

April 4, 1939

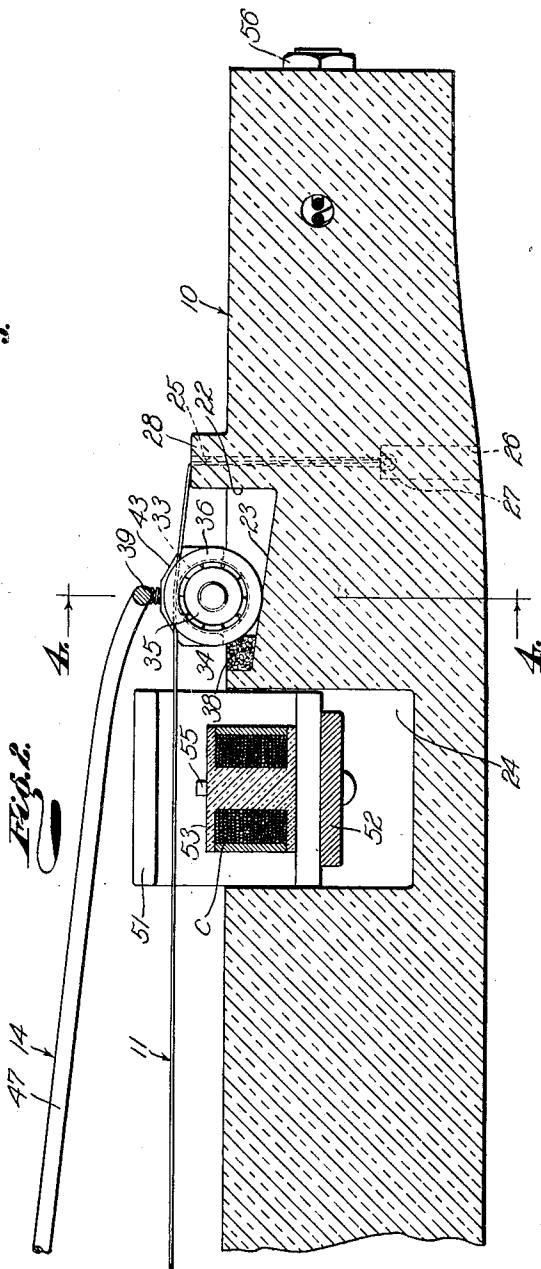
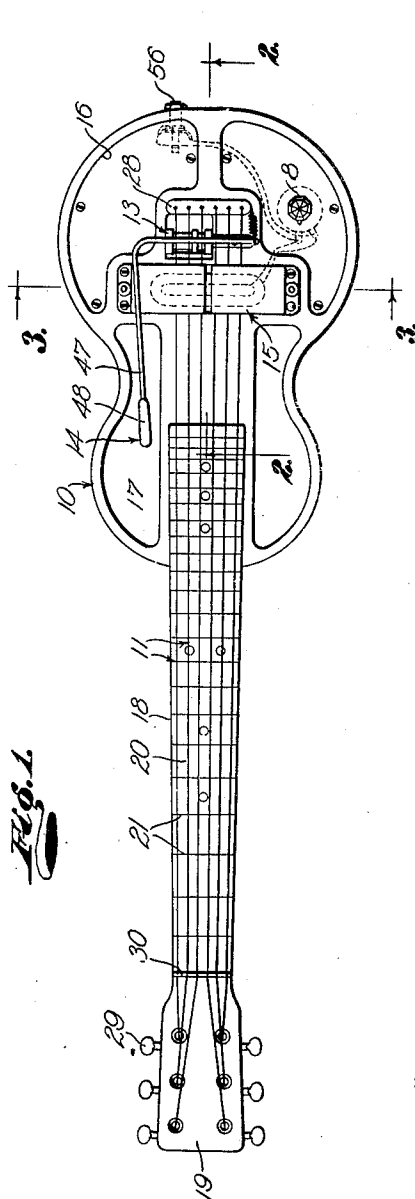
G. D. BEAUCHAMP

2,152,783

STRINGED MUSICAL INSTRUMENT

Filed May 26, 1936

2 Sheets-Sheet 1



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April 4, 1939.

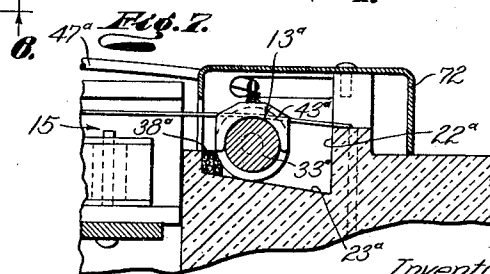
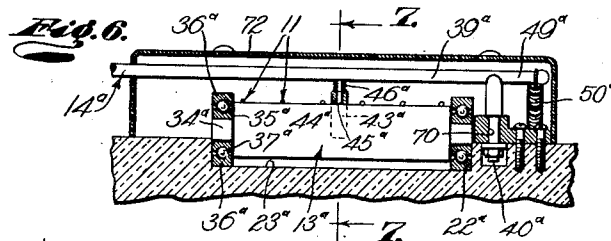
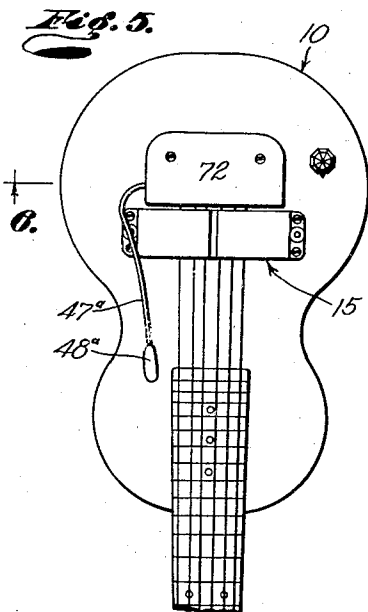
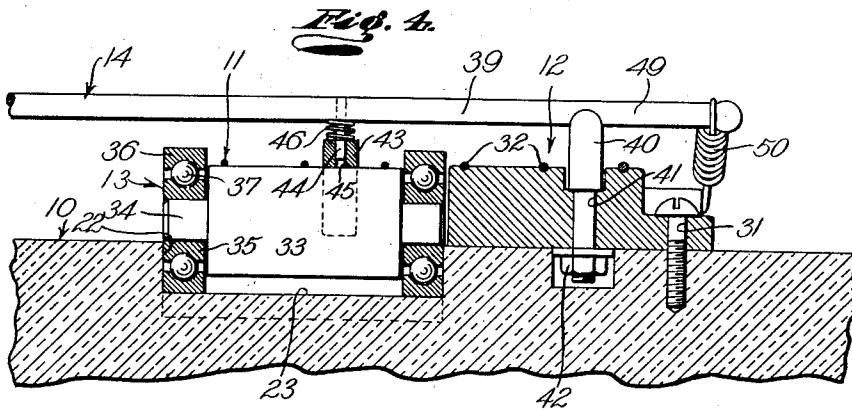
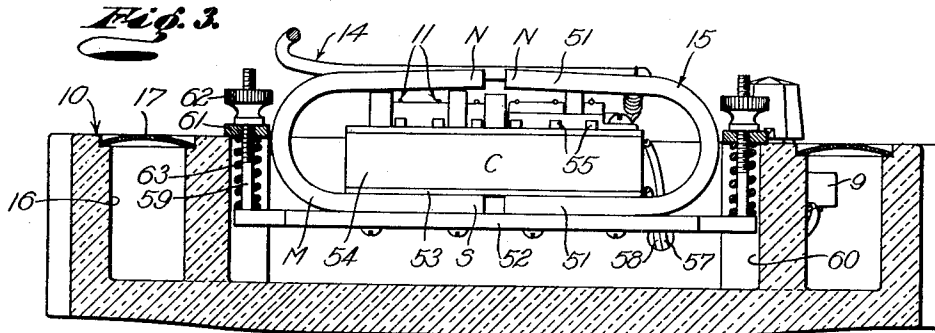
G. D. BEAUCHAMP

2,152,783

STRINGED MUSICAL INSTRUMENT

Filed May 26, 1936

2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,152,783

STRINGED MUSICAL INSTRUMENT

George D. Beauchamp, Los Angeles, Calif., assignor to Electro String Instrument Corporation, Los Angeles, Calif., a corporation of California

Application May 26, 1936, Serial No. 81,826

15 Claims. (Cl. 84—313)

This invention relates to musical instruments and relates more particularly to stringed musical instruments. A general object of this invention is to provide a practical stringed musical instrument embodying simple, novel means for producing a tremolo effect.

Another object of this invention is to provide a stringed musical instrument embodying a shiftable bridge on which the vibratory strings bear and means for shifting the bridge to create quavering or tremulous tones.

Another object of this invention is to provide a stringed musical instrument of the character mentioned in which the shiftable bridge is movable longitudinally or in the direction of the strings as well as in a direction transverse of the strings to produce a pleasing tremolo effect with little or no variation in the tension on the strings.

Another object of this invention is to provide a stringed musical instrument embodying means for producing a tremolo effect that may be conveniently operated or manipulated by the musician's hand employed to pluck or vibrate the strings.

Another object of this invention is to provide a stringed musical instrument of the character mentioned that is operable to produce a pleasing tremolo effect without noise and rattle and without varying the pitch of the vibratory strings beyond a desirable range of variation.

Another object of this invention is to provide a means for creating a tremolo effect in a stringed musical instrument that is suitable for embodiment in or application to an instrument embodying an electro-magnetic pick-up.

Another object of this invention is to provide a stringed musical instrument embodying means for varying the effective lengths of the several strings to create a tremolo effect on the several strings of the instrument.

A further object of this invention is to provide a device or appliance for producing a tremolo effect in a stringed instrument that is compact and inexpensive and that may be easily embodied in or applied to various types of stringed instruments.

The various objects and features of my invention will be fully understood from the following detailed description of typical preferred forms and applications of the invention, throughout which description reference is made to the accompanying drawings in which:

Fig. 1 is a plan elevation of an instrument embodying one form of the invention. Fig. 2 is an enlarged fragmentary vertical detailed sec-

tional view taken as indicated by line 2—2 on Fig. 1. Fig. 3 is a transverse detailed sectional view taken as indicated by line 3—3 on Fig. 1. Fig. 4 is an enlarged fragmentary detailed sectional view taken as indicated by line 4—4 on Fig. 2. Fig. 5 is a fragmentary plan elevation of an instrument embodying another form of the invention. Fig. 6 is an enlarged transverse or vertical detailed sectional view taken as indicated by line 6—6 on Fig. 5, and Fig. 7 is an enlarged fragmentary vertical detailed sectional view taken as indicated by line 7—7 on Fig. 6.

The means or apparatus provided by the present invention for creating a tremolo effect may be embodied in or applied to stringed musical instruments of various characters, for example, it may be used on banjos, guitars, mandolins, harps, pianos, etc., with or without pick-up means. In the following detailed description I will describe two typical forms of the invention as embodied in a guitar having an electro-magnetic pick-up of the character described and claimed in my co-pending application entitled Electrical stringed musical instrument, Serial No. 728,717, filed June 2, 1934. It is to be understood that the invention is not to be construed as limited or restricted to the specific forms or applications about to be described.

The instrument of the present invention illustrated in Figs. 1 to 4, inclusive, of the drawings, includes generally, a body 10, a plurality of vibratory strings 11 on the body 10, a stationary inner bridge 12 for certain of the strings 11, a movable inner bridge 13 for the other strings 11, means 14 for moving the bridge 13 to produce a tremolo effect, and an electromagnetic pick-up 15 responsive to or influenced by the strings 11 and operable to impose electrical modulations on an amplifying and speaker circuit to produce the tones of the vibratory strings 11.

The body 10 may be varied in construction and design without departing from the invention. In the typical embodiment of the invention illustrated in the drawings the body 10 is formed of Bakelite or the like, and has the general configuration of the usual guitar type of instrument. In practice the body 10 may be solid or integral and may be provided with several cavities 16 closed by ornamented or ornamental plates 17. The usual neck 18 projects from the body 10 and is provided at its outer end with a peg box portion 19. A suitable fingerboard 20 is provided on the neck 18 and has the usual frets 21. In accordance with the invention an opening or recess 22 is provided in the upper side of the body.

The recess 22 extends longitudinally of the body 10 and the strings 11 and has vertical or parallel side walls and an inclined bottom wall 23. The bottom wall 23 of the recess 22 is inclined downwardly and rearwardly as illustrated in Fig. 2. In the particular form of the invention being described the recess 22 is at one side of the central longitudinal axis of the body 10. A transverse opening 24 is provided in the upper side of the body 10 to carry the pick-up 15. The opening 24 is spaced forwardly of the recess 22 and intersects the central longitudinal axis of the body 10 and the series of strings 11.

The strings 11 are the tone producing or the tonal vibration producing elements of the instrument. Certain of the strings 11 may be of steel and the other strings may be the usual metal wound strings employed on guitars and the like. The strings 11 extend longitudinally across the fingerboard 20 and the upper side of the body 10. The inner portions of the strings 11 extend through substantially vertical openings 25 in the body 10. Sockets 26 in the bottom of the body 10 joint the openings 25. The usual spools 27 on the ends of the strings 11 cooperate with the bottom walls of the sockets 26 to anchor the inner ends of the strings 11 to the body 10. A tail piece ridge 28 projects from the upper side of the body 10 at the rear end of the recess 22. The strings 11 bear on and pass forwardly from the ridge 28. The string receiving openings 25 and sockets 26 and the ridge 28 eliminate the necessity for the usual tail piece for anchoring the inner ends of the vibratory strings 11.

The strings 11 are arranged in spaced relation in a substantially horizontal series. In the particular instrument illustrated there are six spaced strings, it being understood that there may be more or less strings, as desired. The strings 11 are graduated in diameter and those of small diameter may be of steel and those of larger diameter may be wrapped in the usual manner. Keys or pegs 29 are provided in the peg box portion 19 of the neck 18 to tension the strings 11. The strings 11 pass over and bear on a fixed bridge 30 at the outer end of the neck 18 and pass from the bridge 30 to the pegs 29. It is believed that it will be apparent how the strings 11 may be tensioned and tuned by means of the pegs 29.

The stationary bridge 12 is provided on the body 10 to be engaged by the bass strings or the heavy strings of the instrument. In the particular case illustrated three of the strings 11 bear on the relatively stationary bridge 12 and three of the strings bear on the movable bridge 13. The stationary bridge 12 is spaced forwardly from the tailpiece 28 being opposite or at the inner side of the recess 22. If desired the bridge 12 may be an integral projection or part of the body 10. As illustrated, however, the stationary bridge 12 is a separate part secured to the body 10 by suitable screws 31. The upper end of the bridge 12 is shaped for engagement by the strings 11. In the case illustrated the upper end of the bridge 12 is in the nature of a relatively narrow ridge having notches 32 for receiving the strings 11.

The movable bridge 13 is engaged by the three lighter or smaller strings 11 and is movable in the recess 22 to produce a tremolo effect during vibration of the strings. The bridge 13 is preferably in the form of a roller, drum or wheel and is adapted to be rolled longitudinally in the recess 22 by the operating means 14. The movable

bridge 13 includes a roller 33 cooperating with or forming a bridge support for the strings 11. The roller 33 is cylindrical having a cylindric exterior for shiftable engaging the three strings 11. The roller 33 is smooth and accurately finished to have a minimum of friction in its engagement with the strings.

In accordance with the invention anti-friction bearing means are provided to support the roller 33 for free movement in the recess 22. Axles or trunnions 34 project from the opposite ends of the roller 33. Inner rings or races 35 are rotatable on the trunnions 34. Outer races 36 surround the inner races 35. The opposing surfaces of the races 35 and 36 are suitably grooved to receive a series of balls 37. The races 35 and 36 preferably have flat ends for cooperating with the side walls of the recess 22. The outer races 36 have cylindrical peripheries for rolling on the inclined bottom wall 23 of the recess 22. The assemblies of the races 35 and 36 and the balls 37 form effective anti-friction wheel elements for supporting the opposite ends of the roller 33 in the recess 22. The outer ends or sides of the races 35 and 36 are adapted to cooperate with the side walls of the recess 22 to prevent or limit endwise movement of the bridge 13. The bridge 13 is formed and proportioned to have the upper surface of the roller 33 above the plane of the ridge 28 so that the tensioned strings 11 bear on it at all times. When the movable bridge 13 is at the forward end of the recess 22 its central longitudinal axis is longitudinally aligned with the stationary bridge 12. A stop 38 of felt or the like is provided at the forward end of the recess 22 to limit the forward movement of the bridge 13. It will be observed that the position of the bridge roller 33 in the recess 22 in effect determines the effective lengths of the strings or the lengths of the tone producing portions of the strings 11 bearing on the bridge 13. Movement of the bridge 13 in the recess 22 therefore varies the effective length of the three strings 11 engaging the bridge.

The means 14 for moving or shifting the bridge 13 is conveniently operable by the musician to vibrate or move the bridge 13 back and forth as he plucks or otherwise vibrates the strings. The means 14 includes a pivoted lever 39. The lever 39 may be pivotally supported on the body 10 in any practical manner. In the particular case illustrated in the drawings, the lever 39 has an arm or finger 40 pivotally carried in an opening 41 in or adjacent the outer end part of the bridge 12. A nut 42 or other suitable means may be provided on the inner end of the finger 40 to prevent its displacement from the opening 41. The lever 39 extends laterally or at substantially right angles to the finger 40 to pass across the upper sides of the strings 11 engaging on the movable bridge 13. The lever 39 carries or operates a yoke 43 which cooperates with the roller 33. A pin 44 projects from the lever 39 and is shiftable and pivotable in an opening 45 in the yoke 43. A spring 46 surrounds the pin 44 and is arranged under compression between the lever 39 and the yoke 43 to hold the yoke in proper engagement with the roller 33. The yoke 43 is shaped to engage about the cylindric periphery of the roller 33 to impart movement to the bridge 13 when the lever 39 is pivoted.

The lever 39 is provided with a handle or actuating arm 47. The arm 47 projects forwardly at the outermost side of the series of strings 11 relative to the musician. The outer end of the oper-

ating arm 47 is located to be adjacent the hand with which the musician plucks or vibrates the strings 11. A head or knob 48 may be provided on the forward or outer end of the arm 47 to be engaged by the musician. The knob 48 is such that it may be received in the under side of the hand to be easily gripped or grasped by the small fingers. It is preferred to provide means for holding the movable bridge 13 in a normal position to facilitate tubing of the instrument and to permit playing of the instrument without creating a tremolo effect. The means for holding the bridge 13 in a normal position may be in the form of a spring means. An arm 49 projects from the operating lever 39. A spring 50 is attached to the arm 49 and has an end suitably attached to the instrument body 10. The spring 50 acts to hold the lever 39 in a position where the bridge roller 33 bears against the stop 38. When in this position the bridge 13 is longitudinally aligned with the stationary bridge 12. The spring 50 serves to hold the movable bridge 13 against movement in its foremost or normal position until the bridge is deliberately moved by the player to create the tremolo effect.

The pick-up 15 is in the nature of an electromagnetic pick-up means responsive to or actuated by the tone producing vibrations of the strings 11 to produce a modulated electric current which may be amplified and reproduced as the musical tones by a suitable amplifying and loud speaker unit. The particular pick-up 15 illustrated is of the type fully described and claimed in my co-pending application above-identified. The pick-up 15 is arranged in the opening 24 of the body and includes a pair of opposed permanent magnets M. The magnets M are of the horse-shoe type and are arranged in end to end relation with their corresponding poles in spaced opposition, as illustrated in Fig. 3. The magnets M are substantially horizontally disposed to have their lower arms 51 below the strings 11 and their upper arms 51 spaced above the strings 11. The lower magnet arms 51 may rest on a plate 52 or electrical conducting non-magnetic material. The plate 52 is preferably adjustably supported in the opening 24 as will be subsequently described. The outer arms 51 of the magnets M extend transversely across the series of strings 11 in spaced relation thereto to carry the magnetic effect to the strings and to form a guard for the strings.

The pick-up 15 includes an induction coil C in the field of the pair of magnets M. The coil C comprises a spool 53 arranged between the inner and outer arms 51 of the pair of magnets M. The spool 53 is of suitable insulating and non-magnetic material and is oval or elongated in transverse cross section. The spool 53 is arranged to have its greatest transverse dimension extend longitudinally of the pair of opposed magnets M. A winding 54 of insulated wire is provided on the spool 53 to form the induction winding of the coil C. The gauge of the winding 54 and the number of turns of the winding are determined by the type of the amplifier and speaker unit with which the instrument is to be used.

Core members, or magnetic pole members 55 are provided to concentrate the magnetic force in non-uniform fields linked with the coil C. The members 55 may be in the form of pins or rods. The lower ends of the members 55 engage the lower arms 51 of the magnets M. The members 55 extend outwardly through openings in the spool 53 to have their outer ends in spaced rela-

tion to the strings 11. The upper ends of the members 55 are spaced directly below the strings 11. One of the members 55 may be engaged by the inner winding of the coil C which is exposed to have electric conducting cooperating with the member. The inner end of the winding 54 is thus electrically connected with the plate 52. The pole members 55 operate to concentrate the magnetic force in spaced zones or fields in the spaces between the ends of the members 55 and the outer arms 51 of the magnets M. The strings 11 pass through these concentrated magnetic fields and when vibrated vary the reluctance of the magnetic circuit to induce an electric current in the coil C.

The coil C is adapted to be electrically connected with a suitable amplifier and speaker unit (not shown) whereby the electrical current induced in the coil C by variations in the reluctance of the pick-up is imposed on the speaker unit to be converted into sound. The electrical current induced in the coil C has the frequencies and the other characteristics of the actual tone producing vibrations of the strings 11 so that the tones produced by the amplifier and speaker unit are truly representative of the tonal vibrations of the strings. As amplifying and loud speaker circuits and units are well known to those skilled in the art and as various forms of such units may be employed with the instruments of the present invention the amplifying and speaker unit has been omitted from the present disclosure. A socket or jack 56 is provided on the body 10 of the instrument to receive a plug from the amplifying and speaker unit. One lead or conductor 57 extends from the plate 52 to the jack 56 and a second lead 58 extends from the outer winding of the coil C to the jack 56 whereby the coil C may be electrically connected with a plug inserted in the jack 56. A suitable volume control 9 may be connected in one of the leads 57 or 58 to be conveniently controlled by a knob 8 projecting from the upper side of the body 10.

Means is preferably provided to adjust the pick-up unit relative to the vibratory strings 11 to obtain the desired operation of the pick-up. Pins 59 are fixed to the plate 52 adjacent its opposite ends and extend outwardly through openings 60 in the body 10. Washers 61 on the pins 59 bear on the upper side of the body 10. Nuts 62 are threaded on the pins 59 and bear against the washers 61. The nuts 62 operate to adjustably support the plate 52 and the pick-up unit. Springs 63 surround the pins 59 and are arranged under compression between the washers 61 and the plate 52 to maintain the nuts 62 in proper engagement with the washers 61. The nuts 62 may be simultaneously adjusted to bodily shift the pick-up 15 to move the ends of the members 55 toward or away from the strings 11. The nuts 62 may be individually manipulated to tilt or rock the pick-up unit 15 from one end or the other and thus obtain the desired adjustment of the pick-up.

It is believed that the operation of the instrument illustrated in Figs. 1 to 4, inclusive, of the drawings will be readily understood from the foregoing detailed description. The strings 11 may be plucked or vibrated in the usual manner and the vibration of the strings varies the reluctance of the magnetic circuit in the pick-up 15 to induce a current in the coil C which current is in turn converted into sound by the associated amplifier and loud speaker unit. If desired, the instrument may be played without shifting the

bridge 13 and, therefore, without creating quavering or tremulous tones.

When it is desired to produce a tremolo effect in the tones produced by the three strings 11 bearing on the bridge 13 the knob 48 is engaged or grasped to move or oscillate the arm 47. As above described, the knob 48 may be conveniently grasped by the small fingers of the musician's hand with which he plucks the strings 11. Vibration or movement of the arm 47 of course produces movement of the bridge 13 in the recess 22. As the bridge 13 is moved to and fro in the recess 22 the effective lengths of the strings 11 bearing on the bridge 13 are changed or varied to make the tones produced by the strings quavering or tremulous. Due to the inclination of the bottom wall 23 of the recess 22 movement of the bridge 13 in the recess 22 is accompanied by minimum variation in the tension on the strings 11. Accordingly the tremolo effect is produced by varying the lengths of the tone producing portions of the vibratory strings 11. It is believed that it will be apparent how the musician may manipulate the knob 48 to create the desired tremolo effect. The spring 50 normally holds the bridge 13 in position against the stop 38 where it is aligned with the stationary bridge 12. The bridge 13 is such that it may be moved or shifted with a minimum amount of friction and with no rattling of the strings 11. The roller 33 rotatably supported as above described, is free to turn at will while the bridge is moved in the recess 22. Thus when the bridge 13 is moved in the recess 22 the engagement of the strings 11 with the roller 33 may cause the roller to turn in a direction opposite to the races 35 and 36.

Figs. 5, 6, and 7 of the drawings, illustrate a form of the invention in which a single movable bridge 13^a is provided for the inner ends of the several strings 11 and may be vibrated or moved to produce tremulous tones. The instrument body 10^a may be the same as the body 10 described above, except that its recess 22^a is longer to extend transversely below the entire series of strings 11. The strings 11 may be strung in the same manner as in the previously described form of the invention and the instrument may embody an electro-magnetic pick-up 15 of the type described above.

The movable bridge 13^a is similar to the bridge 13 except that it is longer to support or form a bridge for the entire set of strings 11. The bridge 13^a includes a cylindrical roller 33^a having axles or trunnions 34^a on its opposite ends. Inner races 35^a are rotatable on the trunnions 34^a and are surrounded by outer races 36^a. Series of anti-friction balls 37^a are arranged between the races 35^a and 36^a. The outer sides of the races 35^a and 36^a are adapted to cooperate with the side walls of the recess 22^a to limit or prevent endwise shifting of the bridge 13^a. The peripheries of the outer races 36^a engage and roll on the inclined bottom wall 23^a of the recess 22^a. The bridge 13^a is proportioned to have the tensioned strings 11 bear on its roller 33^a irrespective of its position in the recess 22^a. A stop 38^a of felt or the like is provided at the forward end of the recess 22^a to limit the forward movement of the movable bridge 13^a. The several vibratory strings 11 bear on the single roller 33^a and as the bridge 13^a is moved in the recess 22^a the effective lengths of the strings 11 are varied so that a desirable tremolo effect may be produced.

The means 14^a for moving the bridge 13^a may be similar to the means 14 described above. A

lever 39^a extends horizontally across the series of strings 11 and has a finger 40^a pivotally supported in an opening 70 in the body 10^a. A yoke 43^a cooperates with the bridge roller 33^a. A finger 44^a on the lever 39^a pivotally and shiftably cooperates with an opening 45^a in the yoke 43^a. A spring 46^a is arranged under compression between the yoke 43^a and the lever 39^a to hold the yoke 43^a in engagement with the roller 33^a. An operating arm 47^a projects from the lever 39^a and has a handle or knob 48^a conveniently engageable by the musician. The knob 48^a may be engaged or grasped by the small fingers of the musician's plucking hand. An arm 49^a projects from the lever 39^a and a spring 50^a is connected with the arm 49^a and the body 10^a to normally hold the bridge 13^a against the stop 38^a. A guard or shield 72 extends over and covers the tremolo producing means of the instrument. The shield 72 is suitably secured to the body 10^a and extends substantially horizontally over the inner portions of the strings 11 and the recesses 22^a to enclose the apparatus for creating the tremolo effect. The operating arm 47^a projects forwardly under the shield 72 without interfering with the same.

The operation of the instrument illustrated in Figs. 5 to 7 inclusive of the drawings is substantially the same as that of the previously described form of the invention. If desired, the musician may play the instrument without manipulating the arm 47^a, in which case the bridge 13^a is held against the stop 38^a and remains stationary. When it is desired to produce quavering or tremulous tones the knob 48^a may be shifted or vibrated back and forth to move the bridge 13^a in the recess 22^a. This movement of the bridge 13^a varies the lengths of the tone producing portions of the strings 11^a to thus create the tremolo effect. Due to the inclination of the bottom of the recess 22^a the tension on the strings 11 remains substantially constant during the movement of the bridge 13^a. The single movable bridge 13^a may be shifted to create synchronized quavering or tremulous tones when the several strings 11 are vibrated.

Having described only typical preferred forms and applications of my invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any variations or modifications that may appear to those skilled in the art or fall within the scope of the following claims.

Having described my invention, I claim:

1. In a musical instrument having a tensioned vibratory string, apparatus for producing tremolo effects comprising, an element having bearing engagement with the string to define its effective tone producing length, an inclined surface supporting the element for compound movement in the direction of the longitudinal axis of the string and the direction of the force exerted on the element by the string, and means for moving the element on said surface.

2. In a musical instrument having a tensioned vibratory string, apparatus for producing tremolo effects comprising, an element having bearing engagement with the string to define its effective tone producing length, a part having a surface inclined with respect to the longitudinal axis of the string and supporting the element for compound movement in the direction of the longitudinal axis of the string and the direction of the force exerted on the element by the string, and means for moving the element, including a man-

usually operable part operatively associated with the element.

3. In a musical instrument having a tensioned vibratory string, apparatus for producing tremolo effects comprising, an element having bearing engagement with the string to define its effective tone producing length, a part having a surface inclined with respect to the longitudinal axis of the string and supporting the element for compound movement in the direction of the longitudinal axis of the string and the direction of the force exerted on the element by the string, means normally holding the element stationary, and means for moving the element.

4. In a musical instrument having a tensioned vibratory string, apparatus for producing tremolo effects comprising, a support extending longitudinally of and inclined with respect to the longitudinal axis of the string, a roller having bearing engagement with the string and movable on said support in the direction of the longitudinal axis of the string, and means for moving the roller.

5. In a musical instrument having a tensioned vibratory string, apparatus for producing tremolo effects comprising, a support extending longitudinally of and inclined with respect to the longitudinal axis of the string, a roller having bearing engagement with the string and movable on said support in the direction of the longitudinal axis of the string, spring means holding the roller against movement, and means for moving the roller on the support.

6. In a musical instrument, a movable bridge, a tensioned vibratory string bearing on the movable bridge, a support inclined with respect to the longitudinal axis of the string on which the bridge moves back and forth axially of the string, and means for moving the bridge axially of the string to vary the effective length of the string and thereby produce a tremolo effect, said means including, a manual lever, an operative connection between the lever and bridge, and a spring acting on the lever to hold the bridge in a normal position.

7. In a musical instrument, a tensioned vibratory string, a relatively stationary bridge for the string, a part inclined relative to the longitudinal axis of the string, a second bridge for the string shiftably supported on said part, the string having its effective vibratile portion extending between said bridges, and means for moving the second bridge on said inclined part toward and away from the first named bridge to vary the length of said effective portion of the string.

8. In a musical instrument having a tensioned vibratory string, apparatus for producing tremolo effects comprising, a movable element having bearing engagement with the string to define the length of its tone producing portion, means supporting the element for translation longitudinally of the string, and means for shifting the element longitudinally of the string.

9. In a musical instrument having a tensioned vibratory string, apparatus for producing tremolo effects comprising, a movable element having bearing engagement with the string to define the length of its tone producing portion, means supporting the element for translation longitudinally of the string, and a manual actuating part operatively connected with the element for shifting the element longitudinally of the string.

10. In a musical instrument having a tensioned vibratory string, apparatus for producing tremolo effects comprising, a support having a surface extending longitudinally of and inclined with respect to the longitudinal axis of the string, a bridge having bearing engagement with the string and movable along said surface and axially of the string, and means for moving the bridge on the surface axially of the string.

11. In a musical instrument having tensioned vibratory strings, the combination of, a support having a flat surface, a roller movable back and forth on the surface in the direction of the longitudinal axes of the strings and engaged by the strings, and means for moving the roller axially of the strings to produce tremolo effects.

12. In a musical instrument having tensioned vibratory strings, the combination of, a support having a recess, a roller engaging the strings, anti-friction means supporting the roller in the recess for movement therein in the direction of the longitudinal axes of the strings, and means for moving the roller axially of the strings to vary the effective lengths of the strings.

13. In a musical instrument having tensioned vibratory strings, the combination of, a stationary support having a supporting surface, a roller movable to and fro along the surface axially of the string and engaged by the strings to act as a bridge therefor, and means for moving the roller axially of the strings to produce tremolo effects, said means including a manual lever, and a yoke cooperating with the roller and movable by the lever.

14. A musical instrument comprising, a body having a recess, tensioned strings on the body extending over the recess, a roller movable back and forth on the bottom wall of the recess and engaging the strings to form a bridge therefor, the side walls of the recess guiding the roller for such movement, and means for moving the roller axially of the strings to produce tremolo effects.

15. A musical instrument comprising, a body having a recess, tensioned strings on the body extending over the recess, a bridge for the strings movable back and forth in the recess axially of the strings to change the effective lengths of the strings, the side walls of the recess guiding the roller for such movement, spring means normally holding the bridge against movement, and means for moving the bridge axially of the strings to produce tremolo effects.

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