Jan. 21, 1969 A. W. ALIFANO 3,422,716

PITCH CHANGING MEANS FOR PEDAL STEEL GUITARS

Filed Feb. 18, 1966 Sheet 1 of 2

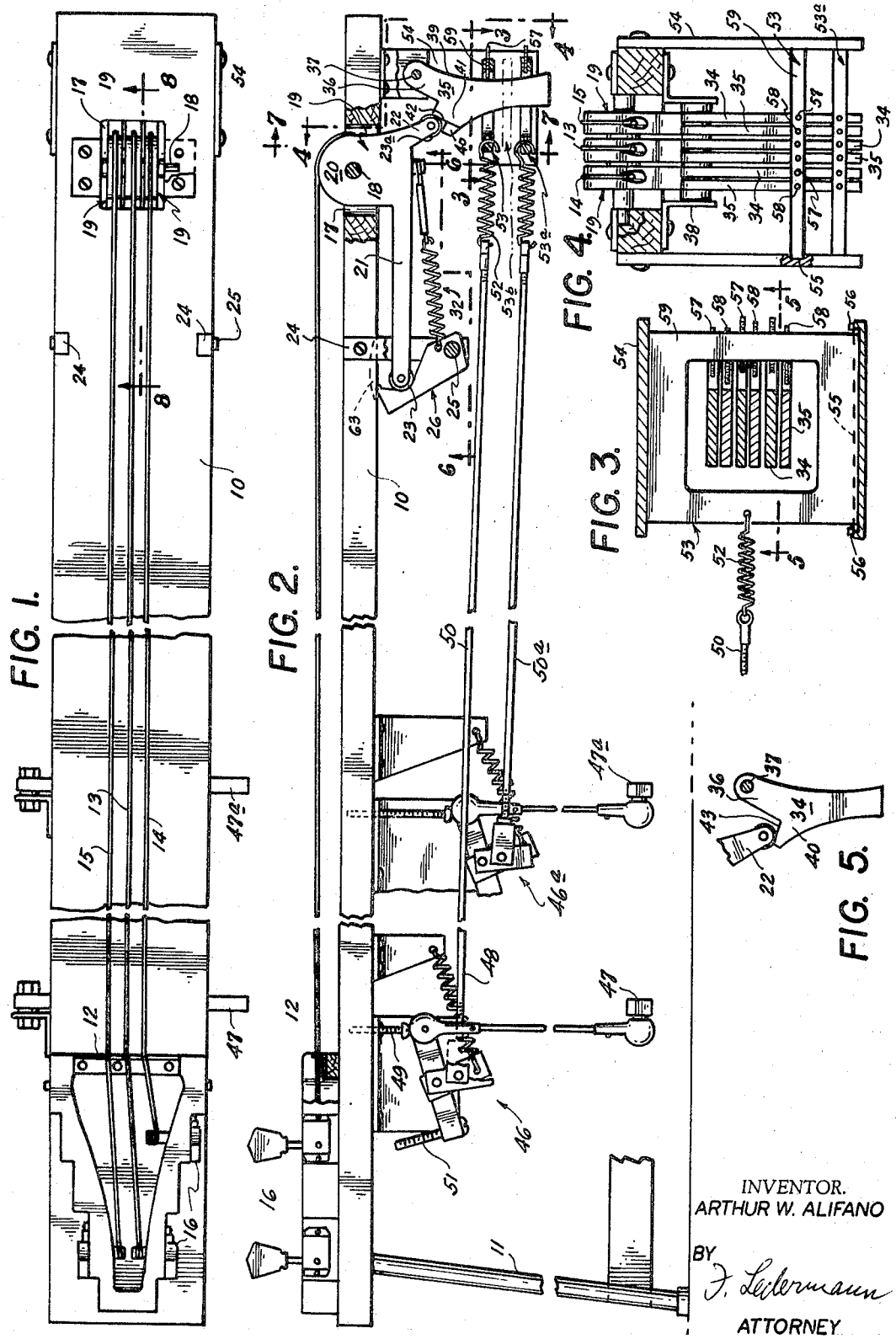


FIG. 1.

FIG. 2.

FIG. 3.

FIG. 4.

FIG. 5.

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FIG. 6.

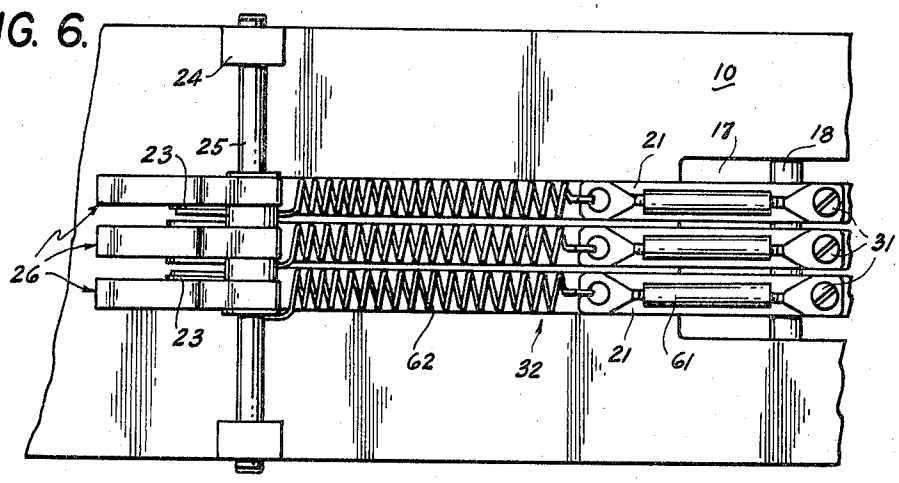


FIG. 8.

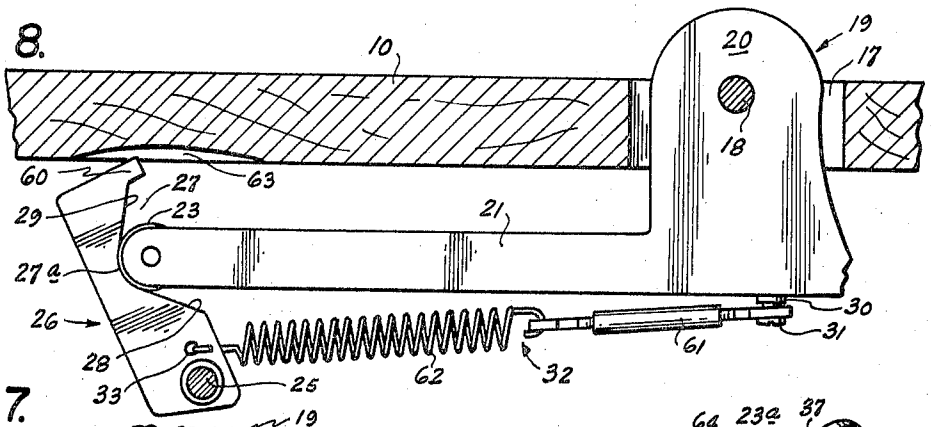
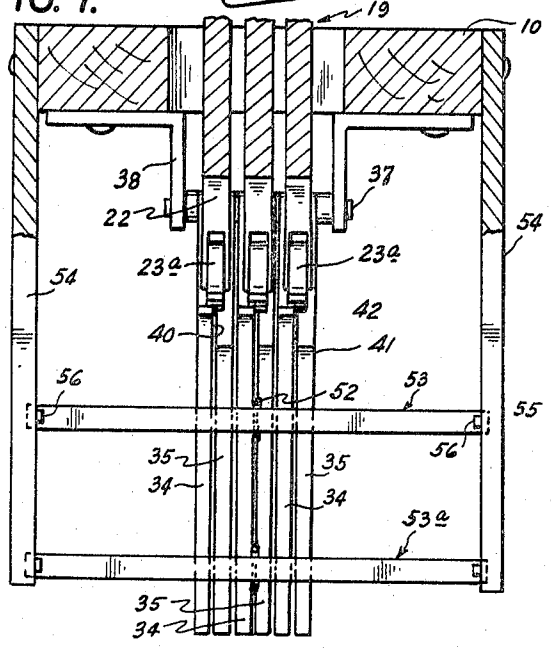


FIG. 7.



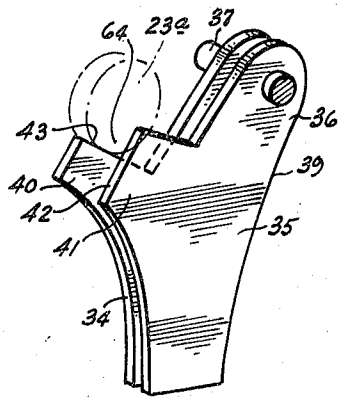


FIG. 9.

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United States Patent Office 3,422,716 Patented Jan. 21, 1969

3,422,716

PITCH CHANGING MEANS FOR PEDAL STEEL GUITARS

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Filed Feb. 18, 1966, Ser. No. 528,515

U.S. Cl. 84—312 8 Claims

Int. Cl. G10d 3/14

This invention relates to stringed instruments of the type which are played by picking the strings in the well known manner, and more particularly but not exclusively the invention relates to so-called pedal steel guitars having one or more necks and provided with pedals or the like by means of which the player may raise or lower the pitch of one or more strings to obtain tones above or below those to which the strings are normally basically tuned.

In the prior art there are such stringed instruments having pedal-operated means for raising or lowering the pitch of individual strings. Usually such instruments are custom tuned at the fractory according to the particular specifications provided by the player in advance, and if any changes are subsequently desired by the player he must return the instrument to the factory because of the difficulty or even impossibility of making the alterations himself.

The present invention contemplates an improved construction provided with novel means for raising or lowering the pitch of individual strings in, theoretically, an infinite number of steps between the extremes of the range proivded. The range, in fact, extends all the way between raising the pitch by tightening the strings to the limit of their elastic strength and lowering the pitch by loosening them to the point where they vibrate below the limit of audibility. Although such extremes are attainable they are not actually used in practice; this range of variation is mentioned merely to illustrate the wide extent of adjustability. Thus, by not limiting the degree of variations in pitch, the player may obtain any tonal effects he desires, even though some of them may sound weird.

Another object of the invention is the provision of novel pedal-operated means whereby all of the strings on each neck of the instrument may be selectively tensed or loosened by the player to produce any tone within the available range, such changing of pitch being quickly and easily accomplished.

Still another object is the provision of a multiplicity, that is, two or more separate pedal-operated means for each neck wherein each such means serves to provide a different set of tone variations in selected strings, thereby doubling or multiplying the number of different tones which the same strings may emit. Thus any combination of raising or lowering pitch is possible; a single pedal can simultaneously raise, say, three strings while lowering two other strings. Strings can be activated as many times as the number of pedals on a neck, giving as many possible different pitches; for example, pedal No. 1 can raise a G-string one-half tone, pedal No. 2 can raise the same string one full tone, and pedal No. 3 can lower the the same string one-half tone.

The above broad as well as additional objects will be clarified in the following description wherein reference numerals refer to like-numbered parts in the accompanying drawing.

Referring briefly to the drawing, FIG. 1 is a top plan view of a pedal steel guitar embodying features of the present invention, showing, merely for the purpose of illustration, a single neck provided with only three strings.

FIG. 2 is a side elevational view, with parts broken away and partly in section.

FIG. 3 is an enlarged sectional view taken on the line 3—3 of FIG. 2.

FIG. 4 is an enlarged sectional view taken on the line 4—4 of FIG. 2.

FIG. 5 is a fragmentary sectional view taken on the line 5—5 of FIG. 3.

FIG. 6 is an enlarged sectional view taken on the line 6—6 of FIG. 2.

FIG. 7 is an enlarged sectional view taken on the line 7—7 of FIG. 2.

FIG. 8 is an enlarged fragmentary sectional view taken on the line 8—8 of FIG. 1.

FIG. 9 is an enlarged perspective view of a pair of cam members, showing, broken away and partly in section, the shaft on which they are pivoted.

Referring in detail to the drawing wherein only three strings are shown on a single neck since such limited showing is sufficient to illustrate the invention, the numeral **10** designates the neck or panel of the instrument which is supported on legs **11** such as that shown in FIG. 2. The usual so-called nut is shown at **12**, the three strings at **13**, **14**, **15**, and the usual tuning screws at **16**. Merely for the purpose of simplifying this disclosure, the end of the panel **10** on which the nut is mounted will be deemed the front end of the panel, and the term "longitudinal" as applied to movement of any part will be deemed to mean longitudinal with respect to the panel **10**.

At the rear end of the panel a cut-out or opening **17** is provided, in the opposed side walls of which a shaft **18** is mounted. Pivotally mounted side by side on the shaft **18**, are shown three identical rockers **19**, commonly known as tone-changing levers. Each such rocker has a rounded head or body **20**, an elongated forwardly-extending arm **21** and a downwardly extending leg **22**, the latter two being preferably provided with frictionless extremities which may be rollers **23** and **23***a*, respectively, or ball bearings or the like.

Forward of the opening **17**, bracket arms **24** extend downward from the panel **10** and support a shaft **25** on which three identical plate-like stop members or stops **26**, also one for each string, are mounted pivotally; these members are preferably of the same thickness as, and lie in common vertical planes with, the rockers **19**. The rearwardly facing edge of each stop **26** provides an approximately V-shaped obtuse-angled notch **27** having a lower sloping side or surface **28** and an upper approximately vertical side or surface **29**, the base **27***a* of the notch being rounded. At its upper extremity the member **26** has a rearwardly extending projection or hook **60**. Each rocker **19** has a depending threaded lug or the like **30** to which with the aid of a screw **31** one end of a tensed resilient link **32** is secured; this link is shown made up of a turnbuckle **61** and a spring **62**. Each stop **26** has means, such as a hole **33** off-set from the shaft **25**, by means of which the free end of the spring **62** is attached thereto. Each link **32** thus lies in a common plane with one stop **26** and one rocker **19**.

Rearward, that is, on the right, FIG. 2, of each rocker **19** is a pair of partly dissimilar approximately Y-shaped cam members **34**, **35**, each member of which pair has approximately one-half the thickness of a rocker **19**. Each such pair of cam members lies in a common vertical plane with one rocker, but for the purpose of identification it may be considered that each member **34**, **35** of a pair is coplanar with a rocker. All the members **34** are identical to each other, and so are also the members **35**. Each member **35** has an upwardly and rearwardly extending arm **36**, and all the arms **36** are pivotally mounted on a shaft **37** positioned rearward of the opening **17** and supported in brackets **38**. The members **34** also have arms **36** identical to those on the members **35** and they also are pivoted on the shaft **37**. All the members **34**, **35** have their rear

edges preferably shaped concavely to provide cam-like surfaces, and they also have upwardly and forwardly extending stub arms indicated at **40** for the members **34** and **41** for the members **35**; the arms **40** are all identical to each other, as are also the arms **41** to each other. Except for their stub arms, the members **34** and **35** are all alike. In the embodiment illustrated, the bottom of the panel **10** has a gouge **63** to permit clearance of the upper ends of the members **26**.

The various movable elements discussed above are shown in their inactive or neutral positions. The stub arm **41** of each member **35** has a flat substantially planar cam surface **42** on its outer edge inclined at a rearwardly sloping upwardly extending angle, while the stub arm **40** has a flat substantially planar cam surface **43** inclined at a forwardly sloping upwardly extending angle. Each pair of members **34, 35**, being positioned directly behind a member **19**, is engaged by the extremity **23***a* of the leg **22** of that rocker. Thus, as illustrated, the extremity **23***a* of each leg **22** normally registers in and is constrained in an angular seat **64** formed by the two mutually adjacent stub arms **40, 41**, since the said extremity **23***a* has a sufficient width and is so positioned, FIGS. 7 and 9, as to lie partly in the plane of each of the two stub arms.

It is now apparent that upon swinging the member **35** clockwise, FIGS. 2 and 9, while member **34** remains stationary, the cam action of the edge **42** on the extremity **23***a* of leg **22** will swing the corresponding rocker **19** also clockwise. Normally, as seen in FIGS. 2 and 9, the "locking" position in which the extremity **23***a* is held in the angular seat **64**, FIG. 9, results in the extremity **23** of the arm **21** being held in normal neutral position such as is shown in FIGS. 2 and 8, registering in the rounded base **27***a* of the notch **27** of the stop member **26**. The tension of the link **32** maintains the stop **26** in engagement with the arm **21**. As the member **35** is swung clockwise to swing the rocker **19** clockwise, the extremity **23** of arm **21** will ride up the surface **29**, the hook **60** providing a limit stop to such movement.

Assuming, now, that the member **35** remains stationary while the member **34** of the pair swings clockwise, the extremity **23***a* which is in contact with the surface **43** of the stub arm **40**, will be raised to turn the rocker **19** counterclockwise, whence the extremity **23** of the arm **21** will ride down the surface **28** of the stop **26**. As shown, each of the strings **13, 14, 15** is passed around the head **20** of a rocker **19** and is anchored thereto at **45** in any desired manner.

One or more pedal-operated mechanisms or linkages are provided, two such being shown at **46** and **46***a*, actuated by pedals **47** and **47***a*, respectively. Since such mechanisms are common and function generally in a well-known manner, only the one shown at **46** will be described, briefly. A spring **48** normally retains the pedal in inactive neutral position, to which it is limited by a stopscrew **49**. Depressing the pedal causes the elongated rod **50** to move to the left, FIG. 2; a screw **51** provides a limit stop to the degree of depression of the pedal. The rod **50** is attached through a spring **52** to a rectangular frame **53**. Plate-like bracket arms **54** extend downward from the panel **10** on both sides of the pairs of members **34, 35**. The frame **53** is longitudinally slidably mounted in co-planar grooves **55** in the bracket arms **54**, both ends of the grooves being shown blocked by stops **56**. All of the members **34, 35** extend downward through the frame, as shown.

For each member **34, 35** of each pair of such members, a set screw **57, 58**, respectively, extends through the rear frame member or bar **59** of the frame **53** directly behind the cam member. Such screws are selectively and individually adapted to be screwed toward or away from the cam members. Assuming that the screws are in their respective positions shown in FIG. 3 and that the pedal **47** is depressed to pull the rod **50** to the left, then the lowermost screw **58** is set to engage the lowermost (FIG. 3) member **35** and tilt it clockwise. Hence, as previously described, the corresponding rocker **19** is turned clockwise to tighten the string **14** and thereby raise its pitch, the degree of such raise obviously being proportional to the distance the set screw has been screwed into the frame opening.

Assuming now that the relative positions of the said lowermost screw **58** and its immediately adjacent neighbor **57** are interchanged, then on moving the frame **53** to the left, only the screw **57** will engage and swing the corresponding cam member **34** clockwise, whence the rocker **19** will swing counter-clockwise and thus loosen the string **14** and lower its pitch. Thus each string may have its pitch selectively raised or lowered to any desired degree within the limits mentioned above. Upon release of the pedal **46** the normal tension of the resilient links **32** (**61, 62**) restores the rockers **19** and hence also the cam members **34, 35** and the stops **26**, to their normal neutral position.

A second identical frame **53***a* is shown in FIGS. 2, 4 and 7, similarly operable by the pedal **47***a*, and a third identical frame **53***b* is shown in phantom only in FIG. 2 to indicate how a plurality of such frames, all provided with set screws such as **57, 58** can be used to greatly increase the variations in pitch attainable on the strings of a single neck. For a two or three neck instrument, similar pitch varying means may be applied to each neck in an obvious manner. As previously mentioned, each instrument neck normally has more than the three strings illustrated and it is obvious how the instant invention may be applied to any instrument or neck regardless of the number of strings it possesses. Should it be desired to leave the pitch of any string unchanged from its basic tuning, both set screws **57, 58** which control such string are unscrewed a sufficient distance to prevent their engaging the corresponding cam member upon actuation of a pedal.

While the invention has been described with particular reference to the embodiment illustrated in the drawing, such is not to be construed as a limitation upon the invention which is best defined in the appended claims.

What is claimed is as follows:

1. A stringed musical instrument including a panel having a given number of playing strings thereon, tuning keys at the front end of the panel anchoring the front ends of said strings thereto and maintaining the strings tensed in normally tuned condition, said panel having an opening therethrough at the rear end thereof, a first transverse shaft extending across said opening, a number of rockers equal to said given number mounted side by side on said first shaft and having rounded heads protruding above the panel, the rear ends of said strings being anchored on said heads, a second transverse shaft positioned below and rearward of said first shaft, supports securing said second shaft to the panel, a number of cam members equal to twice said given number pivotally mounted on said second shaft, said cam members having approximately one-half the thickness of said rockers and being provided in pairs, each pair of said pairs lying in a common plane with one of said rockers, each of said rockers including a downward extension having a rounded extremity, the cam members of each of said pairs having cam surfaces in engagement with said rounded extremity on the rocker co-planar therewith, longitudinally movable first means for tilting said cam members in one rotational direction from a normal neutral position, one cam member of each of said pairs having the cam surface thereof shaped to tilt its co-planar rocker in said rotational direction to tighten the string anchored thereto upon movement of said first means in one longitudinal direction from a normal neutral position and the other cam member of each of said pairs having the cam surface thereof shaped to tilt said co-planar rocker in the opposite rotational direction to loosen said string upon movement of said first means in said one longitudinal direction, said first means including adjustable means for selectively engaging said first means with either one of each pair of cam members, spring-biased pedal-op-

erated means for moving said first means in said one longitudinal direction, and means for automatically tilting said rockers in the opposite rotational direction to restore the same and hence also said cam members to neutral inactive position upon release of said pedal-operated means.

2. A stringed musical instrument according to claim 1, said cam surfaces of each pair of cam members lying approximately at right angles to each other thereby forming an angular seat in which said extremity of said co-planar rocker normally registers.

3. A stringed musical instrument according to claim 1, said first means comprising a transverse bar positioned rearward of said cam members, said adjustable means comprising threaded openings through said bar provided with set screws therein, means constraining said bar to longitudinal movement, said threaded openings being equal in number to the number of said cam members and being positioned in the planes of the cam members, said one direction of said longitudinal movement being that in which said bar moves toward said cam members.

4. A stringed musical instrument according to claim 1, said first means comprising a rectangular frame positioned under said panel in a plane substantially parallel thereto, means constraining said frame to longitudinal movement, said cam members extending downward through the opening defined by the frame, said adjustable means comprising threaded openings in the rear side of said frame provided with set screws extending into said frame opening, said threaded openings being equal in number to the number of said cam members and being positioned in the planes of the cam members, said one direction of longitudinal movement being that in which said frame moves forward and hence said rear side of the frame moves toward said cam members.

5. A stringed musical instrument according to claim 1, said first means comprising a transverse bar positioned rearward of said cam members and at least one additional transverse bar positioned rearward of said cam members and spaced vertically from said first-named bar, means constraining said bars to longitudinal movement, said adjustable means comprising threaded openings through said bars provided with set screws therein, said threaded openings in each of said bars being equal in number to the number of said cam members and being positioned in the vertical planes of the cam members, said one direction of longitudinal movement being that in which said bars move toward said cam members, said pedal-operated means consisting of at least two separably operable means selectively operable upon said bars.

6. A stringed musical instrument according to claim 4, said means constraining said frame to longitudinal movement comprising plates extending downward from said panel and provided with grooves in the opposed walls thereof, said frame being slidably mounted in said grooves.

7. A stringed musical instrument according to claim 1, having a third transverse shaft positioned below and forward of said first shaft and supports securing the same to said panel, said third shaft having pivoted thereon a number of upwardly extending stop members equal to said given number, each stop member lying in the plane of one of said rockers and having an approximately V-shaped notch in the rear edge thereof, the notches being defined by a generally upwardly extending side and a generally downwardly extending side and a rounded base between said sides, each of said rockers having a forwardly extending arm having a rounded extremity registering in said notch, said means for tilting said rockers in said opposite rotational direction comprising tensed resilient links securing each said stop to its co-planar rocker to maintain said arm extremity normally in said base of the notch, said upwardly extending side of the notch having a rearward projection thereon providing a limit stop to the upward movement of said arm extremity thereon.

8. A stringed musical instrument including a panel having a given number of playing strings thereon, tuning keys at one end of the panel having one end of said strings secured thereto, a number of tone-changing levers equal to said given number at the other end of said panel having the other ends of said strings anchored thereto, a plurality of separate pedal-operated means, a separate means interposed between each of said pedal-operated means and all of said levers for selectively varying the tension on said strings, each of said separate interposed means including adjustable means for simultaneously increasing or decreasing the tension on all of said strings to pre-adjusted pitches which differ from each other upon actuation of any one of the pedal-operated means whereby upon actuation of any one of the pedal-operated means any group of said strings less than said given number may have their tension increased to a first set of pitches which differ from each other while simultaneously the remaining group of said strings may have their tension decreased to a second set of pitches which differ from each other and from said first set of pitches.

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