is depressed, and a link connected at one end to the rack and at its other end to a point on the lever spaced from its pivot.

5. A stringed musical instrument comprising an elongated body, a plurality of strings extending along the body, means for securing the end portions of the strings to the body adjacent to its opposite ends, the means for securing at least one of the strings at one end to the body including a member shiftable longitudinally of the body, means on the member to secure the string thereto, a stop on the body engageable with the member to limit movement thereof in response to string tension, a shaft rotatably mounted on the body and having a cam surface thereon engaging the member to shift the member in a direction to increase string tension a pinion secured on the shaft, a rack mounted on the body and slidable longitudinally of the body and meshing with the pinion, a U-shaped lever pivoted in its central part to the body to rock in one direction or the other as one end or the other is depressed,

and a link connected at one end to the rack and at its other end to a point on the lever spaced from its pivot.

6. A stringed musical instrument comprising an elongated body, a plurality of strings extending along the body, means for securing the end portions of the strings to the body adjacent to its opposite ends, the means for securing at least one of the strings at one end to the body including a block mounted on the body and movable longitudinally on the body, a pin rotatably carried by the block and to which the string is secured, means to rotate the pin to adjust the string tension, interengaging parts on the body and the block to limit movement of the block in response to string tension, one of said parts being adjustable, a shaft rotatably mounted on the body and having a cam surface thereon engaging the member to shift the member in a direction to increase string tension, a pinion secured on the shaft, a rack mounted on the body and slidable longitudinally of the body and meshing with the pinion, a U-shaped lever pivoted in its central part to the body to rock in one direction or the other as one end or the other is depressed, and a link connected at one end to the rack and at its other end to a point on the lever spaced from its pivot.

7. A stringed musical instrument comprising an elongated body, a plurality of strings extending along the body and secured adjacent their ends to the body, the means for securing at least one string at one end including a lever having an enlarged end pivoted on the body and the lever extending generally parallel to the strings, means intermediate the ends of the lever to secure the end of a string thereto with the string extending over the enlarged end, the enlarged end being arcuately curved about its pivotal connection to the body throughout the portion thereof which is engaged by the string, and control means engaging the other end of the lever to control its pivoted position.

8. A stringed musical instrument comprising an elongated body, a plurality of strings extending along the body and secured adjacent their ends to the body, the means for securing at least one string at one end including a lever having an enlarged end pivoted on the body and the lever extending generally parallel to the strings, means intermediate the ends of the lever to secure the end of a string thereto with the string extending over the enlarged end, the enlarged end being

arcuately curved about its pivotal connection to the body throughout the portion thereof which is engaged by the string, a rotatable cam engaging the other end of the lever on the side thereof opposite to the string, and a spring urging the lever against the cam.

9. A stringed musical instrument comprising an elongated body, a plurality of strings extending along the body and secured adjacent their ends to the body, the means for securing one end of the strings to the body comprising a plurality of levers having enlarged ends pivoted on a common axis with the levers extending parallel to the strings, means on each lever intermediate its ends to secure one end of a string thereto with the string extending over the enlarged end of the lever, the enlarged end of each lever being arcuately curved about said axis throughout the portion thereof which is engaged by a string, and control means engaging the levers adjacent their other ends to control their angular positions.

10. A stringed musical instrument comprising an elongated body, a plurality of strings extending along the body and secured adjacent their ends to the body, the means for securing one end of the strings to the body comprising a plurality of levers having enlarged ends pivoted on a common axis with the levers extending parallel to the strings, means on each lever intermediate its ends to secure one end of a string thereto with the string extending over the enlarged end of the lever, the enlarged end of each lever being arcuately curved about said axis throughout the portion thereof which is engaged by a string, a rotatable cam shaft extending across the other ends of the levers with separate cam portions thereon engaging the respective levers, and springs urging the levers against the cam shaft.

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