

Jan. 11, 1949.

N. J. ADAIR

2,459,102

MUSICAL INSTRUMENT

Filed Jan. 25, 1947

3 Sheets-Sheet 1

**Fig. 1**

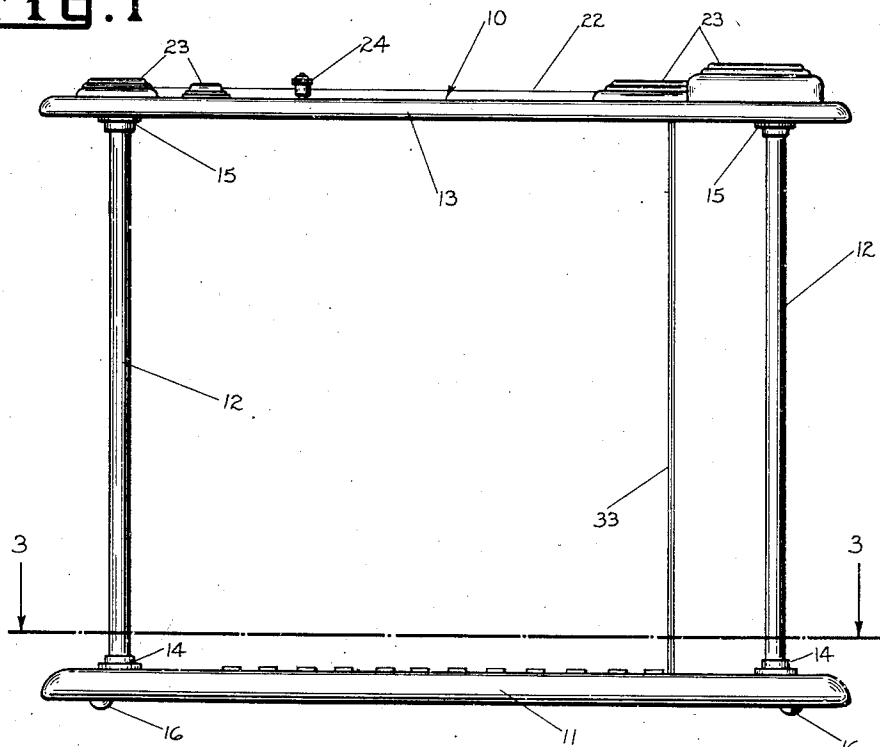


**Fig. 2**

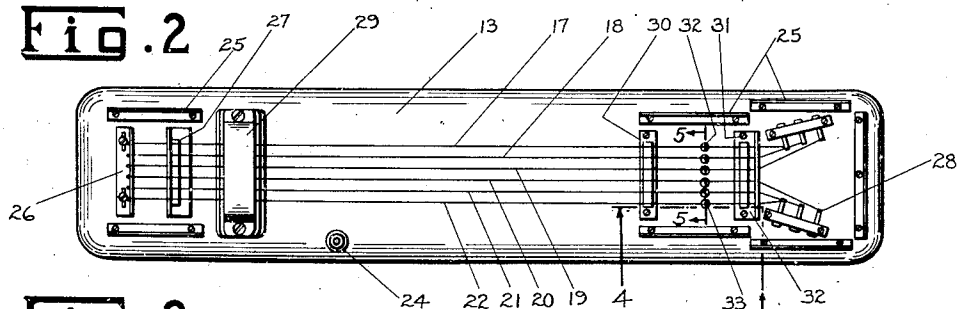
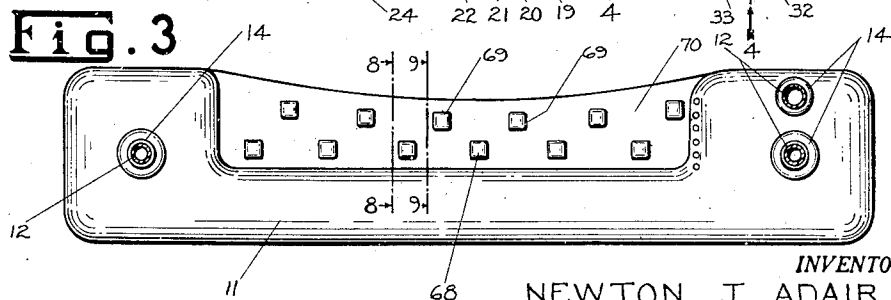


**Fig. 3**



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MUSICAL INSTRUMENT

3 Sheets-Sheet 2

**Fig. 4**

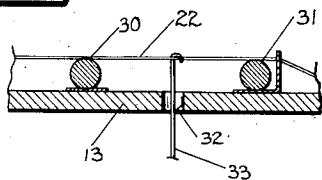


**Fig. 5**

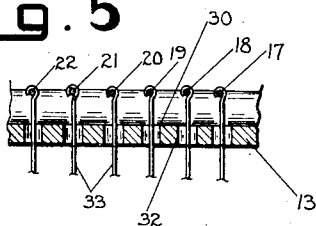


**Fig. 6**

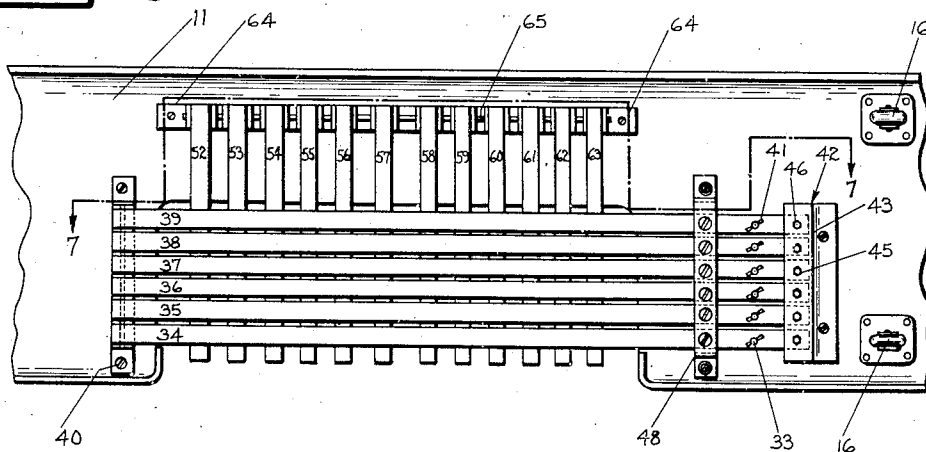
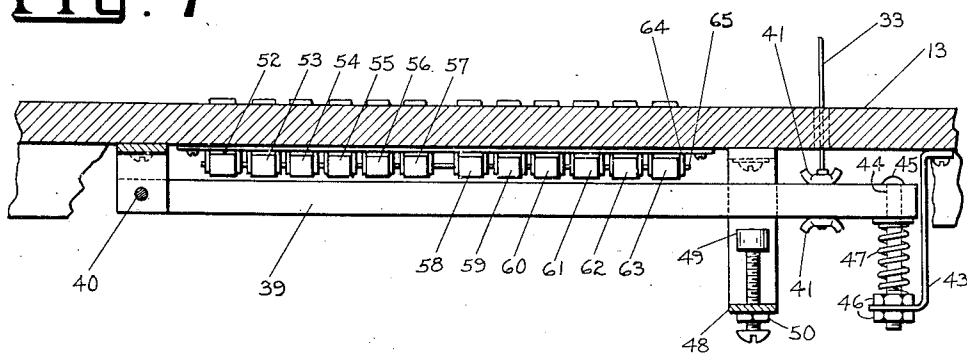


**Fig. 7**



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MUSICAL INSTRUMENT

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3 Sheets-Sheet 3.

**Fig. 8**

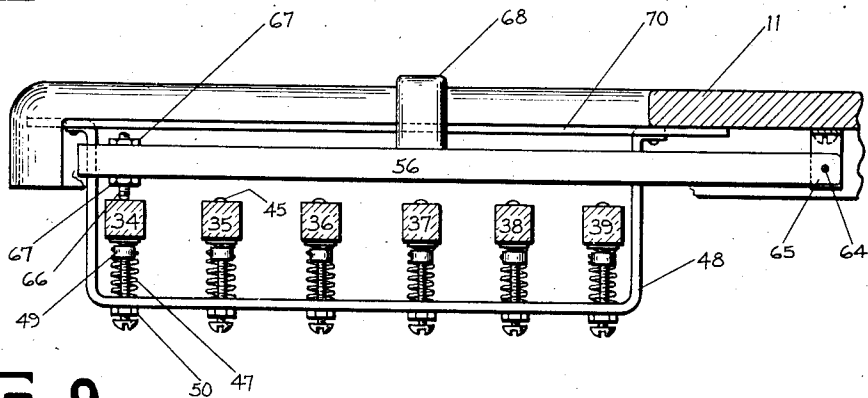


**Fig. 9**

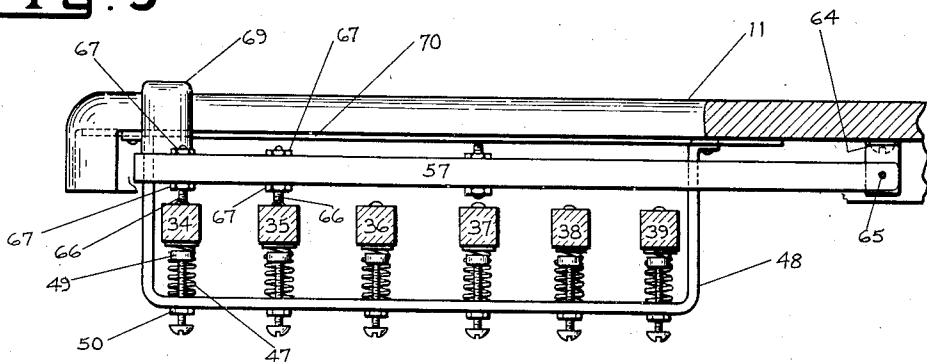
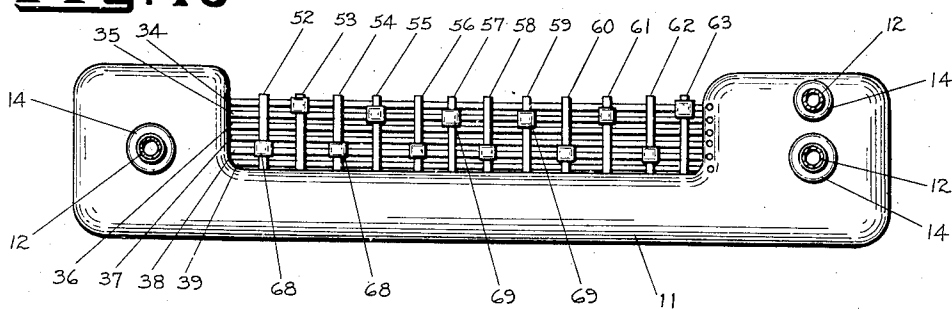


**Fig. 10**



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## UNITED STATES PATENT OFFICE

2,459,102

MUSICAL INSTRUMENT

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7 Claims. (Cl. 84—312)

1

This invention relates to musical instruments and specifically to improvements in tuning mechanisms for stringed instruments.

Many stringed instruments, as for example the type known as the steel guitar, are limited in their musical expression by an inability to achieve many chords, chordal variations, and chordal progressions requisite to the rendition of musical concepts and effects desired. These limitations inhibit the musician in his performance and restrict the composer in his development of theme, mood, ornamentation and variation.

I am aware that others have sought to vary the tuning of stringed instruments by varying the lengths of vibrating strings and by varying the tensions of such strings. My device relates to the latter group in that vibration frequencies of musical strings are regulated by controlled tensioning of the strings but should not be confused with others of the group. Distinguishing characteristics are that my invention achieves precision tuning by positive tension control; greater breadth of musical expression is attainable by employing foot manipulated tuning control leaving the performer's hands free for other operations; highly complicated musical expression, as exemplified by modern arrangement and orchestration, is effected by re-tuning means individually adapted to alter instantaneously and accurately, the pitch of single strings or any combination thereof a predetermined extent; and simplified playing technique may be employed in accomplishing difficult musical passages.

Objects of my invention are to provide stringed instruments having increased breadth of musical expression.

Another object is to alter the pitch of one or more of the strings of such a musical instrument while it is being played to achieve chords, chordal variations, and chordal progressions heretofore considered impossible to achieve on such instruments.

Another object is to provide precision means in stringed musical instruments instantaneously and accurately re-tuning selected strings thereof by increasing or decreasing the tension of the strings a predetermined extent.

Another object is to provide in stringed musical instruments means for accomplishing frequent, accurate, and rapid changes in string tuning as well as effectively maintaining a selected tuning as long as desired.

Another object is to provide, in a steel guitar, pedal manipulated tuning means auxiliary to the

2

conventional playing "steel" whereby the strings relating to a definite chord may be simultaneously changed in tone by depressing a pedal.

Another object of my invention is to provide an attachment for steel guitars which may be quickly and easily adjusted for string tensioning, in combination with the "steel," to achieve any musical chord within the range of the instrument.

Another object is to provide a console stringed instrument, incorporating the foregoing re-tuning means, that is attractive in appearance and convenient to play.

Another object is to provide such a console stringed instrument that is conveniently and easily dismantled for carrying and reassembled for playing without displacing the precision re-tuning thereof from adjustment.

Further objects are to provide improved elements and arrangements thereof in a device of the character and for the purposes set forth that is simple in structure, economical to manufacture, and efficacious in operation.

Other objects and advantages of my invention will become apparent in the following description and the novelty thereof will be particularly pointed out in the appended claims.

In the drawings:

Fig. 1 is an elevation of a console stringed instrument of the electric, steel guitar, type embodying the features of the present invention.

Fig. 2 is a plan view of the table portion of said console steel guitar having housings thereof removed for inspection of working elements, presently described.

Fig. 3 is a horizontal sectional, view showing a plan view of the base of said instrument looking in the direction 3—3 in Fig. 1.

Fig. 4 is a fragmentary enlarged section taken on line 4—4 of Fig. 2.

Fig. 5 is a fragmentary enlarged section taken on line 5—5 of Fig. 2.

Fig. 6 is a fragmentary bottom view of the base of the instrument which is shown in top plan view in Fig. 3.

Fig. 7 is a section taken on line 7—7 of Fig. 6.

Fig. 8 is a section taken on line 8—8 of Fig. 3.

Fig. 9 is a section taken on line 9—9 of Fig. 3.

Fig. 10 is a horizontal sectional view showing of the base of the instrument as seen in Fig. 3 but with the shield of the pedals removed to indicate relative positioning of key elements and pedals, presently described.

Referring in greater detail to the drawings:

In Fig. 1, a support is indicated generally at 10 comprising a base 11, legs 12, and a table

portion 13. Receptacle elements 14 are provided upwardly disposed on the base and similar receptacle elements 15 are provided downwardly disposed on the table portion. The legs are slip-fitted into the receptacles of the base and in turn are received by the receptacles of the table portion resting thereon. The slip fitting of the legs with the base and table portion respectively provides a rigid support and one that may be conveniently disassembled and reassembled. The base is mounted on castors 16.

Tensioned strings 17, 18, 19, 20, 21 and 22 are indicated on the table portion. A volume control 24, as conventionally employed in steel guitars having electrical amplifying means, is indicated in convenient relation to the strings. Housing members 23 serve to hide working elements of the present invention and give the instrument a more pleasing appearance. The housing members are retained in place by retaining elements 25, mounted on the table portion and arranged to receive and frictionally engage said housing members. In Fig. 2 the housing members are removed to reveal the retaining elements and to illustrate normally concealed portions of the instrument. The strings are anchored to the table as at 26, passed over a fixed bridge 27 and are adjustably tensioned by tuning posts 28, as is well known in instruments of the lute type. An electrical pickup 29, is employed with a conventional amplifier in the usual manner. The pickup, amplifying means and volume control do not constitute essential elements of the present invention and thus are not described in detail, but merely alluded to as useful adjuncts.

A pair of spaced bridges 30 and 31 are mounted on the table 13 transversely related to the string. An opening 32 is provided in the table 13 beneath each of the strings and substantially midway between the bridges 30 and 31. To vary the tension of the strings and thus their periods of vibration, link members, or tension means, 33 are passed through the openings and engage the strings. The link members are screw threaded at their lower end portions and preferably hooked at their upper end portions, as shown in Figs. 4 and 5, for convenience in engaging and disengaging the strings. It is obvious that by drawing downward on the link members, the strings may be raised in pitch as their tensions are increased.

To the end of exerting instantaneous and accurately predetermined tension on the strings, precision controls are provided in the base 11 as seen in Fig. 3 and illustrated in further detail in Figs. 6, 7, 8, 9, and 10. Keys 34, 35, 36, 37, 38, and 39 are pivotally mounted in the base portion as at 40, each key having its free end portion disposed generally below one of the openings 32. The link members are extended downwardly and communicate with their respective keys by being passed through openings in the end portions thereof. Thus a link member communicates between the string 17 and the key 34, between the string 18 and key 35, etc. Wing nuts 41 are screw threadedly engaged to the link members above and below the keys, in abutting relation to the keys, to secure and adjustably tension the link members. The keys are provided with stops 42, precluding their movement upwardly from a predetermined neutral position. The stops conveniently comprise a bracket 43 mounted on the base portion and extended downwardly therefrom to underlay, but be spaced from, the free

end portions of the keys. Openings 44 are formed through the free end portions of the keys and screw threaded bolts 45 are passed through the openings and secured to the bracket by means of nuts 46. The heads of the bolts, as positioned by adjustment of the nuts 46, conveniently preclude upward movement of the key elements, from their neutral positions. To urge the keys against the heads of the bolts and thus resist movement downward by the keys from their neutral position, helical compression springs 47 are provided circumjacent the bolts in abutting relation to the overlaying portion of the bracket and their respective keys.

To limit downward movement of the keys and restrict allowable throw thereof, a bridge 48 is mounted below the base 11 in inverted position spanning the keys. Lower stops 49 are screw threadedly engaged to the bridge and spacially adjusted below the neutral positions of the keys. Jamb nuts 50 lock the stops in said adjusted positions when tightened against the bridge. The bridge, and stops borne thereby, are preferably positioned inwardly from the points at which the tension means are attached to the keys to minimize tonal inaccuracies incident to key flexibility and/or excessive downward pressure on the keys.

Pedals 52 to 63, inclusively, are pivotally mounted on the under side of the base 11, superimposed and transversely related to the keys. A convenient pivotal mounting is indicated in Figs. 6, 8, and 9 comprising brackets 64 downwardly extended from said base and bearing a pintle 65 mounting the keys. It has been found convenient to employ alternate pedals to tune single strings of the instrument. As numbered in the drawings the single string tuning pedals are even numbered and the chordal pedals odd numbered. A single string tuning pedal is indicated in Fig. 8, overlaying the keys and manipulating a single key. Movements of the pedals are transmitted to their keys by means of fingers 66 passed through the pedals and downwardly disposed for key engagement. The fingers are screw threaded and are provided with adjustment nuts 67 on each side of the pedals to permit control of the extent that the engaged key is depressed for a given movement of the pedal. The chord pedals, as illustrated in Fig. 9, are essentially the same as the single string tuning pedals described, but communicate with a plurality of key elements to achieve chordal variations. Attention is directed to the middle finger shown in Fig. 9 illustrating a finger adjusted to depress its key element only half way for half tone pitch variation. For convenience in manipulation of the pedals, the single string tuning pedals are provided with upwardly disposed foot rests 68 and the chordal pedals with similar foot rests 69. The foot rests are preferably arranged in banks so that the foot rests 68 are in a bank separate and distinct from the foot rests 69. A shield 70, having openings formed therein through which the foot rests upwardly extend, is mounted by the base 11 in concealing relation to the pedals and the keys.

#### Operation

From the foregoing description, it is believed that the operation of the device of the present invention is obvious and is summarized briefly at this point. In preparing the instrument for the practice of the invention, it is first tuned to basic tuning by varying the tension of the strings as controlled by the conventional tuning posts 28.

A convenient tuning has been found to be an E thirteenth tuning, as described in greater detail in a subsequent chart.

The wing nuts 41 are adjusted to remove any slack in the link members 33. Care is observed to avoid tightening the link members sufficiently to alter the basic tuning of the strings 17 to 22 inclusively. The stops 42 are adjusted in conjunction with the wing nuts and the tuning posts so that when the keys are in normal, or up, positions the strings are accurately tuned to their basic tuning. The lower stops 49 are adjusted so that when the keys are depressed to their lower stops their respective strings are tightened a sufficient amount to raise them in pitch, as desired. Such an illustrative adjustment of the keys is exemplified in the subsequent chart wherein the depressing of the keys raises the seventeenth, eighteenth, nineteenth, twenty-first and twenty-second strings a half tone in pitch and the twentieth string a whole tone.

The fingers 65 are adjusted in their respective pedals so that as their pedals are depressed the keys engaged will likewise be depressed. The single string tuning pedals obviously each bear on one finger; the chordal tuning pedals bear on a plurality of fingers, as desired. When the fingers of the pedals are adjusted they are locked in position with the nuts 67. As long as a chordal pedal has one finger adjusted to depress a key to its lower stop, its other fingers may be adjusted to depress other keys only half way. This is illustrated in Fig. 9, in which the finger over the key 37 is adjusted to depress said key only half way and thus to raise said key's string 19 only a half tone. It is obvious that substantially limitless possibilities exist in the chordal structures attainable by the proper adjustment of the fingers and stops described. Attention is invited to the following chart showing suggested basic tuning of the strings, finger adjustments between the pedals and keys, and a few exemplary chords achieved by depressing the several pedals:

Strings

|                                  | 17th     | 18th     | 19th | 20th     | 21st     | 22nd     | Chord Produced            |
|----------------------------------|----------|----------|------|----------|----------|----------|---------------------------|
| All Strings Open.....            | E        | C#       | G#   | E        | D        | B        | F 13th.                   |
|                                  | E        | C#       | G#   | E        | Not Used | Not Used | C#m.                      |
|                                  | E#       | C#       | G#   | Not Used | do       | do       | C#.                       |
| Single String Tuning Pedals..... | D        | D        | G#   | E        | D        | B        | E 7th.                    |
| 52                               | E        | C#       | A    | E        | Not Used | Not Used | A.                        |
| 54                               | E        | C#       | G#   | F#       | D        | B        | F 9th, 6th added.         |
| 56                               | E        | C#       | G#   | Not Used | D#       | B        | G# M.                     |
| 58                               | Not Used | Not Used | G#   | E        | D        | B#       | E Aug. 7th.               |
| 60                               | do       | do       | G#   | E        | Not Used | Not Used | F# Augmented.             |
| 62                               | F        | C#       | A    | F        | Not Used | Not Used | U.                        |
|                                  | F        | C#       | A    | F        | D        | B        | BM 9th, 5th Low-<br>ered. |
| Chordal Pedals.....              | F        | D        | G#   | F        | D        | B        | D Diminished 7th.         |
| 55                               | E        | D        | G#   | F#       | D        | B        | E 9th.                    |
| 57                               | E        | D        | G#   | F#       | Not Used | Not Used | A 6th.                    |
| 59                               | Not Used | Not Used | A    | F#       | D        | B        | D 6th.                    |
|                                  | E        | C#       | A    | F#       | D        | B        | E 13th.                   |
|                                  | Not Used | C#       | A    | F#       | D        | B        | BM 9th.                   |
| 61                               | do       | C#       | A    | F#       | D#       | B        | B 9th.                    |
|                                  | do       | C#       | A    | F#       | D#       | B        | B 6th.                    |
| 63                               | Not Used | Not Used | G#   | F#       | D#       | B        | B 6th.                    |
|                                  | do       | C#       | G#   | F#       | D#       | B        | BM 6th, 9th added.        |

When it is desired to transport the instrument of the present invention, the link members 33 are disconnected from their respective strings, the table portion 13 is lifted from the legs 12, the receptacles 15 disengaging the legs; and the legs are removed from the receptacles 14. So dismantled the instrument is conveniently and easily transported from place to place. To reassemble the instrument, the opposite procedure is followed and the link members hooked over their respective strings. Inasmuch as the relative posi-

tioning of the pedals, keys, and fingers are not effected in any way by the dismantling or reassembling procedure, no readjustment of them is required. Re-tuning of the strings in the conventional manner by means of the posts 28 suffices.

It will be apparent to those skilled in the art that I have provided a mobile stringed instrument achieving musical expression heretofore considered unattainable in instruments of the lute type; that frequent, accurate, and rapid changes in string tuning is facilitated; and that chordal structures and progressions of complicated character may be expeditiously accomplished.

Although I have herein shown and described my invention in what I have conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope of my invention, which is not to be limited to the details disclosed herein, but is to be accorded the full scope of the claims so as to embrace any and all equivalent devices and systems.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A musical instrument comprising a support, a plurality of strings tensioned thereon, means individual to the strings for progressively varying their tension as the instrument is played, keys individually operating the tensioning means, stops limiting the throws of the keys to achieve predetermined pitch change at maximum throw, pedals manipulating single keys, and chord pedals each manipulating a plurality of keys to achieve single string and chordal tuning of the strings.

2. A musical instrument comprising a support, a stringed instrument mounted on the support, keys pivotally mounted by said support, tension means communicating between the keys and the strings of the instrument to increase the tension of said strings upon depressing the keys from normal position; means limiting movement of the

keys downwardly from neutral position, and pedals associated with the keys depressing said keys singly and in groups according to predetermined arrangement.

3. A pitch changing device for musical instruments having a plurality of tensioned strings as a part thereof, said device comprising a pair of spaced bridges transversely engaging the strings near an end portion thereof, tension means displacing the strings between the bridges from their normal positions to vary the tensions of

said strings, keys manipulating the tension means, stops limiting the throws of the keys to predetermined extents, pedals operating the keys individually to change the pitch of individual strings, and pedals operating pluralities of keys to achieve chordal pitch changes.

4. In a device for varying the pitch of a plurality of strings of a musical instrument above the tuned pitch during the playing thereof, the combination of a pair of spaced bridges transversely related to the strings, tension means adapted to draw down on the strings between the bridges, pivotal key elements connected at their free ends to the tension means, stops limiting the throws of the key elements to achieve a tensioning of the strings resulting in predetermined pitch changes, pedals pivotally mounted transversely to the key elements and engaging individual elements thereof, and chordal pedals mounted transversely to the key elements and engaging pluralities of said elements.

5. A console type musical instrument that is disassembled for carrying and reassembled for playing, comprising a base portion having upwardly disposed receptacles; legs slip-fitted into the receptacles of the base portion; a table member having downwardly disposed receptacles receiving the upper and portions of the legs for table support; a plurality of strings anchored near their end portions to the table member; tuning posts mounted in the table member and adjustably tensioning the strings for tuning purposes; a pair of spaced bridges transversely related to the strings; keys pivotally mounted in the base portion, stops precluding movement of the keys upwardly from neutral positions; stops limiting movement of the free ends of the keys downwardly from neutral position, resilient means urging the keys against the upper stops; tension elements secured to the free ends of the keys and having hooks formed at their upper end portions, hooked over the strings between the bridges when assembled for playing purposes; single string tuning pedals arranged in a bank in the base portion and each connected to a single key to depress said key from its neutral position; and a plurality of chord tuning pedals arranged in a bank in the base portion and each connected

to a plurality of keys to depress their respective plurality of strings from neutral position.

6. In stringed instruments having string tension control means for re-tuning the instrument while it is being played, pedal controls comprising pivotally mounted keys connected at their free ends to the tension control means, stops precluding movement of the keys upwardly from a neutral position, stops limiting downward movement of the keys, resilient means resisting downward movement of the keys from said neutral position, pedals pivotally mounted transversely to the key elements, and adjustable means communicating between the pedals and selected keys translating downward movement of the pedals into predetermined downward movement of their respective keys according to preconditioning of the adjustable means.

7. A musical instrument comprising a base portion and a table portion removably secured thereto in parallel spaced relation thereabove, a plurality of strings stretched taut between the ends of the table, a bridge on the table under the strings near one end thereof, keys pivotally mounted longitudinally of the base portion, stops precluding upward movement of each key from neutral position, resilient means urging the keys against the upper stops, tension means connected between the free end of each key and a string between the bridge and the rear end thereof, a plurality of single string tuning pedals pivotally connected to the base and extending transversely across the keys each adjustably contacting a key, and a plurality of chord tuning pedals pivotally connected to the base and extending transversely across the keys each adjustably contacting a plurality of keys.

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