Aug. 4, 1964 C. L. FENDER 3,143,028

ADJUSTABLE NECK CONSTRUCTION FOR GUITARS AND THE LIKE

Filed Aug. 26, 1963

2 Sheets-Sheet 1

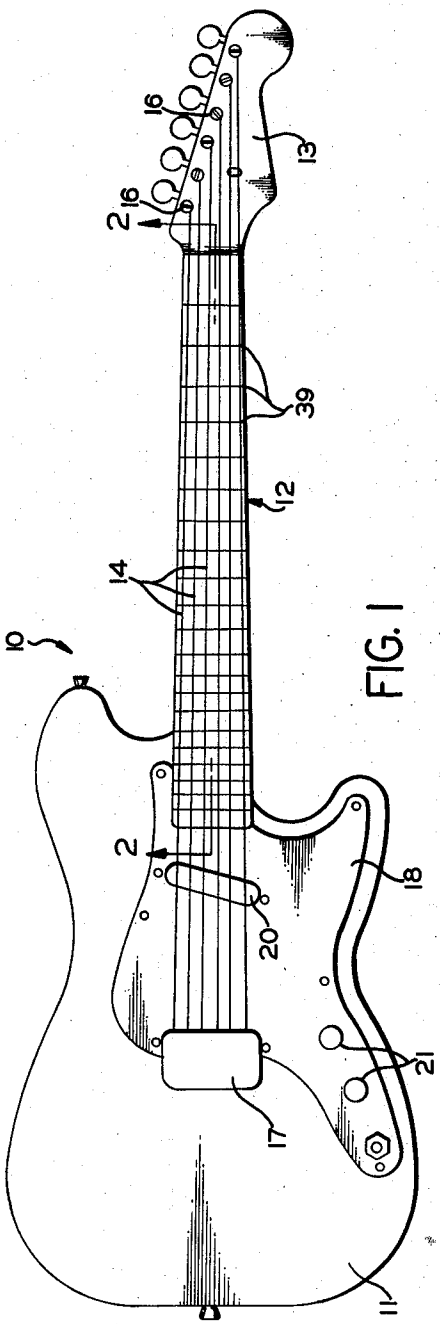

FIG. 1

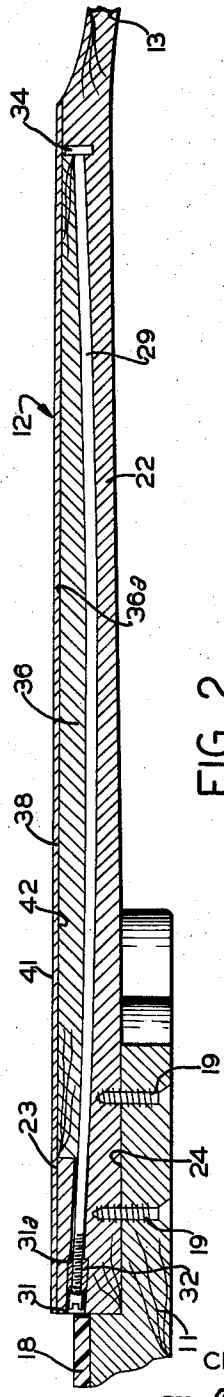

FIG. 2

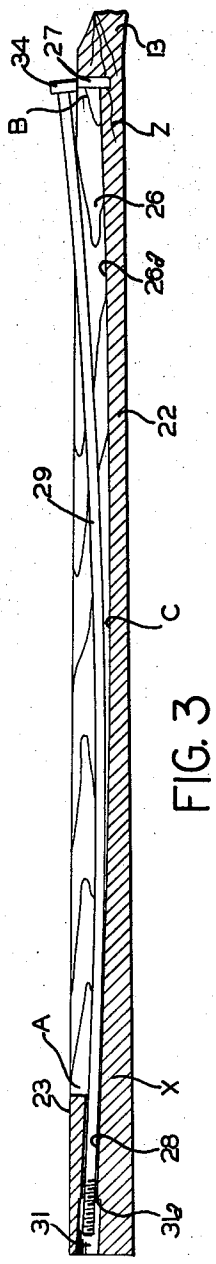

FIG. 3

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ADJUSTABLE NECK CONSTRUCTION FOR GUITARS AND THE LIKE

Filed Aug. 26, 1963 2 Sheets-Sheet 2

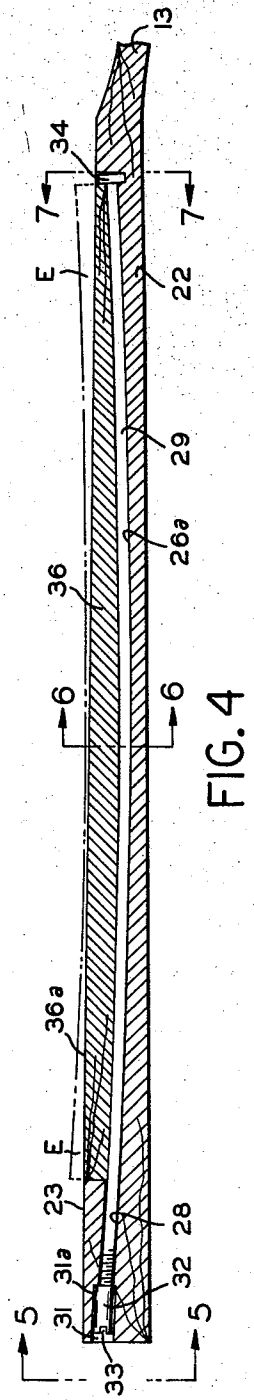

FIG. 4

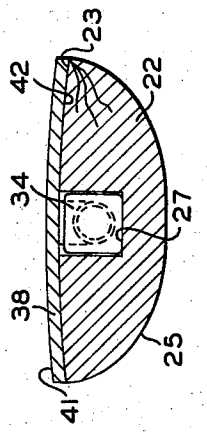

FIG. 7

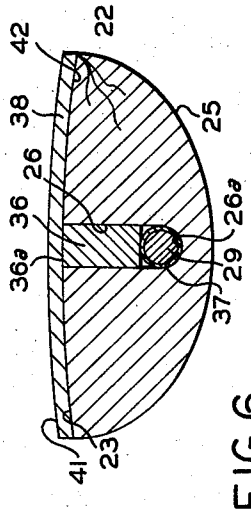

FIG. 6

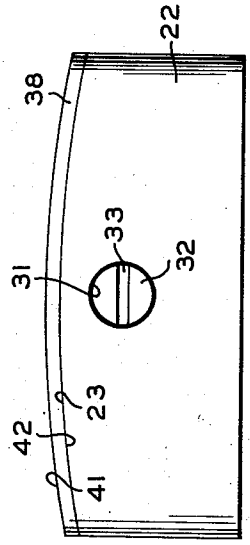

FIG. 5

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ADJUSTABLE NECK CONSTRUCTION FOR GUITARS AND THE LIKE

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5 Claims. (Cl. 84—293)

This invention relates to a neck construction for guitars and the like, and to a guitar incorporating an improved truss rod and fret board assembly adapted to be employed in adjusting the curvature of the neck.

Numerous present-day guitars have truss rod assemblies incorporated into the necks thereof, but such assemblies are characterized by serious deficiencies relative to such factors as (*a*) tendency to warp, (*b*) inadequate strength, and (*c*) relatively high cost of manufacture. Relative to the first of these factors, the tendency to warp, applicant has discovered that the tendency of the truss rod to bow the neck in one direction may be either counteracted or augmented by the tendency of the fret board to enhance or oppose the curvature of the main body (base) of the neck. Since the fret board is laminated onto the upper surface of the neck base, and is formed of a wood having a different coefficient of expansion than that of the neck base, the combination fret board and neck base acts in the manner of a bimetallic strip to bow or warp the neck in one direction or the other. The warping may depend upon such factors as moisture content, temperature, etc. The degree of bowing caused by this bimetallic-strip action may vary periodically, and must be regulated by adjustment of the truss rod at excessively frequent intervals. In accordance with the present invention, applicant has discovered that by forming the fret board in a certain way the indicated bimetallic-strip action is drastically reduced, so that the curvature of the neck depends substantially entirely upon the truss rod adjustment and there is no necessity to alter the setting of the truss rod at frequent intervals.

Relative to the second of the above factors, certain manufacturers of guitars disposed the truss rod in an elongated groove which has a uniform cross-sectional shape throughout its entire length. Since the truss rod is bowed, the end portions of the truss rod are spaced substantial distances from the bottom wall of the groove. The regions between the ends of the truss rod and such groove bottom walls therefore constitute voids which drastically reduce the strength of the entire neck assembly. Relative to the third of the above-mentioned factors, high cost of production, it is important for economy of production that all of the forming operations relative to the neck base and truss rod be performed prior to the laminating of the fret board thereover. In accordance with the present invention, wherein the fret board has a predetermined cross-sectional shape, the indicated economy of manufacture may, for the first time, be achieved in a high-quality guitar neck construction.

From the above it will be understood that the primary objects of the present invention comprise the manufacture of a guitar incorporating a neck assembly which may be accurately adjusted and which will maintain its adjusted condition for long periods of time, to provide a guitar neck which is free of substantial bowing action caused by disuniform expansion between the neck base and the fret board, to provide a guitar neck which may be economically-mass manufactured, and to provide a guitar neck which is extremely strong.

These and other objects will become apparent from the following detailed description taken in connection with the accompanying drawings in which:

FIGURE 1 is a plan view of a guitar incorporating

an adjustable neck constructed in accordance with the present invention;

FIGURE 2 is a fragmentary enlarged longitudinal section taken on line 2—2 of FIGURE 1;

FIGURE 3 is a sectional view illustrating the insertion of the truss rod into the neck base;

FIGURE 4 is a longitudinal central sectional view correspondinging generally to the neck portion of the showing of FIGURE 2 but in the absence of the fret board, portions of the inlay strip being illustrated in phantom;

FIGURE 5 is an enlarged end elevation as viewed from station 5—5 indicated in FIGURE 4; and

FIGURES 6 and 7 are enlarged transverse sectional views on lines 6—6 and 7—7 of FIGURE 4, as viewed in the directions indicated by arrows.

Referring to the drawings, the invention is illustrated as incorporated in an electric guitar **10** having a body **11**, neck **12** and head **13**. A plurality of strings **14** are stretched over the neck **12** and over a portion of body **11** in generally parallel relationship relative to each other. More specifically, strings **14** are stretched between tuning screws **16** on head **13** and a bridge element **17** mounted on body **11**. A pickguard **18** is removeably secured to the face (upper surface) of body **11**, beneath and parallel to strings **14**, and abuts the inner end of the neck **12** as illustrated in FIGURE 2. The neck **12** is removably secured to body **11** in any suitable manner providing a rigid connection, for example by screws **19** (FIGURE 2). A conventional electromagnetic pickup **20**, and electric controls **21**, are provided.

Proceeding next to a detailed description of the neck **12** and the truss assembly incorporated therein, such neck comprises a wooden base **22** formed integrally with head **13**, such base having a rounded upper surface **23** (FIGURE 5–7) the edge portions of which are generally flush with the upper surface of pickguard **18** when the neck is mounted on the body as shown in FIGURE 2. Stated more definitely, the upper surface **23** forms a portion of an imaginary large-diameter cylinder having an axis which is (*a*) generally parallel to the axis of the neck **12**, and (*b*) disposed a substantial distance therebeneath.

The portion of neck **12** which connects to body **11** is generally rectangular in section, as shown in FIGURE 5, for snug seating in a corresponding rectangularly-sectioned channel **24** (FIGURE 2) in body **11**. The remainder of the neck base **22** is preferably formed with a rounded lower surface as shown at **25** in FIGURES 6 and 7.

A groove **26** is formed, as by milling, longitudinally of surface **23** along the great majority of the length of neck **12** and in the center portion thereof. More specifically, the groove **26** extends between points A and B indicated in FIGURE 3, being relatively shallow adjacent points A and B and relatively deep at point C midway therebetween.

The bottom wall **26***a* of groove 26 lies along a continuous curve, for example comprising an arc of a large-diameter imaginary circle having an axis disposed perpendicular to a plane which contains the axis of neck **12** and is generally perpendicular to surface **23**. The side walls of groove **26** are parallel to each other, being generally perpendicular to surface **23**. The bottom wall **26***a* of the groove may be made concave (FIGURE 6) to receive the truss rod which will be described subsequently.

It is emphasized that the formation of groove **26** as a continuous curve, instead of in a straight line, substantially strengthens the neck assembly **12** since the regions indicated at X and Z (FIGURE 3) are maintained be-

neath the groove. It will be understood that if the entire groove had the same depth as does the groove **26** in the region C, the neck would be substantially less strong in that voids would be present adjacent the regions X and Z.

A square recess **27** (FIGURES 3 and 7) is formed in the neck base **22** at point B, adjacent head **13**. Such recess communicates with one end of groove **26** and has side walls which are generally perpendicular to surface **23**.

Communicating with the opposite end of groove **26**, between point A and the extreme inner end of the neck, is an elongated bore **28** adapted to receive a cylindrical truss rod **29** to be described below. Bore **28** lies along a continuation of the curve followed by the bottom wall **26***a* of groove **26**. The inner end of the bore **28** communicates axially with a counterbore **31** adapted to contain an elongated internally-threaded cylindrical nut **32**, such nut having a closed end which is grooved at **33** to receive a screw driver. The shoulder **31***a* formed between the inner end of counterbore **31** and the main portion of bore **28** serves to prevent movement of nut **32** toward head **13**.

It is a feature of the present invention that the counterbore **31** may be defined entirely by the wood which forms the neck base **22**, yet the nut **32** will be positioned for adjustment upon removal of the pickguard **18** (FIGURE 2). This arrangement, which results from the fact that the fret board is thin and arcuate in section as will be described hereinafter, results in a substantial economy of manufacture in that all of the forming operations relative to the neck base **22**, including the forming of the counterbore **31**, may be effected prior to laminating of the fret board over the neck base.

The truss rod **29** is an elongated cylindrical metal rod having a square nut **34** non-rotatably mounted (or formed integrally) at one end thereof. Nut **34** may be mounted on the end of the truss rod as by swaging, and is adapted to be seated non-rotatably in the recess **27**, FIGURE 7. When thus seated in recess **27**, the upper surface of the nut is substantially flush with surface **23**. The opposite end of the truss rod is threaded for threaded insertion into the nut **32**. Since the nut **34** is non-rotatably associated with the truss rod, and is also non-rotatably seated in recess **27**, it follows that turning of nut **32** will not effect rotation of the truss rod but will instead effect either tensioning or relaxing thereof.

The adjustment means for guitar neck **12** further includes a wooden inlay member or insert strip **36** adapted to be inlaid in groove **26** above truss rod **29**. The lower surface of the inlay member **36** is arcuate (longitudinally of the neck) and is parallel to the bottom wall **26***a* of groove **26**. The upper surface **36***a* of the inlay member is slightly rounded (transversely of the neck), being generally flush with surface **23**.

Referring particularly to FIGURE 4, the member **36** is coated on its sides with a suitable glue or adhesive prior to insertion into groove **26**. As indicated in phantom lines at E in FIGURE 4, the end portions of the inlay member or insert strip initially project above the level of surface **23**, the inlay member being rectangular in section throughout its entire length prior to performing of the finishing step next to be described. After the adhesive has set, the upper portions of the inlay member **36** are suitably removed, so that the upper surface **36***a* of the inlay member is, as indicated above, generally flush with surface **23**.

The truss rod **29** is, prior to mounting in groove **26**, suitably coated with wax or other substance which prevents adherence between the truss rod and the glue which secures inlay **36** in position. It follows that longitudinal shifting of portions of the truss rod is possible at all times. A layer of wax is indicated at **37** in FIGURE 6.

The final and most critical element in the present combination comprises a thin wooden fret board **38** having frets **39** (FIGURE 1) mounted at spaced points therealong. It is a highly important feature of the present invention that fret board **38** has parallel upper and lower

surfaces **41** and **42**, respectively, which are spaced only a relatively short distance apart and which correspond in curvature to the upper surface **23** of neck base **22**.

The lower surface **42** of the fret board is secured to the upper surface **23** of base **22** by means of a suitable glue or adhesive. It follows that the fret board completely conceals the inlay member **36** and the nut **34**.

The fret board **38** is formed of a beautifully grained wood, such as rosewood or walnut, which is different than the wood forming the neck base **22**. The neck base may be formed, for example, of wood such as poplar, mahogany, or maple.

In prior-art neck assemblies, the fret boards were formed relatively thick and flat, so that the above-mentioned differential expansion effects (caused by changes in such factors as moisture content and temperature) resulted in severe stressing and warping of the neck assembly. Such severe stressing and warping had to be compensated for by substantial stressing of the truss rod, and frequent adjustments thereof. Applicant has discovered that if the fret board **38** is made relatively thin in comparison to the thickness of the neck base **22** (in a direction perpendicular to the fret board), and if the fret board is caused to have a uniform curved cross-sectional shape (with parallel upper and lower surfaces), the stressing and distortion of the neck assembly caused by differential expansion effects is drastically reduced and rendered relatively negligible in consequence. It follows that the nut **32** need only be adjusted at infrequent intervals, and that the truss rod **29** may be employed to compensate substantially entirely for the stress exerted by the strings of the instrument, not undesired stresses such as those caused by differential expansion of the two wooden members. The thickness of the fret board **38** should not be more than approximately 15% of the average thickness of the neck base **22**. As previously stated, the fret board and also the upper surface **23** of the neck base should be curved through a large diameter curve about an axis which is parallel to the axis of the neck and is spaced a substantial distance therebeneath.

Manner of Assembly, and Summary of Operation

In manufacturing the adjustable neck construction, the neck base **22** is first formed to shape, after which the groove **26** is milled therein between points A and B indicated in FIGURE 3. The square recess **27** is then formed in any suitable manner, and the bore **28** is made through the inner end of the neck. Counterbore **31** is then formed.

The square nut **34** is then non-rotatably swaged on one end of truss rod **29**, and the other end of the rod is threaded to conform to the cylindrical nut **32**. The threaded end of the truss rod is then inserted from groove **26** through bore **28** into recess **31**, after which the square nut **34** is non-rotatably inserted (FIGURE 3) into the recess **27**. Adjustment nut **32** is inserted into counterbore **31** by threading the same onto the end of the truss rod.

The inlay strip **36** is then adhesively secured in groove **26**, and formed flush with surface **23** as described relative to FIGURE 4. The inlay **36** does not interfere with the movement of truss rod **29** because of the wax coating **37** (FIGURE 6) thereon. The fret board **38** is then glued in position, after which the entire neck assembly is rigidly secured to the guitar body **11** by means of screws **19** (FIGURE 2). The pickguard **18** is mounted (by means of screws) on the guitar body adjacent the inner end of neck **12**, partially concealing the end of nut **32**.

With the described construction, it is a simple matter for the guitarist to adjust precisely the curvature of the neck **12** by employing a screw driver to turn the nut **32**. When the nut **32** is turned in a direction effecting drawing of the threaded end of truss rod **29** into the nut, the tension on the truss rod is increased substantially and causes the truss rod to tend to become straight. This has the effect of elevating the central portions of the truss rod, thereby reducing the concave curvature (which concave

curvature is caused by the tension of strings **14**) of the neck **12**. Turning of nut **32** in the opposite direction has the effect of relaxing the truss rod, thereby permitting the concave curvature of neck **12** to increase.

In the indicated manner, the curvature of the neck relative to the strings **14** stretched thereover may be controlled with great precision and in accordance with the preferences of the individual guitarist. It is important to note that the neck should have a concave curvature, bowed away from the strings, instead of being perfectly straight and inclined relative to the strings. However, this curvature should not be excessively great (as is present in many guitars, due to string tension, after the guitars are a few months or years old). Thus, the degree of bowing should be precisely and uniformly controlled.

As described in detail heretofore, critical factors such as the cross-sectional shape and thickness of fret board **38** are so regulated that the neck will not warp. It follows that nut **32** need only be adjusted infrequently.

The foregoing detailed description is to be clearly understood as given by way of illustration and example only, the spirit and scope of this invention being limited solely by the appended claims.

I claim:

1. A guitar, which comprises,

a body,

an elongated wooden neck base connected at one end to said body,

said neck base being formed of a first type of wood,

said neck base having an upper surface which is curved about an imaginary axis disposed substantially below and generally parallel to said neck base,

the upper side of said neck base having a narrow groove formed longitudinally therein for the majority of the length thereof and disposed in a plane which is generally perpendicular to said upper surface and lies midway between the edges of said upper surface,

elongated metal truss rod means disposed longitudinally in said groove,

said truss rod means including adjustable means to vary the degree of tension in said truss rod means,

an inlay element mounted in said groove above said truss rod means,

a thin wooden fret board disposed on said upper surface of said neck base,

said fret board being formed of a second type of wood different from said first type of wood,

said fret board having parallel upper and lower surfaces which are curved about said imaginary axis,

said lower fret board surface being in engagement with and adhesively secured to said upper surface of said neck base, and

a plurality of strings mounted in tensioned relationship over said fret board and over a portion of said body, spacing between said strings and said fret board being determined in part by said adjustable means for varying the degree of tension in said truss rod means.

2. The invention as claimed in claim 1, in which the distance between said upper and lower fret board surfaces is less than about 15% of the distance between said upper neck base surface and the lower surface portion of said neck base most remote from said upper surface thereof.

3. The invention as claimed in claim 1, in which said neck base has formed therein a passage extending between the extreme inner end of said neck base and the adjacent end of said groove, all portions of said passage being disposed in said plane and in spaced relationship beneath said lower fret board surface.

4. The invention as claimed in claim 3, in which said truss rod means comprises a cylindrical metal rod extending through said passage and disposed in said groove, a nut threadedly mounted on one end of said rod adjacent said extreme inner end of said neck base in a counterbore therein, and means connecting the other end of said rod non-rotatably to said neck base.

5. The invention as claimed in claim 1, in which the bottom wall of said groove is curved longitudinally of said neck base, the central portion of said bottom wall being more remote from said upper surface than are the end portions of said bottom wall, in which said inlay element is adhesively secured in said groove and has a bottom edge parallel to said bottom wall, and in which said truss rod means is a cylindrical rod movably disposed between said bottom edge and bottom wall.

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