

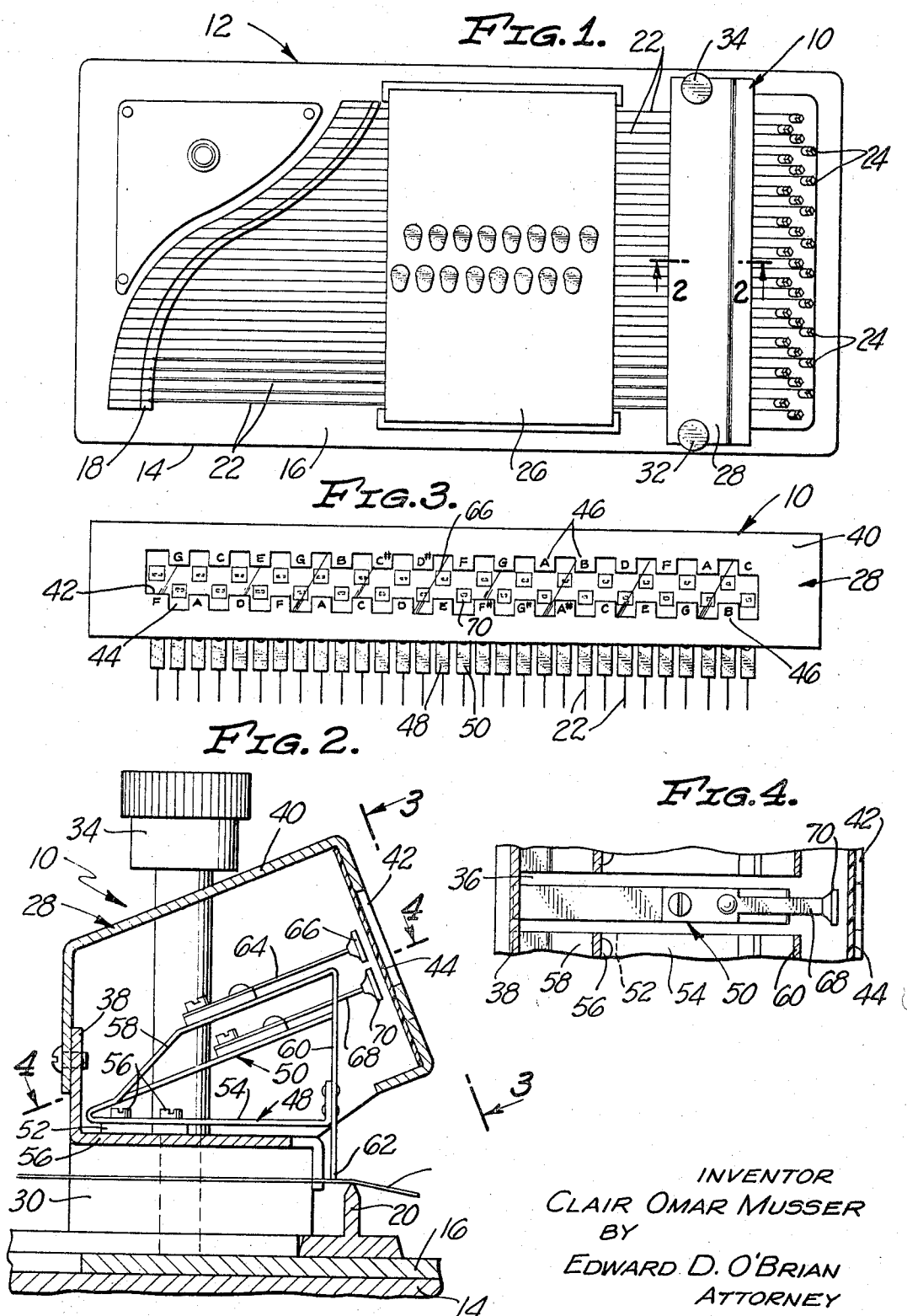
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VISUAL TUNER

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VISUAL TUNER

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9 Claims

ABSTRACT OF THE DISCLOSURE

This invention is directed to a visual tuner particularly useful for the tuning of stringed instruments. It has been found on stringed instruments that strings do not vibrate in the classic sinusoidal wave form over their full length, but adjacent the bridge thereof the string vibrates more in the nature of a reed or tuning fork. The visual tuner of this invention critically contacts the point of change from reed-like vibration to the traditional sinusoidal wave form portion of the string vibration. This juncture is considered an antinode. A flexible driver contacts each string at this antinodal point, and a tuned reed is mounted upon each flexible driver. Each tuned reed has a fundamental resonant frequency equal to the desired fundamental frequency of the particular string with which its driver is in contact. A plurality of drivers and reeds can be positioned along the instrument, adjacent the bridge, at the antinodal contact point, so that each string can be tuned by visually observing the vibration of its associated reed. Each reed varies in thickness, width, length and/or weight on its end in accordance with the desired fundamental frequency for which it is to resonate.

BACKGROUND

Stringed instruments are well known, and visual tuners resonating at the desired frequency in response to string vibrations have been previously proposed. However, previous reed type tuners have been ineffective because the antinodal point described above has not been recognized and has not been contacted by the previous vibrating structures. Thus, the antinodal point has not been previously recognized, and the criticality of contact at the antinodal point has not been recognized. For this reason, the present visual tuner is effective, while the previous vibrating reed tuners have been ineffective for accurate tuning.

DESCRIPTION

Accordingly, it is an object of this invention to provide a visual tuner which physically contacts a vibrating string at the antinodal point at the junction on the string between the portion having substantially reed-like vibration characteristics and the portion having substantially sinusoidal vibration characteristics and to provide a reed as a part of the contacting structure, which reed has a fundamental frequency equal to the desired fundamental frequency of the string being contacted so that when the string vibrates at the desired frequency, the reed is active. It is another object of this invention to provide a visual tuner which is inexpensive, trouble free and accurate so that the visual tuner may be economically applied to stringed musical instruments. It is a further object of this invention to provide a visual tuner which can provide accurate tuning by inexperienced instrumentalists. Other objects and advantages of this invention will become apparent from a study of the following portion of this specification, the claims and the attached drawings.

FIG. 1 is a top plan view of a chord harp showing the visual tuner of this invention in association therewith.

FIG. 2 is an enlarged partial section taken generally along the line 2—2 of FIG. 1.

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FIG. 3 is a reduced elevational view looking generally along the line 3—3 of FIG. 2.

FIG. 4 is a section with parts broken away taken generally along the line 4—4 of FIG. 2.

Referring now to the drawings, the visual tuner of this invention is generally indicated at 10. It is shown as mounted upon a chord harp 12. Chord harp 12 comprises rectangular main frame 14 which contains suitable resonance structure and which has a top 16. Bridges 18 and 20, see FIGS. 1 and 2, are secured to the top 16 and strings, generally indicated at 22, are tensioned across the bridges. Capstans 24 each have one end of one string wrapped therearound, so that turning of the capstans changes the tension in the associated strings to change the fundamental vibration frequency thereof. Thus, the harp 12 is sufficient to produce music. In addition to this structure, however, chording structure 26 is provided. Chording structure 26 has a plurality of push buttons on the top. Each of the push buttons operates selected string dampers. Thus, when one of the push buttons is depressed and all of the strings are energized by strumming, only the strings of the selected chord are free to vibrate. Thus, the select chord is heard. Different chords are selected by different push buttons.

Considering visual tuner 10, frame 28 is best seen in FIG. 2. Frame 28 has end legs, one of which is seen at 30, which extends down to engage upon top 16. Fasteners 32 and 34 extend through base plate 36 adjacent the legs and extend into the structure of main frame 14 so as to maintain the visual tuner 10 in place on the chord harp 12. The remainder of the visual tuner bridges across the strings 22. Base plate 36 has an upturned flange 38 to which cover 40 is secured. Cover 40 has a suitable window 42 in the front thereof so as to permit seeing of the reeds in the tuner 10. Window 42 may have transparent protective material 44 behind it so as to prevent physical access to the reeds of the tuner to thus prevent mechanical damage thereto. Furthermore, suitable indicia 46 may be marked upon the cover 40 adjacent the appropriate place in window 42 so as to identify the particular reeds.

A plurality of drivers are mounted upon base 36. Two of such drivers are shown in FIG. 2. Driver 48 is in contact with the nearest string 22 seen in FIG. 2, while driver 50 is associated with the next string beyond it. Each of the drivers is made of resilient material. Each of the drivers is separately mounted with respect to base plate 36. Mounting plate 52 is positioned upon base plate 36 and main bar 54 of driver 48 is secured thereto by means of screws 56. Support bar 58 extends upwardly from main bar 54 and forwardly toward window 42. Contact bar 60 is secured to bars 54 and 58 and extends downward below base plate 36 to contact strings 22.

As is previously indicated, the material of each of the drivers is resilient. The resiliency is sufficient to maintain contact by the foot 62 of contact bar 60 with strings 22 as the contact point moves in accordance to string vibrations. However, the resonance of driver 48 is far from the resonance of strings 22 so that it does not resonate therewith, but merely follows it. The contact pressure is sufficiently light and the mass is sufficiently small so that with the interaction of the reed upon driver 48, as is subsequently described, the string loading is absolutely minimal so that the pitch of the string is not thrown off of its desired pitch and its wave form is not affected. The distance between bridge 20 and foot 62 is critical, and is described in more detail hereinbelow.

Reed 64 is mounted upon support bar 58 so as to extend toward window 42. Reed 64 has the proper resiliency, width and length, as well as the proper weight 66 on its free end so that it vibrates at the desired frequency. Each of the reeds is arranged for vibration at its particular

desired frequency. This fundamental frequency, of course, corresponds to the fundamental frequency of the desired tone of the string with which its driver is in contact. Reed 64 is positioned so that weight 66 is visible through window 42, and corresponds to one of the upper row of weights visible in the window. Reed 68 is mounted on driver 50 so that its weight 70 is visible in the lower row. When energized at the correct frequency, these weights visibly vibrate to indicate that the string is in tune.

An important discovery which makes the present visual tuner operable, despite the failures of previous such structures, is the discovery that the strings do not vibrate throughout their entire lengths in the classical sinusoidal wave pattern. Such pattern is present in a major portion of their length, but at the portions adjacent the bridges, the strings vibrate more in the form of a reed or tuning fork. Of course, there is a juncture between the point where the reed type of vibration ceases and the sinusoidal vibrational wave form begins. It is at this juncture that the foot 62 is in contact with the strings. At this juncture the loading of the driver upon the string will not throw the string off of tune, providing that the driver loading is reasonably light. The relatively stable portion at the end of the string, in reed like vibration, is sufficiently stable for this purpose. Since maximum practical amplitude is desired, the end of this portion is the desired contact point. Furthermore, the thicker and heavier the strings the more the vibration resembles the reed mode, but in the particular instrument, which includes the weight, length and tension effects of the string to provide a particular tone, the end of the reed mode of vibration is farther away from the bridge in the higher notes than in the lower notes. In the type of instrument shown, the distance from the bridge to the end of the reed mode of vibration on the low F string, to the left end of FIG. 3, is .080" while for the high C, shown at the right end of FIG. 3, the distance is 0.94". Thus, the foot of the driver upon the low F string is .080" away from the bridge, while the foot of the driver for the high C string is .094" away from the bridge. While these particular dimensions refer to the particular instrument shown, it is considered critical for any instrument to position the foot of the driver at the point where the vibrational mode changes. This point may be located for any particular string by ear by determining where the driver 62 does not affect the note obtained from a particular string. This point may also be located in other manners.

This invention having been described in its preferred embodiment, it is clear that it is susceptible to numerous modifications and changes within the skill of the routine artisan and without the exercise of the inventive faculty. Accordingly, the scope of this invention is defined by the scope of the following claims.

I claim:

1. A visual tuner for a stringed musical instrument, said instrument having a body, two bridges mounted on said body so as to be spaced from one another, means for tensioning a string mounted on said body on the side of one of said bridges remote from the other of said bridges, and a string held under tension so as to vibrate at a desired frequency connected to said means for tensioning and extending across and between said bridges, said tuner having a reed which is tuned so as to resonate at said frequency, wherein the improvement comprises: said tuner including a driver, a portion of said driver being mounted on said body, said driver including a moveable foot forming a part thereof engaging said string substantially at the point where said string changes in vibrational mode from a substantially reed mode to a substantially sinusoidal mode when tuned to vibrate at said frequency and is vibrated, said foot engaging said string sufficiently lightly so as not to affect the pitch and waveform of said string, said tuned reed being connected to

said foot so that vibration of said string is transmitted through said moveable foot and to said reed so as to cause said reed to resonate when said string is held under the tension necessary for said string to vibrate at said frequency and is vibrated.

2. A visual tuner as claimed in claim 1 wherein said driver is resilient and said moveable foot is resiliently biased against said string.

3. A visual tuner as claimed in claim 1 wherein:

a plurality of means for tensioning are located on said body, and

a plurality of separate strings are held so that each extends between and across said bridges and is connected to one of said means for tensioning, and including a frame mounted on said body of said instrument, and

a plurality of said drivers, said drivers being mounted on said frame, each of said drivers having a moveable foot engaging one of said strings.

4. A visual tuner as claimed in claim 3 wherein each of said drivers are resilient and each of said moveable feet is resiliently biased against one of said strings.

5. A visual tuner as claimed in claim 4 wherein:

each of said reeds has an end attached to said driver and a free end, and a weight attached to its free end, said weights being readily visible so as to indicate visually when said reeds are resonating at the frequency of the strings to which they correspond.

6. A visual tuner, said visual tuner comprising a plurality of drivers, each of said drivers having one portion thereof fixedly mounted, each of said drivers having a foot adapted to be in contact with a string of a stringed musical instrument adjacent to and spaced from the bridge thereof, each of said drivers being resilient so that said foot and a portion of said driver vibrates in response to reed like motion of the string, a reed mounted on each of said drivers, said reeds being tuned to resonate at the desired frequency of the string controlled by the driver upon which it is mounted,

said tuner being mounted upon a stringed musical instrument having a plurality of strings, said strings being tensioned between first and second bridges, each of said drivers being in contact with one of said strings between said first and second bridges and adjacent said first bridge,

the distance between said first bridge and said foot of each of said drivers is substantially equal to the distance between said first bridge and the point on said string contacted where said string changes in vibrational mode from a substantially reed mode to a substantially sinusoidal mode,

the change in mode from substantially reed like vibrations to substantially sinusoidal vibrations of each of the strings varies between strings so that the distance from said bridge to said feet varies from string to string.

7. The visual tuner of claim 6 wherein a frame is mounted on said musical instrument, said frame bridging across said plurality of strings, said drivers being mounted on said frame above said strings.

8. The visual tuner of claim 7 wherein each of said reeds is weighted so as to make each of said reeds readily visible and of a convenient length for the desired frequency of resonance.

9. The visual tuner of claim 8 wherein said frame extends adjacent said weights on said reeds, and a window is provided in said frame adjacent said weights so that said weights are seen through said window.

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