Oct. 16, 1962 C. O. MUSSER 3,058,384

VISUAL TUNING DEVICE FOR STRINGED INSTRUMENTS

Filed June 29, 1959 2 Sheets-Sheet 1

FIG. 1.

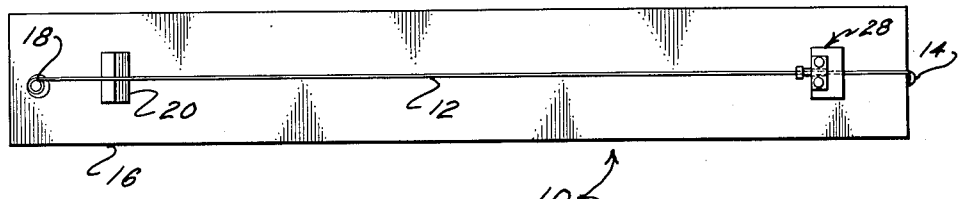


FIG. 2.

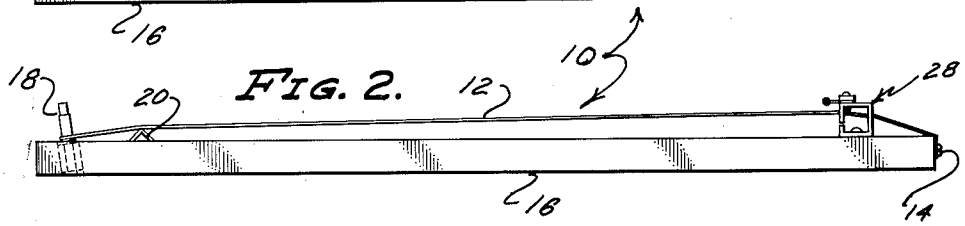


FIG. 3.

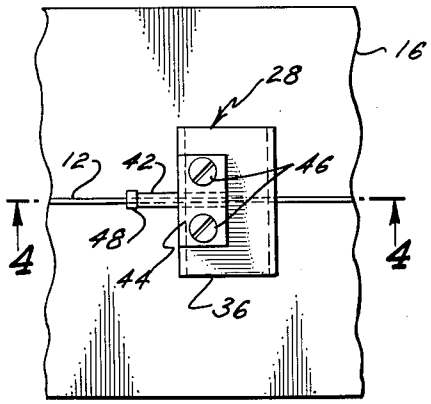
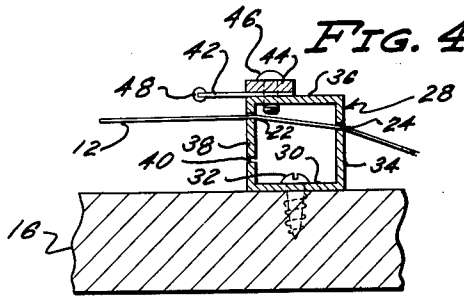


FIG. 4.



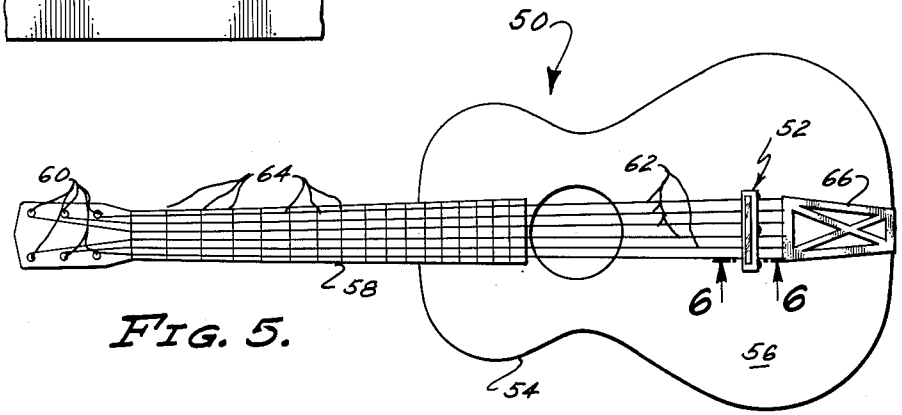


FIG. 5.

INVENTOR.
CLAIR OMAR MUSSER
BY
Edward D. O'Brien
ATTORNEY

Oct. 16, 1962 C. O. MUSSER 3,058,384

VISUAL TUNING DEVICE FOR STRINGED INSTRUMENTS

Filed June 29, 1959 2 Sheets-Sheet 2

FIG. 6.

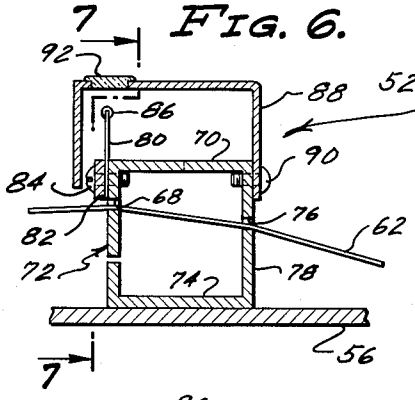
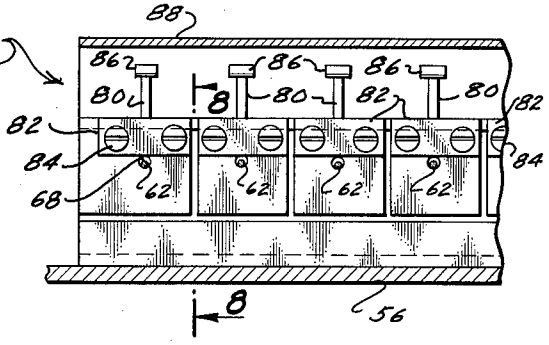


FIG. 7.



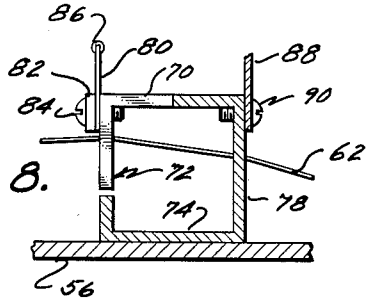


FIG. 8.

FIG. 11.

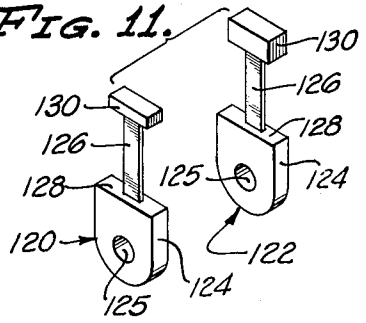


FIG. 9.

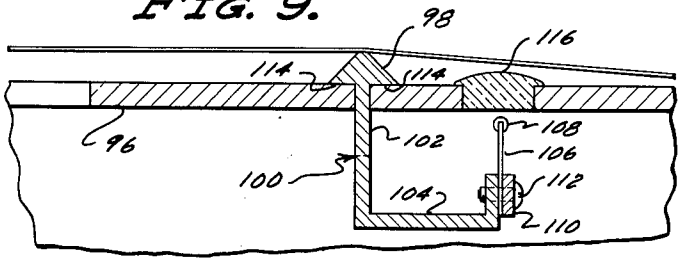
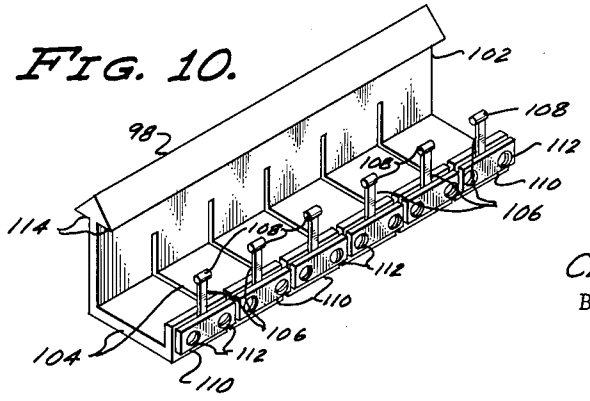


FIG. 10.



INVENTOR.
CLAIR OMAR MUSSER
BY
ATTORNEY

United States Patent Office 3,058,384 Patented Oct. 16, 1962

3,058,384

VISUAL TUNING DEVICE FOR STRINGED INSTRUMENTS

Clair Omar Musser, 12997 Blairwood Drive, Studio City, Calif.

Filed June 29, 1959, Ser. No. 823,666
3 Claims. (Cl. 84—454)

This invention pertains to visual tuners for stringed musical instruments.

The tuning of stringed musical instruments has always been regarded as a very serious matter. The average individual is normally regarded as being incapable of accurately tuning any such instrument because of a lack of proper auditory acumen. Even many professional musicians are incapable of accurately tuning stringed instruments for the same reason. The consequences of such inaccurate tuning vary, of course, with the extent of the inaccuracy. Practically every individual has on a number of occasions listened to music of an improper and disturbing character as a result of improperly tuned instruments.

Because of the fact that most individuals are incapable of accurately tuning by ear conventional stringed musical instruments a number of attempts have been made to provide devices capable of visual inspection in order to determine if such instruments are properly tuned. These prior visual tuners have relied upon reeds or rods fixed to some sort of a base or support so as to have a free end and a fixed end. In these prior devices one of these reeds or rods is generally provided for each of the strings of an instrument, and each of the reeds or rods is proportioned as to its length so as to vibrate sympathetically in accordance with the desired tuned frequency of a corresponding string of the instrument.

Visual tuners of this type are considered objectionable for a variety of reasons. One of these is that the frequency at which such a reed or rod will vibrate depends upon its length. Hence, such reeds or rods must vary considerably as to their lengths in many common types of stringed musical instruments. This obviously is inconvenient and impractical for many purposes. Further, the vibration of a reed or rod fixed at one end and having another free end is governed by a number of different physical limitations such as the inherent elasticity of the material from which such a reed or rod is manufactured. It is this elasticity which sustains the vibration in such a member.

As a result of the physical dimensions of such a reed or rod it will not vibrate exactly in the desired theoretical manner. This manifests itself by such a reed or rod dividing itself during vibration into a series of unequal ventral segments separated by various compound nodes. These effects are particularly evidenced at lower frequencies since comparatively long reeds or rods are more susceptible to the creation of compound nodes than are shorter reeds or rods.

An object of the present invention is to provide visual tuners for use in stringed musical instruments which are much more desirable and acceptable than the aforegoing and various related types of visual tuners known at the present time. A further object of the present invention is to provide visual tuners which are much more accurate than many prior devices of a similar character and which nevertheless may be manufactured and used in a stringed musical instrument at a comparatively nominal cost. A still further object of the present invention is to provide visual tuners for use in stringed musical instruments which are of a comparatively small size and which, as a consequent of this, may be easily incorporated within such instruments as an integral part of them without necessitating any "basic" changes in the structures of such instruments.

These and many other objects and advantages of this invention will be fully apparent to those skilled in the art to which this invention pertains from a detailed consideration of the remainder of this description including the appended claims and the accompanying drawings in which:

FIG. 1 is a top plan view of what may be referred to as an extremely simple embodiment of a stringed musical instrument embodying a visual tuner of this invention;

FIG. 2 is a side elevational view of this instrument;

FIG. 3 is an enlarged top plan view of the tuner employed in the instrument shown in FIG. 1;

FIG. 4 is a cross-sectional view taken at line 4—4 of FIG. 3;

FIG. 5 is a top plan view of a guitar including a visual tuner of this invention;

FIG. 6 is a cross-sectional view taken at line 6—6 of FIG. 5;

FIG. 7 is a cross-sectional view taken at line 7—7 of FIG. 6;

FIG. 8 is a cross-sectional view taken at line 8—8 of FIG. 7;

FIG. 9 is a side elevational view corresponding to FIGS. 4 and 6 of a modified visual tuner of this invention incorporated within a stringed musical instrument;

FIG. 10 is a perspective view of the visual tuner shown in FIG. 9; and

FIG. 11 is a perspective view of several plastic parts which may be used in a modified visual tuner of this invention.

The accompanying drawings are primarily intended so as to clearly illustrate several presently preferred forms or embodiments of this invention. It will be realized, however, that visual tuners as herein described may be constructed in a number of different manners as may be desired in using these tuners upon various different instruments, such as pianos, zithers, violins, or the like. Such modification or adaptation of visual tuners of the present invention can be made through the exercise of routine or conventional engineering skill with a minimum of difficulty following the principles of this invention set forth in this specification.

As an aid to understanding this invention it can be essentially stated in summary form that it involves visual tuners for use in stringed instruments having at least one string held under tension. In accordance with this invention such a string extends across a supporting bridge structure so that some tension is applied to this bridge structure by the string. With the visual tuners of this invention a resilient reed or spring is mounted upon such a bridge structure so as to have a free end located away from this bridge structure; this free end carries a counterbalanced head or weight. With this construction the combined reed and weight are proportioned and tuned so as to vibrate sympathetically with the corresponding string when this string is in tune and vibrates at the desired frequency.

The actual nature of this invention is best more fully explained by referring directly to the accompanying drawings. In FIGS. 1 to 4 of the drawings there is shown what may be considered a stringed musical instrument **10** of the present invention which has been designed so as to clearly illustrate the essential nature of a visual tuner as herein described. Strictly speaking the "instrument" **10** is not a conventional instrument at all, but is a simple structure containing a single string **12** which is capable of being actuated so as to vibrate at a desired frequency when bowed, plucked or struck. Thus, the instrument **10** is designed so as to produce a single note. It is further

designed to show how the basic principles employed in a visual tuner of the present invention can be embodied within virtually any type of stringed instrument, regardless of whether such an instrument is a zither, a violin, a guitar, a mandolin, a viola, a harp, a ukulele, a piano or the like.

In the instrument **10** one end of the string is immovably held by means of a small pin **14** mounted upon a board **16**. This board **16** can be considered a sounding board although for explanatory purposes it can be considered as a complete top of any conventional type of instrument. The other end of the string **12** is held by means of a conventional tuning pin **18** in such a manner that the tension upon the string **12** may be adjusted as may be required. In the instrument **10** this string **12** extends across a fixed, conventional bridge **20** which may, for purposes of understanding this invention, be considered as being the equivalent of a fret or the like upon a number of different types of conventional musical instruments.

The string **12** also extends through holes **22** and **24** in another bridge **28** forming a part of a visual tuner of this invention. It will be seen from an examination of the drawings that the tuned length of this string **12** when it is in tune corresponds to the distance between the top of the bridge **20** and the hole **22**. The bridge **28** has a generally square, cross-sectional configuration as indicated in FIG. 4 of the drawing. It includes a bottom side **30** designed to be attached to the board **16** by means of a small screw **32**. The hole **24** is formed in a back side **34** of the bridge **28**; the top side **36** of this bridge **28** connects the back side **34** with a front side **38** of it containing the hole **22**. This front side **38** is separated from the bottom side **30** by means of a slot **40**.

With this type of construction the string **12** is resiliently supported on the front side **38** in such a manner that vibrations of this string **12** are efficiently transmitted to the top side **36** of the bridge **28**. Preferably the bridge **28** is sufficiently rigid in character so that tuning of the string **12** through the rotation of the pin **18** does not cause the front side **38** to contact either the board **16** or the bottom side **30** of the bridge **20**.

In accordance with this invention vibrations from the string **12** are transmitted through the structure of the bridge **28** to a small, resilient, flat reed or spring **42**. The reed **42** is mounted upon the top side **36** so as to extend therefrom by means of a clamping plate **44** secured to this top side **36** by means of screws **46**. With this construction the reed **42** is in direct intimate contact with the surface of the top side **36**.

The reed **42** thus has both a fixed end held against the bridge **28** and a movable end located remote from this bridge **28**. In accordance with this invention, this movable end carries a counter-balanced head or weight **48**. Preferably this weight **48** is formed as an integral part of the reed **42** as by being cast of metal upon an end of this reed. The mass of the weight **48** is, in accordance with this invention, proportioned so that the entire reed **42** and the weight **48** structure extending from the bridge **28** sympathetically vibrates during vibration of the string **12** at a frequency corresponding to the desired tuned frequency of the string **12**.

This type of construction, while seemingly very simple, is extremely important, effective and advantageous. With this construction the weight **48** is easily visible and there is no problem in determining when the reed **42** is or is not vibrating so as to indicate that the string **12** is in tune. In order to increase its visibility the weight **48** may, of course, be colored. More important than this is the fact that it is possible to form the reed **42** and weight **48** structure so that this structure is of a comparatively small dimension and so that such structures can be used to accurately tune strings vibrating at virtually any frequency. As an example of this a series of small reeds and attached weights following the basic principles indicated in FIGS. 1 to 4 of the drawings designed to operate with strings vibrating at frequencies normally encountered in musical instruments have been constructed so as to all have uniform lengths of approximately 1 cm.

A very important factor with the construction of the reed **42** and the combined weight **48** lies in the manner in which this structure vibrates sympathetically at a desired frequency without vibrating at other than such a desired frequency. During such vibration of this structure a node is created at the point where the reed **42** is rigidly secured to the bridge **28** and another node is created between the weight **48** and the bridge **28**. In effect this means that the reed **42** vibrates during use in essentially a desired wave pattern and not as a conventional elongated reed or rod. As a result of this type of construction undesired nodes and ventral segments are not created during the use of a visual tuner as herein described. Hence, a simple tuning structure as indicated in FIGS. 1 to 4 of the drawings is extremely accurate. These tuning structures have been made so that strings of an instrument may be easily and conveniently tuned to within plus or minus .02 of a semitone. These results are considered to be phenomenal.

In FIGS. 5, 6, 7 and 8 of the drawings there is shown a guitar **50** incorporating a complete visual tuner **52** of this invention. The guitar **50** is basically of a conventional construction and includes a body **54** having a top **56**. From this body **54** there extends a neck **58** carrying at its ends a plurality of tuning pins **60**. These pins carry the ends of a plurality of strings **62** which extend across frets **64** on the neck **58** and across the top **56** of the body **54** and terminate in a tail piece **66** serving to hold these strings **62** in place.

With this invention each of the individual strings **62** passes through a hole **68** in a resilient arm **70** formed on an elongated, generally rectangular bridge structure **72**. These arms **70** extend from a base **74** of the bridge structure **72** which may be attached to the top **56** of the guitar **50** by an appropriate adhesive (not shown) or other equivalent means. It will be noted that each of the strings **62** passes through another hole **76** formed in a back side **78** of the bridge structure **72**.

Within the tuner **52**, flat, resilient metal reeds **80** similar to the reed **42** previously described are secured to the arms **70** by jeans of clamping plates **82** and screws **84** in substantially the same manner in which the reed **42** is secured in place in the instrument **10**. Each of the reeds **80** carries a counter-balanced head or weight **86**. These weights **86** differ from one another as to size so as to be capable of vibrating together with the attached reeds **80** at a desired frequency corresponding to the tuned frequencies of the adjacent strings **62**.

Preferably the tuner **52** includes a protective cover **88** attached to the back side **78** by means of screws **90**. This cover is provided with an elongated transparent window **92** so that the vibration of the reeds **80** and the attached heads **86** may be easily observed during a tuning operation and so that these parts of the tuner are protected at all times.

The tuner **52** is operated in essentially the same manner as the tuner **28**. Each of the reeds **80** and its attached head **86** is preferably proportioned so as to vibrate at the frequency of the string **62** passing through the arm **70** upon which this reed is operated. In accordance with the teachings of this invention it is preferred to form all the reeds **80** so that they are identical to one another, and to accomplish this proportioning by varying the mass of the heads **86** attached to them. During the use of the tuner **52** an individual string **62** is caused to vibrate as the tension upon this string is varied through the use of pins **60**. When a string is in tune, and only at this point, the corresponding reed **80** and head **86** will vibrate a substantial amount so as to indicate

that this string is properly in tune. Further, since the reeds **80** are flat and are mounted so as to be spaced in substantial alignment with one another they will vibrate in parallel planes and will not interfere with each other during such vibration.

In FIGS. 9 and 10 of the drawings there is shown a modified visual tuner **94** of the present invention mounted within the top **96** of a conventional stringed instrument such as a zither, a guitar, a violin or the like. This tuner includes an elongated, generally triangular shaped bar **98** forming a part of a bridge **100**. From this bar **98** there extends a plate **102**, the ends of which are formed so as to include a plurality of bent individual resilient arms **104**. Each of these arms carries at its free end a reed **106** to the free end of which there is attached a counter-balanced head or weight **108**. The weight of the weights **108**, of course, vary so as to allow the tuner to be used with strings capable of vibrating at different frequencies. The reeds **106** are secured to the arms **104** by means of plates **110** and screws **112** corresponding to the plates and screws **82** and **84** respectively.

The tuner **94** is preferably used so that shoulders **114** on the bar **98** rest against the top **96** and support the entire tuner in such a manner that the reeds **106** and heads **108** are located beneath the top **96** directly adjacent to an elongated, transparent window **116** mounted on the top **96**. With this construction a plurality of strings **118**, each corresponding to one of the reeds **106** extend across the exposed edge of the bar **98** in the established manner.

When any of the individual strings **118** are in tune and are caused to vibrate such vibrations result in sympathetic vibration of a corresponding reed **106** and head **108**. Since the reeds **106** are of a flat configuration and are mounted in substantially the same plane they do not interfere with each other as they vibrate, even though they are very closely spaced together. In tuning any one of these strings the tension on it may be adjusted until when it is vibrated this corresponding part of the tuner **94** automatically vibrates, indicating that the desired tuned state has been reached.

In FIG. 11 of the drawings there are shown several reeds **120** and **122** capable of being used with any of the embodiments of the invention previously discussed in place of the reeds, the heads on these reeds and the clamping plates used to hold them in position. Thus, it will be realized that the term "reeds" used in connection with the reeds **120** and **122** is employed in a broad generic sense.

These complete reeds **120** and **122** are designed to be molded completely out of known organic polymers such as are commonly used for many purposes. Both the reeds **120** and **122** include base plates **124** containing holes **125** which are adapted to be used in securing these reeds in place through the use of screws (not shown) so that the plates **124** are held firmly against a part of a bridge member in order to effectively transmit vibrations to flat, elongated reeds **126** of rectangular cross-section extending from surfaces **128** of the reeds **120** and **122**. The free ends of the reeds **126** carry counterbalanced heads or weights **130**.

The two reeds **120** and **122** differ as to the physical dimensions of these heads **130** so as to illustrate how reeds of the general type shown in FIG. 11 may be adapted to be used in tuning different strings of different frequencies. From an examination of FIG. 11 of the drawings it will be noted that the weight **130** on the reed **120** is smaller than the weight **130** on the reed **122**. This is because the reed **120** is adapted to be used in tuning strings at a higher frequency than the reed **122**. With both of the reeds **120** and **122** the total lengths of all of the complete structures shown are equal. Preferably all of the parts of these reeds **120** and **122** are also of equal dimension and weight in all respects except as to the weights of the heads **130** used upon them.

Those skilled in the art to which this invention pertains will realize that visual tuners as herein described constitute a decided advance in the art of musical instruments. Tuners of the categories indicated in this specification can be easily and conveniently used so as to accurately tune visually virtually any stringed musical instrument. It is also important that these tuners may be manufactured and installed in either new or existing instruments at a comparatively nominal cost, thus bringing accurate tuning within the financial reaches of virtually anyone using a musical instrument. In all the tuners herein described the strings employed bear against the bridges forming a part of these tuners in such a manner as to cause sympathetic vibrations to be transmitted through these bridge structures to the individual headed reeds used corresponding to a string employed. Because of the nature of this invention it is to be considered as being limited only by the appended claims forming a part of this disclosure.

I claim:

1. In a stringed musical instrument having a bridge and at least one tunable string extending across said bridge so as to bear against said bridge so that a portion of said string next to said point of engagement of said string with said bridge is capable of being vibrated during the use of said instrument, a tuning structure which includes:

a spring member operatively attached to said bridge so as to extend therefrom adjacent to each string on said instrument;

a weight operatively attached to each spring member at an extremity thereof remote from said bridge, each of said weights being tuned so as to cause the spring member carrying it to vibrate sympathetically during the vibration of the string adjacent to said spring member when this string vibrates at a desired tuned frequency;

a resilient arm formed on said bridge corresponding to each string on said instrument,

each string on said instrument bearing against said bridge adjacent to the resilient arm corresponding thereto, each spring member being attached to the resilient arm corresponding to the string which corresponds with such spring member so as to extend therefrom;

each string in said instrument bearing against a portion of said bridge remote from the resilient arm corresponding to it.

2. In a stringed musical instrument having a bridge and at least one tunable string extending across said bridge so as to bear against said bridge so that a portion of said string next to said point of engagement of said string with said bridge is capable of being vibrated during the use of said instrument, a tuning structure which includes:

a spring member operatively attached to said bridge so as to extend therefrom adjacent to each string on said instrument;

a weight operatively attached to each spring member at an extremity thereof remote from said bridge, each of said weights being tuned so as to cause the spring member carrying it to vibrate sympathetically during the vibration of the string adjacent to said spring member when this string vibrates at a desired tuned frequency;

a plurality of strings extending across and bearing against said bridge,

the spring member and the weight operatively attached thereto corresponding to each of said strings operatively attached to said bridge, each of said spring members and the weight operatively attached thereto corresponding to one of said strings;

said bridge extending into the interior of said musical instrument,

said spring members and the weights that are attached

thereto being located within the interior of said instrument, and

window means mounted on said instrument enabling said spring members and the weights attached thereto to be viewed from the exterior of said instrument.

3. In a stringed musical instrument having a bridge and at least one tunable string extending across said bridge so as to bear against said bridge so that a portion of said string next to said point of engagement of said string with said bridge is capable of being vibrated during the use of said instrument, a tuning structure which includes:

a spring member operatively attached to said bridge so as to extend therefrom adjacent to each string on said instrument;

a weight operatively attached to each spring member at an extremity thereof remote from said bridge, each of said weights being tuned so as to cause the spring member carrying it to vibrate sympathetically during the vibration of the string adjacent to said spring member when this string vibrates at a desired tuned frequency;

a plurality of strings extending across and bearing against said bridge,

the spring member and the weight operatively attached thereto corresponding to each of said strings operatively attached to said bridge, each of said spring members and the weight operatively attached thereto corresponding to one of said strings;

a resilient arm formed in said bridge corresponding to each of said strings,

each of said spring members being operatively attached to the one of said arms corresponding to the string which corresponds to the spring member operatively attached thereto,

said strings bearing against a part of said bridge remote from said arms.

References Cited in the file of this patent

UNITED STATES PATENTS

796,289	Brady	Aug. 1, 1905
841,384	England	Jan. 15, 1907
1,742,869	Mirfield	Jan. 7, 1930
2,681,588	Dyner	June 22, 1954

FOREIGN PATENTS

205,560	Germany	Jan. 4, 1909