

Dec. 31, 1935.

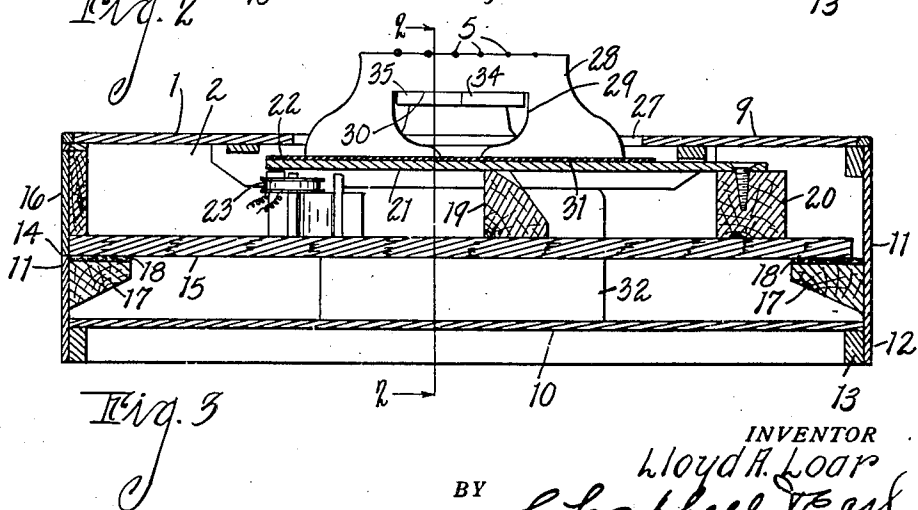
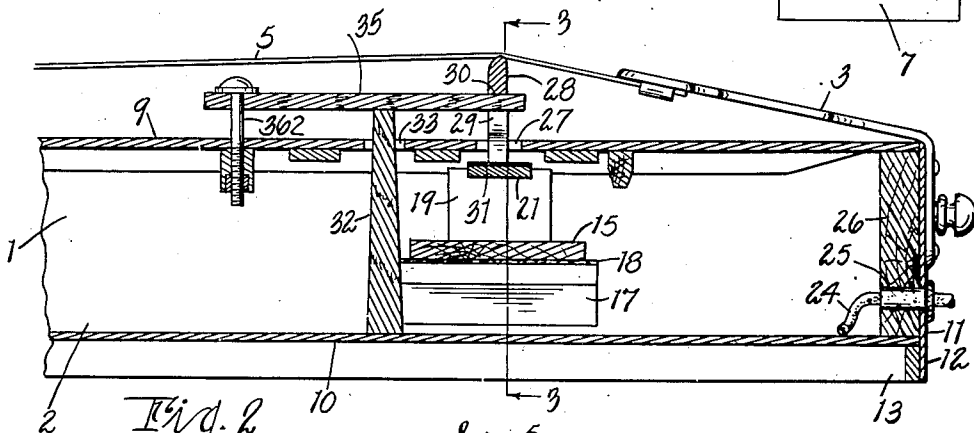
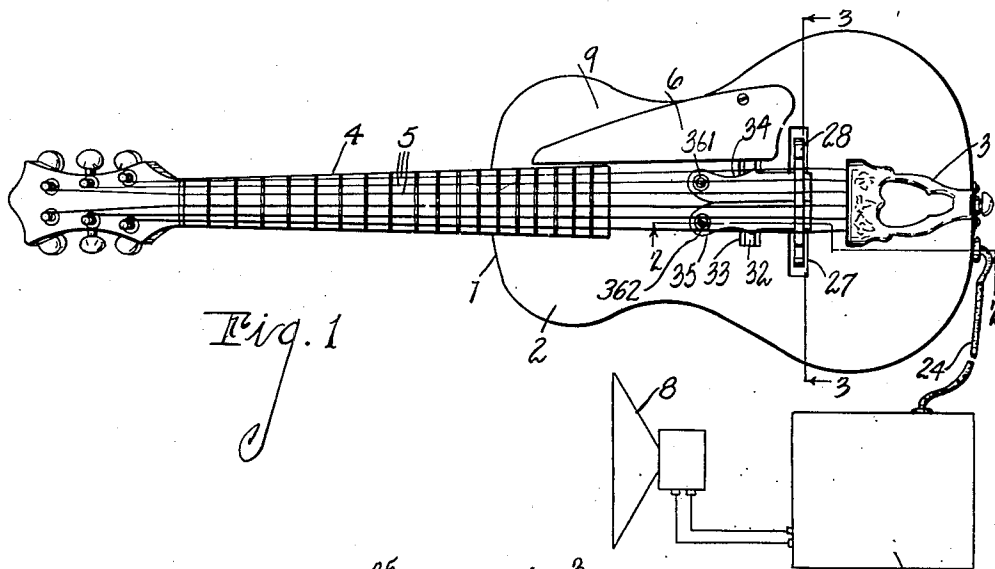
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2,025,875

STRINGED MUSICAL INSTRUMENT

Filed Jan. 27, 1934

2 Sheets-Sheet 1



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# UNITED STATES PATENT OFFICE

2,025,875

## STRINGED MUSICAL INSTRUMENT

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Application January 27, 1934, Serial No. 708,571

23 Claims. (Cl. 84—1)

My invention relates to musical instruments and more particularly to stringed instruments of the lute and viol type.

The main object of my invention is to provide an improved stringed instrument having an electrical pick-up associated therewith and means for adjusting the string bridge so that the instrument can be used either as a generator or a musical instrument or both.

Another object is to provide an improved bridge construction in an instrument of this character so that the vibration of the string bridge acts to vibrate both the belly sounding board and the back sounding board of the sound box simultaneously and oppositely relative to each other.

A further object is to provide means for supporting the string bridge clear of the sounding boards.

Objects relating to details and economies of my invention will appear from the description to follow. The invention is defined and pointed out in the claims.

A structure which is a preferred embodiment of my invention is illustrated in the accompanying drawings, in which:

Fig. 1 is a top plan view of a guitar embodying the features of my invention and an amplifier and loud speaker associated therewith, the latter being shown diagrammatically.

Fig. 2 is an enlarged fragmentary longitudinal section on a line corresponding to line 2—2 of Figs. 1, 3 and 4.

Fig. 3 is an enlarged transverse section on a line corresponding to line 3—3 of Figs. 1, 2 and 4.

Fig. 4 is an enlarged fragmentary view partially in section and partially in plan, the section being taken on a line corresponding to line 4—4 of Fig. 6.

Fig. 5 is an enlarged fragmentary top plan view of the parts with the armature or bridge support removed.

Fig. 6 is a fragmentary sectional view taken on a line corresponding to line 6—6 of Figs. 4 and 5.

In the embodiment of my invention illustrated by the drawings, numeral 1 indicates a guitar comprising a sound box 2, a tailpiece 3, a finger piece 4, and strings 5 connected between the tailpiece and the finger piece in the usual manner. A hand or finger rest is indicated at 6. The amplifier 7 and loud speaker 8 are of suitable construction, these parts being similar to or equivalent to a radio receiver.

The sound box 2 comprises a belly sounding

board 9 and a back sounding board 10, these parts being held in assembled spaced relation by means of the side wall 11. I preferably arrange the parts so that the lower edge 12 of the side wall extends over or below the back sounding board to provide a guard rim to prevent the clothing of the operator from coming in contact with the back sounding board. This projecting edge or flange 12 is backed up by the reinforcing member 13 mounted on the inner side thereof and in contact with the back sounding board.

In one side of the side wall 11, I provide a substantially rectangular drawer opening 14 for the drawer 15 which has a front panel 16 fittingly filling such opening. To support the drawer 15, I mount shelves or ledges 17, 17 on opposite inner sides of the side wall and with their upper surfaces on a level with the lower edge of the drawer opening. The upper surface of each shelf or ledge 17 is covered with a layer 18 of felt or other similar vibration absorbent material. An intermediate block or post 19 and an end block 20 are mounted on the drawer 15 at one side of its longitudinal center to carry the string bridge support 21 of magnetic material having a free end 22 overhanging the opposite side of the longitudinal center of the drawer.

The stator 23 of an electrical pick-up, in this case magnetic, is fixed to the drawer 15 in operative relation to the free end 22 of the string bridge support, the latter constituting the armature of the pick-up. The stator 23 of the pick-up is connected to the amplifier 7 by means of insulated conductors 43 in the conduit 24 which passes through an opening 25 provided therefor in the base 26 of the instrument. The stator 23 consists of a permanent magnet 44 of horseshoe shape fixed to the drawer 15 and having upright pole pieces 45 and 46 providing the core of a winding 47 mounted on the horseshoe magnet. The upper end of the pole pieces 45 and 46 are spaced from the free end 22 of the string bridge support to provide air gaps 48 and 49 variable in accordance with the vibration of the strings of the instrument. The permanent magnet provides a magnetic flux in a path passing through the pole piece 45, air gap 48, armature 22, air gap 49, pole piece 46, and permanent magnet 44. Thus, string vibrations are transmitted through the string bridge 28 to the armature 22, vibration of the armature in turn creating pulsations in the magnetic flux, resulting in the generation of electrical impulses in the winding 47. These electrical impulses are transmitted to the amplifier and loud speaker by

the conductors 43. In this way string vibrations are averted into sound.

The stator 23 and armature of the pick-up are arranged to form an electrical generator the operation of which is responsive to the vibration of the strings 5 of the instrument. The generated impulses are amplified by the amplifier 7 so that the loud speaker 8 produces a tone corresponding to that of the strings. The string vibrations are imparted to the armature of the pick-up through the string bridge 28. Thus, the string vibrations are transformed into a sound which is a true reproduction of the note set up by the vibration of the strings.

The belly sounding board 9 is provided with a transverse slot 27 for the passage of the string bridge 28 which is mounted on the support 21, the bridge having a relatively large aperture 29 dividing the lower half of the bridge and provided with an upper edge 30 arranged in parallel relation with the top of the bridge. A layer of felt 31 or other similar material is disposed between the string bridge and the support. With the parts thus arranged, the drawer 15 can be readily removed from the sound box by elevating the string bridge clear of its support.

On the back sounding board 10, I mount a back bridge 32 which extends upwardly through and clear of the transverse slot 33 provided therefor in the belly sounding board. On this back bridge 32 as a fulcrum, I mount a treble bridge lever 34 and a bass bridge lever 35 in side-by-side relation and extending into one end under the upper edge 30 of the aperture in the string bridge 28. I connect the opposite ends of the levers to the belly sounding board 9 by means of adjusting bolts or tension members 36, 36. By adjusting the tension members 36, the string bridge 28 can be lifted from the support 21 to any desired degree.

As the tension members 36, 36 are tightened, they press the levers 34 and 35 down on the back bridge 32 and lift the string bridge 28 from its position on the pick-up armature. By tightening the tension members sufficiently, all of the string pressure on the string bridge can be transferred to the back sounding board 10 through the back bridge 32 and to the belly sounding board 9 through the tension members. When this is done, the sounding boards amplify the string vibration and the pick-up device will receive none of it directly. With the parts adjusted in this manner, the instrument is playable as a conventional musical instrument. By changing the lever arms, the ratio of vibration imparted to the sounding boards relative to each other can be changed.

As the bolts 36, 36 are loosened, the string pressure is removed from the sounding boards and returned to the string bridge support or pick-up armature. With this adjustment, the sounding boards are practically inoperative and all of the string vibration directly controls the vibration of the pick-up armature. This construction permits many special adjustments to meet special occasions.

With the usual sound-board amplification, and a usual type pick-up on the sound board, unless the speaker is near the player, the tone from the speaker will be behind or lag behind that from the sound board. In the case of a listener, he will hear the tone from the source nearer to him first. If this difference of distances from the two sources is sufficient the total effect will be one of confusion, especially in rapid playing. The only way to avoid this with the usual type of instrument and pick-up is always to have the instru-

ment and loud speaker close together. In many cases this is not desirable.

With the usual type of pick-up used with no sound board or resonance structure, to mechanically amplify the tone the instrument is always dependent on the amplifier-speaker combination and an electric outlet to operate the amplifier for audibility.

My invention permits the instrument to be quickly adjusted to meet either situation.

For special occasions, where tone from both mechanical and electrical amplification is desirable, the tension members 361 and 362 are adjusted to provide string pressure on both the pick-up armature and sound boards 9 and 10. This condition could arise from broadcasting where the microphone is dispensed with and output of pick-up is introduced directly into the broadcasting amplifier from the pick-up. This arrangement avoids losses or distortion from the microphone and also permits broadcasting even where there is extraneous noise. For such broadcasting the player may wish to hear his playing clearly enough to guide his interpretation and do so without the use of a monitor speaker operated from the broadcasting station amplifier.

My invention also offers mechanical means to change the timbre of the instrument tone through the pick-up and independently of whatever such possibilities are offered by the pick-up construction. Thus, adjusting bolt 361 and lever 34 alone can put more or less treble string pressure on the pick-up armature, adjusting bolt 362 and lever 35 alone can put more or less bass string pressure on the pick-up armature. A corresponding variance in timbre of tone will result. This variety of adjustments has the same effect on the tone as that mechanically amplified by sound boards 9 and 10.

My invention makes possible (1) the use of mechanical amplification only, for string vibration; use of electrical amplification only; or use of both at the same time, (2) the use of mechanical amplification from two sound boards, forming the top and back of the instrument body, and with or without electrical amplification, (3) mechanical control of timbre of tone from pick-up amplifier-speaker device used with a stringed instrument, from a sound-board type instrument, and from an instrument using both sound board and electrical amplification for tone production from string vibration, and (4) transferring string pressure from armature bar of pick-up device to two sound boards so that all string pressure available is substantially borne by each board and in a direction to press them outwardly from the instrument body.

I have illustrated and described my improvements in an embodiment which I have found very practical. I have not attempted to illustrate or describe other embodiments or adaptations, as it is believed this disclosure will enable those skilled in the art to embody or adapt my improvements as may be desired.

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

1. A stringed musical instrument comprising a belly sounding board having a transverse string bridge slot and a transverse back bridge slot, a back sounding board, and a side wall coacting with said belly and back sounding boards to provide a sound box, a transverse drawer mounted on said side wall at opposite sides of said sound box and underlying said string bridge slot, spaced

posts on said drawer, a string bridge support mounted on said posts, an electrical pick-up operatively associated with said support within the sound box and comprising a stator fixed to said drawer and an armature constituted by a free end of said string bridge support, a string bridge mounted on said support to project through and clear of said string bridge slot and having an aperture dividing the lower half of the bridge and provided with an upper edge parallel with the top of the bridge, the bridge and one post being disposed medially of the support, and the stator and the other post being disposed at the ends of the support, a back bridge mounted on said back sounding board and projecting through and clear of said back bridge slot, a pair of treble and bass bridge levers mounted on said back bridge in side-by-side relation and extending at one end under the upper edge of the aperture in said string bridge, and adjustable bolts connecting the opposite ends of the bridge levers to the belly sounding board for lifting said string bridge relative to its support and at the same time establishing an operative connection between the string bridge and both sounding boards so that the latter are vibrated simultaneously and oppositely relative to each other by the vibration of said string bridge.

2. A stringed musical instrument comprising a belly sounding board having a transverse string bridge slot and a transverse back bridge slot, a back sounding board, and a side wall coacting with said belly and back sounding boards to provide a sound box, a transverse drawer mounted on said side wall at opposite sides of said sound box, spaced posts on said drawer, a string bridge support mounted on said posts, an electrical pick-up operatively associated with said support within the sound box and comprising a stator fixed to said drawer and an armature constituted by a free end of said bridge support, a string bridge mounted on said support to project through and clear of said string bridge slot and having an aperture provided with an upper edge parallel with the top of the bridge, the bridge and one post being disposed medially of the support, and the stator and the other post being disposed at the ends of the support, a back bridge mounted on said back sounding board and projecting through and clear of said back bridge slot, bridge levers mounted on said back bridge in side-by-side relation and extending at one end under the upper edge of the aperture in said string bridge, and adjustable means connecting the opposite ends of the bridge levers to the belly sounding board for lifting said string bridge relative to its support and at the same time establishing an operative connection between the string bridge and both sounding boards so that the latter are vibrated simultaneously by the vibration of said string bridge.

3. A stringed musical instrument comprising a belly sounding board having a transverse string bridge slot and a transverse back bridge slot, a back sounding board, and a side wall coacting with said belly and back sounding boards to provide a sound box, a transverse support member mounted on said side wall at opposite sides of said sound box, spaced posts on said support member, a string bridge support mounted on said posts, a string bridge mounted on said support to project through said string bridge slot and having an aperture provided with an upper edge parallel with the top of the bridge, the bridge and one post being disposed medially of the support, the other post

being disposed at one end of the support, an electrical pick-up comprising a stator mounted on said support member and an armature consisting of the free end of said support, a back bridge mounted on said back sounding board and projecting through said back bridge slot, a plurality of bridge levers mounted on said back bridge in side-by-side relation and extending at one end under the upper edge of the aperture in said string bridge, and adjustable tension means connecting the opposite ends of the bridge levers to the belly sounding board for lifting said string bridge relative to its support and at the same time establishing an operative connection between the string bridge and both sounding boards so that the latter are vibrated simultaneously and oppositely relative to each other by the vibration of said string bridge.

4. A stringed musical instrument comprising a belly sounding board having a transverse slot, a back sounding board, and a side wall coacting with said belly and back sounding boards to provide a sound box, a cross support member mounted on said side wall at opposite sides of said sound box, a string bridge support mounted on said support member at spaced points positioned medially and at one end thereof, a string bridge mounted on said support medially thereof and having an aperture, a back bridge mounted on said back sounding board and projecting through said slot, a plurality of bridge levers mounted on said back bridge in side-by-side relation and extending at one end under the upper edge of the aperture in said string bridge, adjustable tension means connecting the opposite ends of the bridge levers to the belly sounding board, and an electrical pick-up comprising a stator and an armature, the string bridge support being formed of magnetic material to constitute said armature, the stator being mounted on said support member under the free end of said armature.

5. A stringed musical instrument comprising a belly sounding board, a back sounding board, and a side wall coacting with said belly and back sounding boards to provide a sound box, a support member mounted on said side wall within said sound box, a string bridge support mounted at spaced points on said support member, a string bridge mounted on said support, a back bridge mounted on said back sounding board, a plurality of string bridge supporting levers mounted on said back bridge in side-by-side relation, and adjustable means connecting the bridge levers to the belly sounding board for lifting said string bridge relative to its support and at the same time establishing an operative connection between the string bridge and both sounding boards so that the latter are vibrated simultaneously and oppositely relative to each other by the vibration of said string bridge, the string bridge being disposed medially of said support, the latter having a free end composed of magnetic material, and an electrical pick-up stator mounted on said support member for coaction with said armature.

6. A stringed musical instrument comprising a belly sounding board, a back sounding board, and a side wall coacting with said belly and back sounding boards to provide a sound box, a string bridge support in said sound box, a back bridge mounted on said back sounding board, a string bridge supporting lever mounted on said back bridge, adjustable means connecting the bridge levers to the belly sounding board for lifting said string bridge relative to its support and at the same time establishing an operative connection

between the string bridge and both sounding boards so that the latter are vibrated simultaneously by the vibration of said string bridge, means supported by said side wall and acting to support said string bridge support at spaced points, one end of the support comprising the armature of a generator, and a stator fixed to said means for coaction with said armature.

7. A stringed musical instrument comprising a belly sounding board having a transverse string bridge slot, a back sounding board, and a side wall coacting with said belly and back sounding boards to provide a sound box, the side wall having a drawer opening in one side thereof, a pair of drawer shelves mounted on opposite sides of said side wall on a level with the lower edge of said drawer opening, a drawer disposed on said shelves and having a front panel filling the drawer opening, a pair of spaced blocks mounted on said drawer on one side of its longitudinal center, a string bridge support mounted on said blocks and having a free end overhanging one side of the longitudinal center of said drawer and constituting a pick-up armature, an electrical pick-up comprising said armature and a stator fixed to said drawer, a string bridge disposed on said support and projecting through said slot clear of the belly sounding board, and adjustable lever means associated with said belly and back sounding boards for lifting said string bridge from its support and forming an operative connection between the string bridge and sounding boards.

8. A stringed musical instrument comprising a belly sounding board having a transverse string bridge slot, a back sounding board, and a side wall coacting with said belly and back sounding boards to provide a sound box, the side wall having a drawer opening in one side thereof, a pair of drawer shelves mounted on opposite sides of said side wall on a level with the lower edge of said drawer opening, a drawer disposed on said shelves and having a front panel filling the drawer opening, a pair of spaced blocks mounted on said drawer on one side of its longitudinal center, a string bridge support mounted on said blocks and having a free end overhanging one side of the longitudinal center of said drawer and constituting a pick-up armature, an electrical pick-up comprising said armature and a stator fixed to said drawer, and a string bridge disposed on said support and projecting through said slot clear of the belly sounding board.

9. A stringed musical instrument comprising a belly sounding board having a transverse string bridge slot, a back sounding board, and a side wall coacting with said belly and back sounding boards to provide a sound box, a pair of shelves mounted on opposite sides of said side wall on a level, a beam disposed on said shelves, a pair of spaced blocks mounted on said beam on one side of its longitudinal center, a string bridge support mounted on said blocks and having a free end overhanging one side of the longitudinal center of said beam and constituting a pick-up armature, an electrical pick-up comprising said armature and a stator fixed to said beam, a string bridge disposed on said support and projecting through said slot clear of the belly sounding board, and adjustable lever means associated with said belly and back sounding boards for lifting said string bridge from its support and forming an operative connection between the string bridge and sounding boards.

10. A stringed musical instrument comprising a belly sounding board having a transverse string

bridge slot, a side wall coacting with said belly, a pair of shelves mounted on opposite sides of said side wall on a level, a beam disposed on said shelves, a pair of spaced blocks mounted on said beam on one side of its longitudinal center, a string bridge support mounted on said blocks and having a free end overhanging one side of the longitudinal center of said beam and constituting a pick-up armature, an electrical pick-up comprising said armature and a stator fixed to said beam, a string bridge disposed on said support and projecting through said slot clear of the belly sounding board, and adjustable means associated with said belly sounding board for lifting said string bridge from its support and forming an operative connection between the string bridge and sounding board.

11. A stringed musical instrument comprising a belly sounding board having a transverse string bridge slot, a back sounding board, and a side wall coacting with said belly and back sounding boards to provide a sound box, a string bridge support mounted on said side wall and having a free end constituting a pick-up armature, an electrical pick-up comprising said armature and a stator, a string bridge disposed on said support and projecting through said slot clear of the belly sounding board, and adjustable lever means associated with said belly and back sounding boards for lifting said string bridge from its support and forming an operative connection between the string bridge and sounding boards.

12. A stringed musical instrument comprising a belly sounding board, a back sounding board, and a side wall coacting with said belly and back sounding boards to provide a sound box, a support member mounted at its ends on said side wall within the sound box, a string bridge support mounted at spaced points on said support member, said support having a free end constituting an armature, an electrical pick-up comprising said armature and a stator mounted on said support member, a string bridge disposed on said support clear of the belly sounding board, and adjustable means associated with said belly and back sounding boards for lifting said string bridge from its support and forming an operative connection between the string bridge and sounding boards.

13. A stringed musical instrument comprising a sounding board, a side wall, a support member mounted at its ends on said side wall within the sound box, a string bridge support mounted at spaced points on said support member, said support having a free end constituting an armature, a string bridge disposed on said support clear of the sounding board, and adjustable means for lifting said string bridge from its support and forming an operative connection between the string bridge and sounding board.

14. The combination in a stringed musical instrument, of a body comprising front and rear sounding boards, the front sounding board having spaced bridge openings therein, a rear sounding board bridge mounted on the rear sounding board and disposed through one of said openings in said front sounding board, a string bridge disposed through the other opening in said front sounding board, an electrical pick-up device comprising an armature adapted to sustain the thrust of said string bridge, means supporting said armature medially and at one end thereof, and a stator carried by said means for coaction with the free end of said armature, a pair of string bridge supporting levers fulcrumed on said rear sounding board bridge and disposed in side-by-

side relation, and independently adjustable threaded tension members connecting the ends of said levers opposite the string bridge with the front sounding board.

5 15. The combination in a stringed musical instrument, of a body comprising front and rear sounding boards, the front sounding board having spaced bridge openings therein, a rear sounding board bridge mounted on the rear sounding board and disposed through one of said openings in said front sounding board, a string bridge disposed through the other opening in said front sounding board, an electrical pick-up device comprising an armature adapted to sustain the thrust of said string bridge, means supporting said armature medially and at one end thereof, and a stator carried by said means for coaction with the free end of said armature, a pair of string bridge supporting levers fulcrumed on said rear sounding board bridge, and independently adjustable members connecting the ends of said levers opposite the string bridge with the front sounding board.

25 16. The combination in a stringed musical instrument, of a body comprising front and rear sounding boards, a rear sounding board bridge mounted on the rear sounding board and disposed through an opening in said front sounding board, a string bridge disposed through an opening in said front sounding board, an electrical pick-up device comprising an armature operatively associated with said string bridge, means supporting said armature medially and at one end thereof, and a stator carried by said means for coaction with the free end of said armature, a pair of string bridge supporting levers fulcrumed on said rear sounding board bridge, and independently adjustable threaded members connecting said levers with the front sounding board.

40 17. The combination in a stringed musical instrument, of a body comprising front and rear sounding boards, a rear sounding board bridge mounted on the rear sounding board and disposed through an opening in said front sounding board, a string bridge, a pair of string bridge supporting levers fulcrumed on said rear sounding board bridge, and independently adjustable threaded members connecting said levers with the front sounding board, said threaded members and said string bridge being connected to opposite sides of said levers relative to said rear sounding board bridge.

50 18. The combination in a stringed musical instrument, of a body comprising front and rear sounding boards, a rear sounding board bridge mounted on the rear sounding board and disposed through an opening in said front sounding board, a string bridge disposed through an opening in said front sounding board, an electrical pick-up device comprising an armature operatively associated with said string bridge, means supporting said armature medially and at one end thereof, and a stator carried by said means for coaction with the free end of said armature, a pair of string bridge supporting levers fulcrumed on said rear sounding board bridge, and independently adjustable means connecting said levers with the front sounding board.

19. The combination in a stringed musical instrument, of a body comprising front and rear sounding boards, a rear sounding board bridge mounted on the rear sounding board and disposed through an opening in said front sounding board, a string bridge, a pair of string bridge supporting levers fulcrumed on said rear sounding board bridge, and independently adjustable means connecting said levers with the front sounding board, said last named means and said threaded members and said string bridge being connected to opposite sides of said levers relative to said rear sounding board bridge.

20. The combination in a stringed musical instrument, of a body comprising front and rear sounding boards, a rear sounding board bridge mounted on the rear sounding board and disposed through said front sounding board, a string bridge disposed through an opening in said front sounding board, an electrical pick-up device comprising an armature adapted to sustain the thrust of said string bridge, means supporting said armature medially and at one end thereof, and a stator carried by said means for coaction with the free end of said armature, a string bridge supporting lever fulcrumed on said rear sounding board bridge, and a threaded member connecting said lever with the front sounding board.

21. The combination in a stringed musical instrument, of a body comprising front and rear sounding boards, a rear sounding board bridge mounted on the rear sounding board and disposed through said front sounding board, a string bridge, an electrical pick-up device comprising an armature adapted to sustain the thrust of said string bridge, means supporting said armature medially and at one end thereof, and a stator carried by said means for coaction with the free end of said armature, a string bridge supporting lever fulcrumed on said rear sounding board bridge, and a threaded member connecting said lever with the front sounding board.

22. The combination in a stringed musical instrument, of a body comprising front and rear sounding boards, a rear sounding board bridge mounted on the rear sounding board and disposed through said front sounding board, a string bridge disposed through an opening in said front sounding board, an electrical pick-up device comprising an armature adapted to sustain the thrust of said string bridge, means supporting said armature medially and at one end thereof, and a stator carried by said means for coaction with the free end of said armature, a string bridge supporting lever fulcrumed on said rear sounding board bridge, and an adjustable member connecting said lever with the front sounding board.

23. The combination in a stringed musical instrument, of a body comprising front and rear sounding boards, a string bridge, an electrical pick-up device comprising an armature adapted to sustain the thrust of said string bridge, a string bridge supporting lever fulcrumed on said rear sounding board bridge, and an adjustable member connecting said lever with the front sounding board.

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