June 20, 1967 A. J. PRICE 3,326,072

VIBRATO CONSTRUCTION FOR LUTE-TYPE MUSICAL INSTRUMENTS

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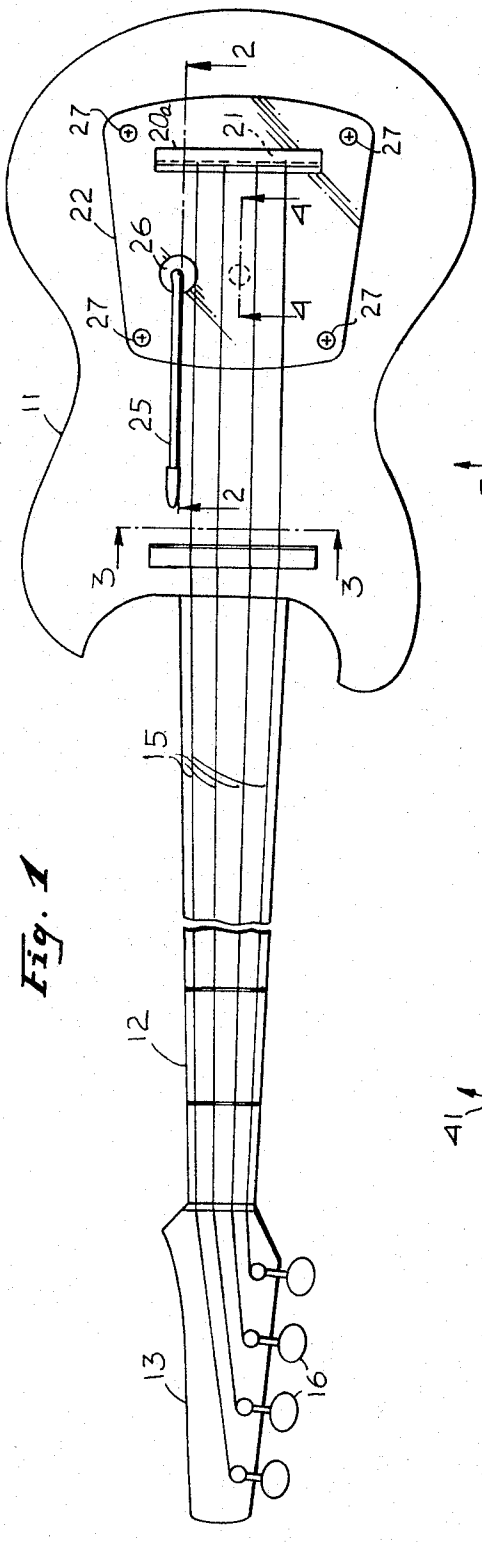



Fig. 1

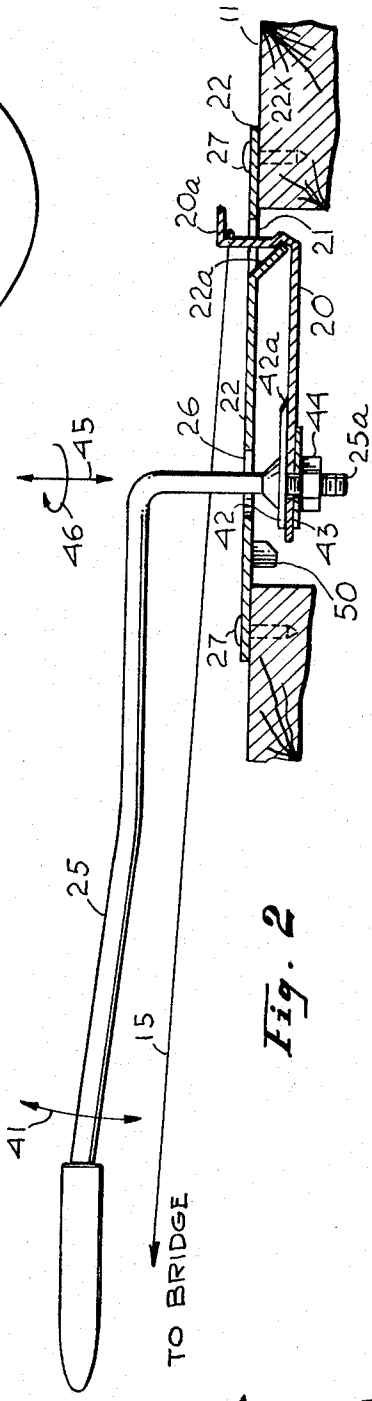



Fig. 2

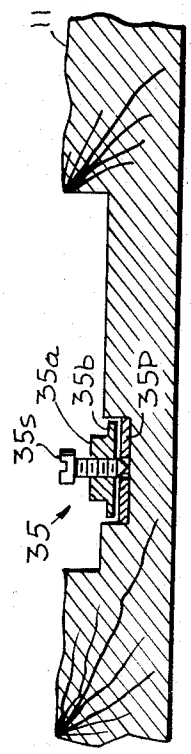



Fig. 4

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Fig. 3

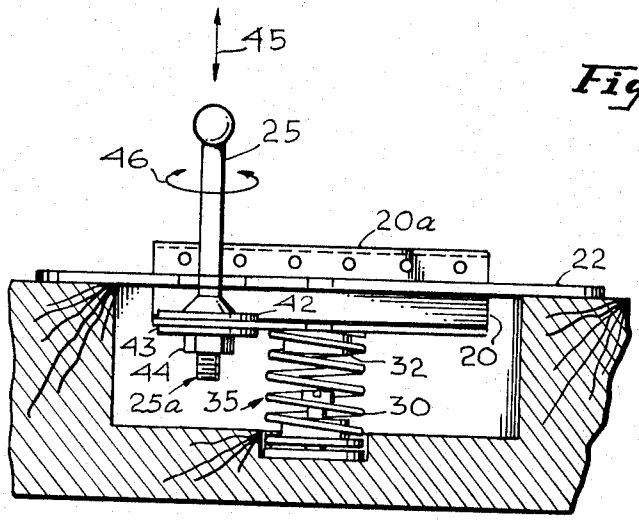
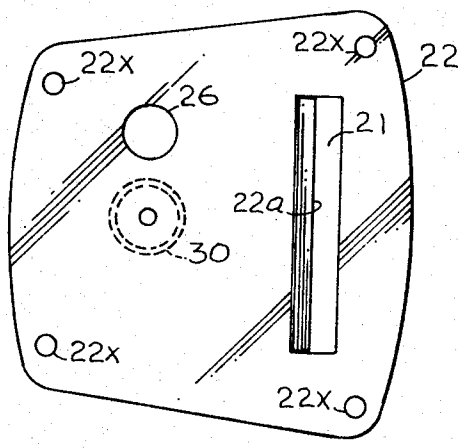



Fig. 5



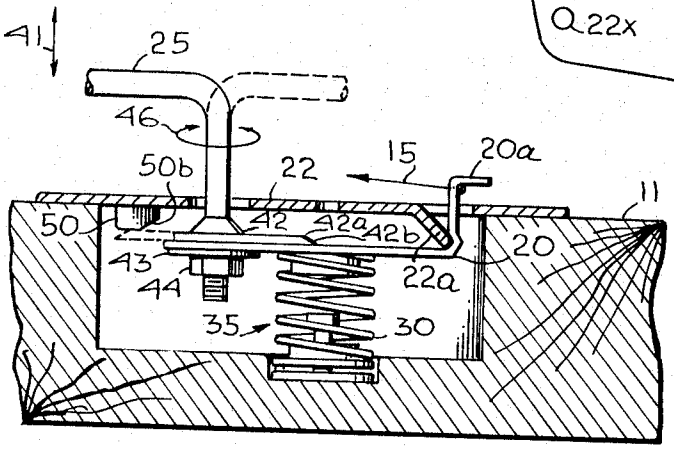




Fig. 6

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3,326,072

# VIBRATO CONSTRUCTION FOR LUTE-TYPE MUSICAL INSTRUMENTS

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This invention relates to a vibrato construction for a lute-type musical instrument and more particularly to improvements therein.

In presently known lute-type musical instruments with a vibrato construction, also known as a tremolo construction, some technique is generally employed wherein a spring plate, which is pivotable about a fulcrum, is positioned in a neutral position by counteracting the forces applied to the plate by the tuned strings which are coupled thereto with the forces applied by a biasing spring. A control arm is connected to the plate so that the player, by applying a force thereto, may controllably pivot the plate from its neutral position and thereby vary the tension on the strings. The change in the tension of the springs produces the vibrato effect, which is a corresponding raising and lowering of the tuned pitch of the strings.

It has been found that the task of tuning the instrument and/or replacing a string can be greatly simplified by incorporating, on the instrument, a member which is manually positionable to come in contact with the string plate in order to apply a counterbalancing force to the force applied by the spring so that the plate can be conveniently pivoted to its neutral position and lock in such a position, irrespective of the tensile forces of the strings. In the prior art instrument which incorporates such a member, the member is located on the top of the instrument under the plurality of strings, near the control arm which protrudes through an opening in the instrument's top plate.

While the basic principle of operation is sound, the technique of manually positioning a member located under a plurality of strings is quite unsatisfactory and awkward, since the player must insert his finger between the strings to locate the member in order to move it to the required locking position. Furthermore, for proper engagement, it is necessary to simultaneously depress the control arm in order to insure that the spring plate is properly associated with the member when the latter is in the desired locking position. The relative inconvenient location of the member under the strings coupled with the simultaneous double action that the player must perform, unnecessarily limit the advantages of the presently known vibrato construction.

Accordingly, it is an object of the present invention to provide a novel vibrato construction for a lute-type musical instrument which overcomes the disadvantages of the prior art.

Another object is to provide a new and relatively simple vibrato construction for a lute-type musical instrument with which a player can lock the string plate in a neutral position by operating on a single member only.

A further object of the present invention is to provide an improved vibrato construction with which a player can lock the string plate in a neutral position by applying forces only to the control arm, thereby minimizing the number of members which need be moved with respect to one another to properly lock the plate in the desired position.

Still a further object is the provision of a novel and simple vibrato construction for a lute-type instrument which greatly simplifies the operation of locking the string plate of the construction in a neutral position for convenient tuning or replacing a broken string.

These and other objects of the invention are achieved



by providing a vibrato construction for a lute-type musical instrument in which the control arm is designed to perform two functions. The first function is similar to that performed by the control arm in the prior art vibrato construction, namely applying a force to the string plate to pivot it about its fulcrum so as to change the tension on the strings to produce the vibrato effect. In addition, in accordance with the teachings of the present invention, the control arm which is coupled to the string plate is also rotatable thereabout. A stop means is integrally connected to the control arm so that whenever it is necessary to lock the string plate in its neutral position, the control arm is rotated about an axis of rotation to be described hereafter in detail, thereby rotating the stop means into a locking position which in turn locks the string plate in its neutral position. Thus, instead of having to depress the control arm and move a member with respect to the string plate in order to lock it in its neutral position, as is the case in the prior art, in accordance with the teachings of the present invention, the only thing necessary to lock the string plate in the desired position is to rotate the control arm from a playing position to a locking position, and thus accomplish the desired result.

The novel features that are considered characteristic of this invention are set forth with particularity in the appended claims. The invention itself both as to its organization and method of operation, as well as additional objects and advantages thereof, will best be understood from the following description when read in connection with the accompanying drawings, in which:

FIGURE 1 is a top view of a lute-type musical instrument with a vibrato construction;

FIGURE 2 is a side view along lines 2—2 in FIGURE 1;

FIGURE 3 is a side view along lines 3—3 in FIGURE 1;

FIGURE 4 is a side view along lines 4—4 in FIGURE 1;

FIGURE 5 is a top view of a top plate shown in FIGURE 1; and

FIGURE 6 is a simplified side view of the novel vibrato construction of the present invention.

Attention is now directed to FIGURE 1 which is a top view of a lute-type musical instrument, such as a guitar, incorporating a vibrato construction. The instrument has a body **11**, a neck **12** with a head **13**. A plurality of strings **15** is stretched or tensioned between tuning members **16** located on the head **13** and one end of a string plate **20** which forms a part of the improved vibrato construction of the present invention. The plate **20** protrues from the interior of the instrument body **11**, through an opening **21** in a cover plate **22**. Similarly, a control arm **25** protrudes through an opening **26** in the cover plate which is fastened to the body **11** by means of a plurality of screws **27** which protrude through openings **22***x*.

For a better understanding of the mode of operation of the vibrato construction and the improvements of the present invention, reference is made to FIGURES 2, 3 and 4 which are cross-sections along the lines 2—2, 3—3 and 4—4 respectively, shown in FIGURE 1. As seen from FIGURE 2, the strings **15** are coupled to end **20***a* of plate **20** which protrudes through the opening **21** in top plate **22**. The top plate **22**, the top view of which is shown in FIGURE 5, has a portion **22***a* (see FIGURE 2) bent downwardly to form a fulcrum about which string plate **20** pivots in an axis which is perpendicular to the strings. Thus the tensioned strings **15** apply to a force to the plate **20** which tends to pivot it about fulcrum **22***a* in a counterclockwise direction. To counteract this force, the vibrato construction includes a biasing spring **30** (FIGURE 3), which is supported at

one end by a nut-like member **32**, the latter being fastened such as by brazing to the string plate **20**. The bottom end of spring **30** is supported by an assembly **35** which will be described hereafter in conjunction with FIGURE 4.

Biasing spring **30** applies a force to the string plate **20**, tending to pivot it in a clockwise direction. In practice, the force applied by the spring **30** is adjusted by means of assembly **35** (FIGURE 3) to be equal and opposite to the force applied by the tensioned strings when the instrument is properly tuned. Thus, when the instrument is tuned, the string plate **20** is positioned in a neutral position. As seen from FIGURE 2, the control arm **25**, which protrudes through opening **26** in top plate **22**, is coupled to the string plate **20**. A player, by applying a force to the arm in the direction indicated by arrow **41**, alters the pivotal position of the string plate **20** from the neutral position, which in turn affects the tension on the strings. The latter phenomenon produces the vibrato effect. In the prior art vibrato construction, the control arm is integrally fastened to the string plate so that the only function of the arm is to vary the pivotal position of the string plate from the neutral position in order to produce the vibrato effect.

As is appreciated by those familiar with the art, once the instrument is tuned (by tensioning the strings), the equal and opposite forces applied to the plate by the tensioned strings and the biasing spring **30** will maintain the string plate in its neutral position. However, when a string breaks, the force applied by the strings decreases so that the net force on the plate tends to pivot the string plate in a direction which increases the tension in the remaining strings, thus detuning the instrument. This has been overcome in the prior art by moving a stop member towards the string plate to counteract the spring forces and position the plate in its neutral position irrespective of the forces applied by the strings. As herebefore discussed, the prior art technique of locking the plate in its neutral position is awkward and quite unsatisfactory, since its requires a player to manually operate on two parts which must be properly positioned with one another. Furthermore, one of the members is located underneath and between the plurality of strings, further complicating the movement thereof.

These disadvantages are overcome by the present invention in which the control arm **25** (FIGURES 2 and 3) is used to perform two functions. One function is similar to that performed in prior art vibrato constructions, namely producing the vibrato effect by pivoting the string plate about fulcrum **22***a*. In addition, the control arm in the present invention is rotatably mounted on the string plate **20** so that by rotating the arm, the string plate **20** can be conveniently locked in its neutral position.

For a better understanding of this novel aspect of the invention, reference is again made to FIGURES 2 and 3 wherein the arm **25** shown threaded at one end **25***a* is coupled to the plate **20** by means of an upper washer **42**, a lower washer **43**, and a fastening nut **44**. In practice, the nut is tightened so that the friction between plate **20** and washers **42** and **43** is sufficient to prevent the arm from rotating due to its own weight about an axis **45**. However, by manually applying a rotating force designated by arrow **46** in FIGURES 2 and 3, the arm **25** may rotate about axis **45**. When the arm rotates, washers **42** and **43** and nut **44**, which may be thought of as forming an integral part thereof, rotate therewith.

As seen from FIGURE 2, washer **42** is unsymmetrical about axis **45** so that when the arm is rotated from a playing position to a locking position which may amount to rotating the arm by a half turn or less, end **42***a* of washer **42** engages the bottom face of a stop member **50** which is fastened to the bottom face of top plate **22**. When the two elements are in engagement, the string plate **20** is prevented from further pivoting in a clockwise direction irrespective of the magnitude of the forces applied thereto by the spring **30** and tensioned strings **15**. In practice, the dimensions and relative locations of the stop member **50** and washer **42** are chosen so that when the two are in engagement, the string plate is in its neutral position.

From the foregoing, it should thus be appreciated that as long as the control arm is in a playing position, such as that shown in FIGURE 2, any force applied in the direction indicated by arrow **41** will vary the pivotal position of the string plate **20** to produce the vibrato effect. Then when a string breaks or the instrument is to be tuned, all that a player need do to lock the plate in the neutral position is rotate the arm to bring washer end **42***a* in engagement with stop member **50**. Thus, the locking of the plate is accomplished by operating on one member which is a basic part of the vibrato construction and is required with or without the locking feature of the construction. Furthermore, the ability to speedily lock the string plate by merely rotating or turning the control arm in a one-handed motion, greatly simplifies the player's task.

The basic mode of operation of the novel vibrato construction of the invention may be summerized in conjunction with FIGURE 6. It is assumed that the position of plate **20** represents its neutral position. This position is achieved by equalizing the force applied by spring **30** which tends to rotate the plate in a clockwise direction with the force applied by the tensioned strings **15**. As long as the arm **25** is in the position shown by solid lines, the instrument is in a playing state or position so that forces in the direction **41** vary the tension on the strings to produce the vibrato effect. To lock the plate **20** in its neutral position in order to either tune the strings or replace a string, the player merely rotates the arm to the position indicated by the dashed line so that washer end **42***a* and the bottom face of member **50** are in engagement. To facilitate the engagement of the two members, their respective faces are preferably bevelled as indicated by the diagonal lines **42***b* and **50***b*. Once the instrument has been tuned and/or a string replaced, the instrument is again placed in a playing state by rotating the arm to the position shown by the solid lines.

In order to compensate for varying string forces due to assorted gauges of strings and manufacturing tolerances of the biasing spring **30**, the vibrator construction includes the assembly **35** (FIGURES 3 and 4) by means of which the string plate may be located in the neutral position when the instrument is properly tuned or when using strings of varying string forces or springs of different tolerances. This is accomplished by supporting the bottom end of spring **30** (FIGURE 3) in the assembly **35** which, as seen from FIGURE 4, comprises a recessed washer-type member **35***a* having a neck **35***b* on which the bottom end of the spring is located. A screw **35***s* is threaded through the member **35***b* and supported by an end plate **35***p*. An opening in the nut-like member **32** (FIGURE 3) and another opening **22***s* in the top plate **22** (FIGURE 5) enables a player to reach the top of screw **35***s* through top plate **22**. By raising or lowering the screw **35***s*, the force applied by spring **30** on string plate **20** is adjustable to position the plate in the neutral position when the instrument is properly tuned.

There has accordingly been shown and described herein an improved vibrato construction for a lute-type musical instrument. It should be appreciated that those familiar with the art may make modifications in the arrangements as shown without departing from the true spirit of the invention. Therefore, all such modifications or equivalents are deemed to fall within the scope of the appended claims.

What is claimed is:

**1.** In a lute-type musical instrument having a plurality of tensioned strings thereon, an improved vibrato construction comprising:

a string plate in pivotal association with said instrument about a pivot axis, said string plate being connected

to said plurality of tensioned strings whereby said string plate is pivotable in a first direction about said axis, as a function of the force applied thereto by said tensioned strings;

resilient means in association with said string plate for counteracting the force applied thereto by said plurality of strings to position said plate in a neutral position about said pivot axis, the improvement comprising:

a control arm in association with said string plate for selectively varying the tension on said string by varying the position of said string plate about said pivot axis from said neutral position, said control arm being rotatable about a rotation axis from a playing position to a locking position; and

means integrally coupled to said control arm for counteracting the force applied by said string plate when said control arm is in said locking position to lock said string plate in said neutral position.

**2.** In a lute-type musical in instrument with a vibrato construction whereby the tension on the strings is selectively varied by changing the pivotal position of a string plate to which said strings are connected from a neutral position, said plate being pivotable about a pivot axis transverse to said strings, said construction including resilient means associated with said plate for counteracting the force applied to said plate by said tensioned strings to position said plate in said neutral position when said instrument is properly tuned, the improvement comprising:

a control arm in association with said string plate for selectively changing the pivotal position of said string plate, said control arm being rotatable about a rotation axis transverse to said pivot axis; and

stop means integrally fastened to said control arm for locking said string plate in said neutral position when said arm is selectively rotated to a predetermined locking position about said rotation axis.

**3.** In a vibrato construction for a lute-type musical instrument for producing a vibrato effect by selectively varying the position of a string plate to which the instrument's strings are connected from a neutral position with respect to a pivot axis about which said plate is pivotable, the construction including a biasing spring for counteracting the force applied to said plate by the strings when said instrument is tuned by applying a balancing force so as to position said plate in said neutral position, said construction further including a control lever in association with said plate to manually unbalance the forces applied by said strings and said biasing spring and thereby selectively change the position of said plate from said neutral position to produce said vibrato effect, the improvement comprising:

means for coupling said control lever at one end thereof to said string plate whereby said lever is rotatable about an axis aligned with said one end from a first position to a locking position, as a function of a manual force applied thereto; and

stop means integrally fastened to said one end of said lever for counteracting the force applied by said spring on said plate to lock said plate in said neutral position irrespective of the force applied by said strings when said lever is rotated to said locking position.



**4.** In a vibrato construction the improvement defined in claim **3** wherein said stop means comprise a washer-type member coupled to said lever, and an engageable member fastened within said instrument, whereby said washer-type member and said engagable member are physically engaged when said lever is in said locking position to prevent said spring from changing the position of said plate from said neutral position.

**5.** The improvement defined in claim **4** wherein said means for coupling said lever comprise a washer-type member in friction engagement with said string plate for maintaining said lever about said axis of rotation at a relatively stationary position in absence of a manual force being applied thereto.

**6.** In a lute-type instrument having a plurality of tunable strings tensioned thereon, an improved vibrato construction comprising:

a string plate in pivotal association with said instrument about a pivot axis, said string plate being connected to said plurality of tensioned strings, whereby the force applied to said plate by said tensioned strings pivots the plate in a first direction about said axis;

a biasing spring in association with said string plate for applying a selectable counteracting force to said plate to counteract the force of said tensioned strings to position said plate in a neutral pivotal position about said pivot axis when said tensioned strings are tuned;

a control arm having one end frictionally coupled to said string plate for selectively varying the tension on said strings to produce a vibrato effect by varying the pivotal position of said string plate about said pivot axis from said neutral position, said control arm being rotatable about an axis of rotation to a locking position as a function of a manual force applied thereto, said axis of rotation being aligned with said one end of said control arm; and

a member integrally coupled to said control arm at said one end and in friction engagement with said string plate, said member being rotatable together with said control arm to said locking position to counteract the force applied by said biasing spring to said spring plate and lock said plate in said neutral position.

**7.** In a lute-type instrument the improved vibrato construction defined in claim **6** further including means coupled to said control arm, and in friction engagement with said string plate, for maintaining said arm at a relatively stationary position about said axis of rotation in the absence of said manual force being applied thereto.

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