Feb. 10, 1970 M. KASHA 3,494,239

BASS-BAR AND COORDINATE BRIDGE FOR VIOLIN FAMILY

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Fig. 1

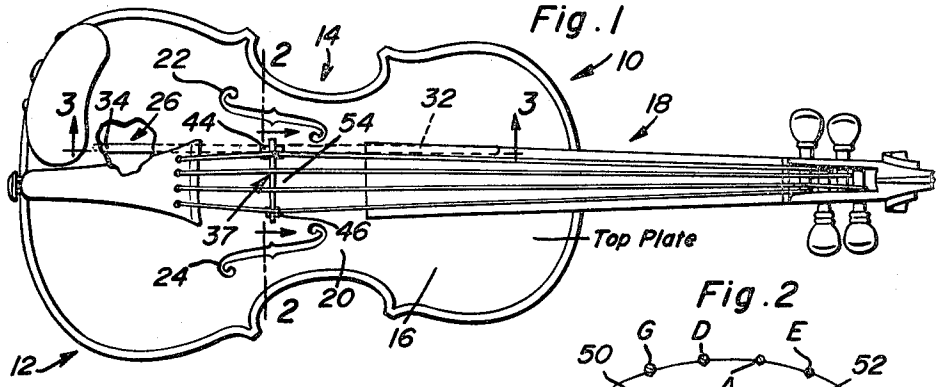


Fig. 2

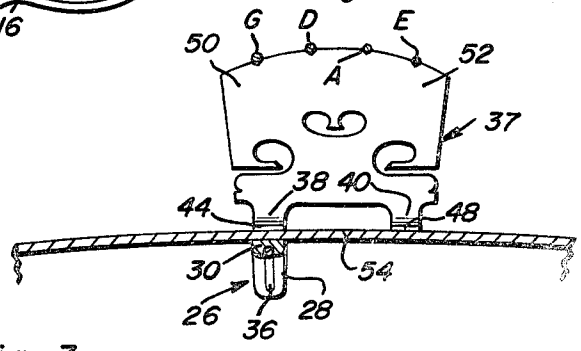


Fig. 7

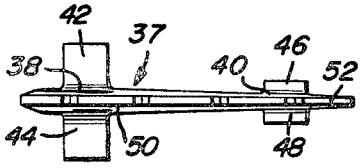


Fig. 3

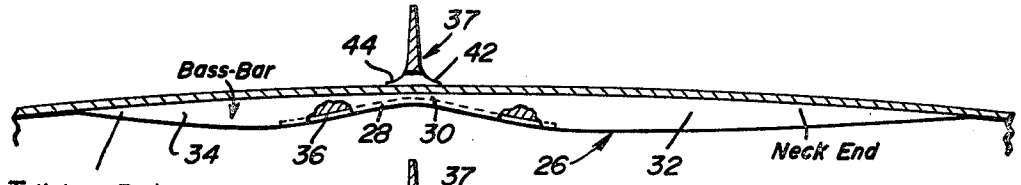


Fig. 4

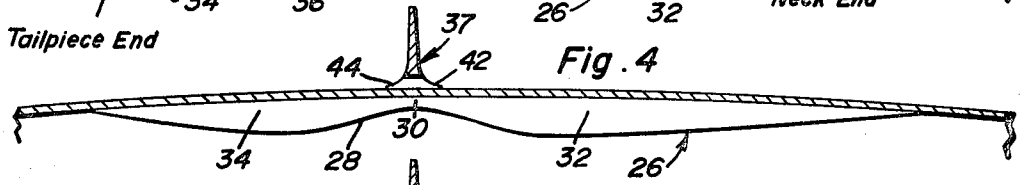


Fig. 5

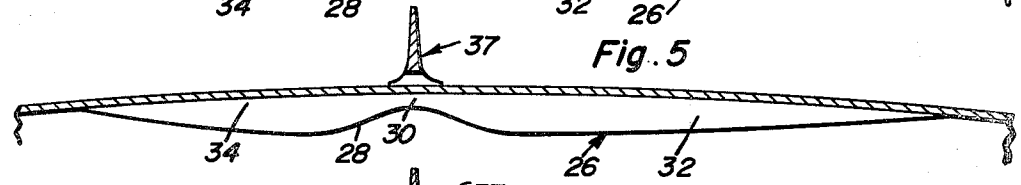
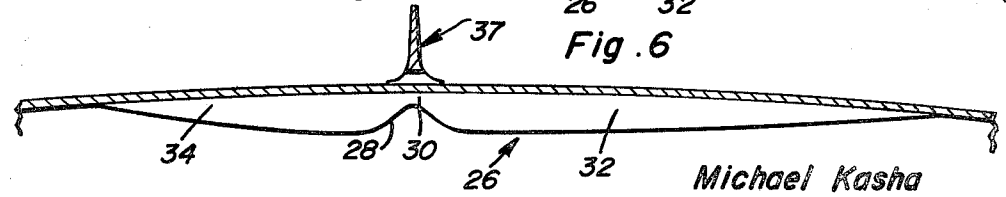


Fig. 6



Michael Kasha

INVENTOR.

BY Clarence A. O'Brien and Harvey B. Jacobson

Attorneys

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BASS-BAR AND COORDINATE BRIDGE FOR VIOLIN FAMILY

Michael Kasha, Tallahassee, Fla.
(621 Escalona Drive, Santa Cruz, Calif. 95060)

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ABSTRACT OF THE DISCLOSURE

The concept disclosed has to do with vibratory responsiveness, equable quality of tone and amplification susceptible of attainment in stringed instruments, for example, the violin, viola, violoncello and bass viol. Adequate sound level output and compatible harmonic timbre and resonance depends on a number of relevant factors which involve the hollow body or sound chest and the components which are carried by and are complemental thereto. To the ends herein desired, the conventional sound chest, as such, remains unaltered. On the other hand the usual bass-bar and regular symmetrical bridge are replaced by (1) an improved bass-bar and (2) a companion asymmetrical impedance matching bridge expressly designed and adapted to counterbalance and coordinate with said bass-bar through the medium of (3) that portion of the top plate which is interposed therebetween. This resourceful united achievement produces greater amplitude and harmonic richness of tone not now available in low cost and medium priced instruments.

This invention relates to stringed musical instruments such as, for example, those of the violin family and pertains to the violin, viola, violoncello, and bass viol and, more particularly, to a modified bass-bar and an asymmetrical companion bridge which, when in use, contributes its improved vibratory function to the bass-bar by way of the responsive top plate in a manner to amplify the sound output, to achieve balanced resonance, and a quality of tone which is pleasing and comparable with that found only in precision made expensive instruments.

A conventional bass-bar, not shown, in a typical violin or the like has significant purposes and functions. One function is to amply support and cope with an appreciable force which is exerted downwardly on the belly portion of the top plate by the usual string suspending bridge. A second function is to distribute and communicate the localized vibrations imparted to the top plate by the bridge, that is, from the locale of the bridge, to the orientated forward and rearward areas in a manner to effectually drive the lowest frequency vibratory regions of the top plate. Craftsmen, acousticians and others conversant with violin making and the many real and theoretical difficulties, repeatedly encountered, have no doubt recognized that the regular or conventional bass-bar is of greatest cross-sectional dimension and accordingly thickest directly under the left or bass foot of the bridge—precisely where unhampered maximal vibratory response is unquestionably most needed. It follows that one objective in the instant achievement is to modify and sensitize the bass-bar by cutting or otherwise recessing the median portion in a manner to provide an arched zone which, as experimental testing has shown, serves to

cope with this heretofore unsolved response problem and overcomes the dulling and stultifying effect on the tone of the two lowest strings, for example, G and D on a violin.

In carrying out the underlying principles of the present invention, the centrally arched bass-bar provides (a) greater capability of motion for the top plate (b) permits the bass-bar to carry out its normal function and, at the same time, extends vibrations via the top plate in an improved manner to the marginal areas of the plate, and (c) provides a unique arched support adequate for the load and tension imposed by the bridge. To the ends desired, the dimension and shape of the arched portion will vary in a manner to be hereinafter set forth.

It may be here noted that the improved recessed and arched bass-bar is highly and acceptably effective in combination with the herein disclosed impedance matching asymmetrical bridge. This new bridge is so designed and constructed that it coacts with the belly and uniquely arched bass-bar, and, in so doing, it compensates for the inherent loss of strength and mechanical weakening attributable to the notching and arching of the median portion of said bass-bar.

A conventional violin bridge is known to have a complex set of properties in its function of coupling and transmitting the string motion to the top plate. Aside from these complexities, persons conversant with the study of bridges hold that the bridge has primarily a rising and falling motion in driving the top plate and predominating over longitudinal rocking motion. The rising and falling motion of the bass foot of the bridge, as contrasted with that relative to the treble foot of the bridge, is assumed to be of a very different amplitude because of the internal acoustical structure (bass-bar vs. soundpost) of the resonating chamber of the hollow body. In the conventional bridge the two feet of the bridge are identical in shape and orientation. Consequently, they could be described as a compromise on the motion to be coupled.

The improved impedance matching bridge has feet which are asymmetric relative to each other, distinguishable from the substantially symmetric feet of the conventional bridge. The G and D strings can impart a vertical vibratory motion directly to the soundboard, the fundamental low-frequency mode being enhanced by the significantly lengthened right angularly disposed bass foot of the bridge. The treble-strings can impart a high-frequency elastic oscillation to the bridge, which is matched to the soundboard high-frequency harmonics by a narrowed treble foot of the bridge.

The improved bass-bar (divided and arched) is similar to the conventional one in overall profile, with the salient difference that near the center of the underside a generally parabolic (or hyperbolic) arch is cut, directly under the bass foot of the bridge, in contrast to the conventional bass-bar which is thickest in this region. The purpose of this dimensionally reduced arch is to allow a much greater amplitude for the soundboard's fundamental vibrations on the bass side.

Briefly stated, the overall concept has to do with a hollow neck-equipped violin or an equivalent hollow acoustical body which is characterized by the usual bouts and which, as usual, is provided interiorly with a standard soundpost coordinated with the right hand *f*-hold and a bass-bar coordinating with the left hand *f*-hole, and wherein the bass-bar, although similar in profile to a con-

ventional one, is improved and a specially designed asymmetrical companion bridge is provided for compatible use in interdependent combination with said improved bass-bar.

In carrying out the principles of this invention the bass-bar is stationed and the upper lengthwise edge is glued or otherwise fixed inwardly of the left *f*-hole in its regular lengthwise position and is proportional in length with the length of the top plate of the body. Near the center of the underneath lengthwise edge a notch or recess is cut or otherwise formed to define a prescribed arch (parabolic or hyperbolic, as the case may be). This notched arch divides the leading and trailing components of the bass-bar and is oriented with the usual central nicks of the adjacent (left) *f*-hole so that it will assume a locale directly under the specially designed left or bass foot of the improved asymmetrical bridge. This thus arched bass-bar and complemental bridge acting in conjunction therewith, results in greater amplitude (magnitude) and more desirable vibratory efficiency on the low frequency or G and D string side.

The improved asymmetrical bridge and arched bass-bar lend themselves to acceptable modes of manufacture of violins, violas, violoncellos, bass viols and other instruments of the violin and viol group. Their adoption and endorsed use and unique acoustical results will doubtless lead to improved instruments at lowered cost, keeping in mind the usual stringent demands for quality wood for top plates, special varnishes, and other relevant time and labor consuming matters.

More explicitly, novelty is predicated on the aforementioned interrupted or arched bass-bar and asymmetric companion bridge with impedance matching and their relationship to each other and the intervening top plate coacting, as they do, to increase the sound output level with an attending gain in resonance and balanced tone.

While stress is placed on the improvement the present invention gives to the response and timbre of the fourth and third strings of the violin family (G and D of violin, C and G of viola, etc.), experience has shown that, to a lesser degree, the brilliance of the second and first strings is also increased by the application of this invention.

These together with other objects and advantages which will become subsequent apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIG. 1 is a view in top plan of a conventional violin embodying the improved bass-bar and showing the improved companion bridge.

FIG. 2 is an enlarged fragmentary detail view taken approximately on the plane of the section line **2—2** of FIG. 1.

FIG. 3 is an enlarged fragmentary view with portions broken away illustrating the improved bass-bar and taken approximately on the plane of the section line **3—3** of FIG. 1.

FIGS. 4, 5 and 6 are views similar to FIG. 3 and which are included here to bring out the fact that nominal modifications in the arched portion of the bass-bar (with or without the embedded wire) may be resorted to in actual practice if desired.

And FIG. 7 is a top plan view of the improved bridge by itself.

By way of introduction to the description of the details it may be stated here that the viola, violoncello and double-bass (bass viol) differ primarily in size and not in contoured shape. The laws affecting their individual construction, as distinguished from the violin are basically and proportionately alike. The underlying principle of the inventive concept is illustrated here in the form of the violin shown in FIG. 1. As already stated, the hollow body of the violin shown in FIG. 1 is characterized by an upper or forward bout **10**, a lower or rearward bout **12** and a middle bout **14** sometimes referred to as the waist. To be sure the hollow body includes a conventional back (not detailed) and a top plate which is generally denoted here at **16**. The conventional neck (including the fingerboard and other parts) is denoted generally by the numeral **18**. The *f*-hole on one side of the belly **20** is denoted at **22** and the companion *f*-hole on the other side is denoted at **24**. No alterations in this hollow body or tone chest per se are herein resorted to. It is reiterated therefore that the invention has to do with the improved bass-bar **26** and the companion improved asymmetrical bridge **37**. The bridge is detailed in FIGS. 2 and 7 and the bass-bar **26** in FIGS. 3, 4, 5 and 6. In this description FIG. 3 will be used as the basis for discussion of the bass-bar. In fact, the generic aspect of the invention is shown in FIG. 3 and the slight modification are shown in FIGS. 4, 5 and 6. To simplify the description, like reference numerals will be employed on like component parts in these views (FIGS. 3–6).

The upper uninterrupted longitudinal edge of the bass-bar as usual is glued along its entire length to the underneath of the top plate or belly **16**. It is similar in overall profile to a conventional bass-bar but is uniquely different in that it is provided intermediate its forward and rearward ends with a recess **28**. Stated otherwise, the underneath side only of the median portion of the bass-bar is recessed at **28** to define a complemental arch **30**. The arch spans the recess and is variable at will by the craftsman in a manner to increase the audible output and to enliven the response and intensity of the tone primarily of the two low-frequency strings (G) and (D) as evident in FIG. 2. The thus reduced arch divides the forward or neck end portion **32** (FIG. 3) from the rearward end portion **34**. As a strengthening feature, when a maximum gain of sound output is required calling for deep arches as shown in FIG. 3 or FIG. 4, a light spring metal wire **36** (or narrow band) may be embedded on the underside of the bass-bar, following the notch and arch profile. Such a spring wire adds to the elastic moment and at the same time restricts plastic flow of the spruce top and reduced bass-bar under bridge loading.

The exact delineation and length of the notch **28** (archway) and the vertically reduced arch **30** can be varied to control, that is, increase the in toto output and augmented intensity of the tone. For example, the long and deep hyperbolic arch (FIG. 3) is contemplated for use on low-priced student instruments in that it yields a satisfactory increase in sound output with enhanced depth of tone. By way of comparable contrast the shallow hyperbolic arch (FIG. 6) achieves nominal change in output yet has a mellowing influence and effect on the tone of a raw, often harsh, newly made instrument. The parabolic arches shown in FIGS. 4 and 5 serve well on fine new instruments to increase intensity of tone and magnitude. The pattern revealed in FIG. 4 (as well as FIG. 6) can be and has been resorted to for use on fine old instruments to noticeably increase resonance, especially of the low-frequency 3rd and 4th (D and G) strings.

It is reiterated here that the optional reinforcing wire feature **36** while shown only in FIG. 3 is susceptible of use in the variations in the arched shapes shown in FIGS. 4, 5 and 6.

The bridge **37** is similar in general overall appearance to a conventional bridge which, as is well known, is provided at the bottom with identical feet. In the unique adaptation herein shown it is provided at the bottom with a left or bass foot **38** and at the right (FIG. 2) with a treble foot **40**. It will be further noted from FIG. 2 that the cross-sectional dimension of the foot **38** corresponds with the cross-sectional dimension of the bass-bar **26**. Also this foot is elongated in a direction at right angles to the lengthwise dimension of the body of the bridge and provides a forward end portion **42** (FIG. 7) which projects at right angles to and beyond the front face of the bridge and a rearward tip portion **44** which

projects at right angles beyond the rearward face of the bridge. With respect to the treble foot **40** it will be noted that the projecting portions while likewise at right angles to the front and rear faces are comparatively or relatively short as denoted at **46** and **48** respectively. The cross-sectional thickness of the bridge is increased as generally denoted at **50** in FIG. 2 conformable with the foot **38**. The thinner and tapering portion **52** is conformable with the shorter treble foot **40**. The sole portions of both bar and to compensate for the mechanical weakening of the bass-bar resulting from the aforementioned notch **28** and reduced arch **30**.

With further reference to the theory of the bridge, it will be evident that the left or bass foot **38** and right or treble foot **40** are cooperatively oriented longitudinally and transversely and that the sole portion or area under each foot is predetermined for its assigned purpose. This comparable and relative variation constitutes mechanical impedance matching. It follows that a relatively small area of the top plate is driven with the usual soundpost acting as a nodal point. On the bass side, the lengthwise extension of the left or bass foot achieves more efficient driving of the entire top plate when based on the top plate directly over the notched arch of the bass-bar.

What is claimed as new is as follows:

1. A stringed musical instrument in the violin and viol group comprising, a hollow resonant body characterized by forward, rearward and middle bouts and embodying a top plate, a conformable back, and ribs intervening and connecting the marginal edges of said top plate and back, said top plate having a predetermined convex bridge seating belly portion equipped with opposed left and right *f*-holes, said forward bout being provided with a forwardly projecting conventional neck, an elongated one piece bass-bar having an uninterrupted upper longitudinal edge secured along its entire length to the underneath of said top plate, the median lower longitudinal edge of said bass-bar being arched directly beneath said bridge seating belly portion and being reduced in vertical cross-sectional dimension, whereby to provide increased and greater amplitude of motion to the bridge seating belly portion of said top plate while at the same time achieving the normal bass-bar function.

2. The musical instrument defined in and according to claim **1**, and wherein the arched portion is cut to define a relatively deep hyperbolic arch susceptible of yielding an appreciable increase in sound output and an attending enhanced depth of tone.

3. The musical instrument defined in and according to claim **1**, and wherein said arched portion is inverted V-shaped in appearance and defines a relatively shallow hyperbolic arched portion which yields minimal change in output but achieves a mellowing effect on the tone of, for example, a raw, harsh and newly made instrument.

4. The musical instrument defined in and according to claim **1**, and wherein said arched portion is of a shape and dimension to define a parabolic arch which lends itself for use on fine old instruments to increase resonance, more particularly, resonance generated by the usual low frequency 3rd and 4th strings.

5. The musical instrument defined in and according to claim **1**, and wherein the aforementioned reduced vertical cross-section is of a predetermined degree and is proportional to the complemental forward and rearward portions of the over-all bass-bar and wherein the underneath edge of the reduced portion has a longitudinally bowed reinforcing wire embedded therein.

6. The stringed musical instrument defined in and according to claim **1**, and, in combination, a companion impedance matching asymmetrical bridge having bass and treble feet, said bass foot being elongated in a direction at right angles to the vertical front and rear faces of the body of the bridge, having leading and trailing tip portions projecting forwardly and rearwardly of said front and rear faces, respectively, the longitudinal disposition of said bass foot being designed to coact in registrable alignment with the arched portion of the bass-bar, whereby to compensate for the reduced structurally weakened but highly sensitive arched portion.

7. The stringed musical instrument defined in and according to claim **6**, and wherein said bass foot is of a length proportional with the length of the complemental arch and is of a cross-sectional dimension corresponding with the cross-sectional dimension of said arched portion.

8. The stringed musical instrument defined in and according to claim **6**, and wherein said bass foot is of a length proportional with the length of the complemental feet are fittingly applied to the convex or belly portion **54** in the manner shown. This improved bridge is designed to expressly coact with the improved arched bass-arch and is of a cross-sectional dimension corresponding with the width of said arch, and wherein the bottom plan dimension of said bass foot is greater that the bottom plan dimension of said treble foot, said treble foot being parallel with, similar in cross-section to but slightly shorter than said basss foot, whereby a relatively small area of the underlying top plate is driven, with the soundpost acting as a nodal point, and the enlongate bass foot contributing to more efficient driving magnitude of the coordinating low-frequency area of said top plate.

9. In a stringed musical instrument, a top plate having a forward end portion, a rearward end portion, and an intervening bridge seating belly portion having regulation left and right *f*-holes formed therein, and, in combination, an elongated bass-bar having an uninterrupted lengthwise edge abutting and affixed lengthwise to the underneath side of said top plate inwardly of but adjacent to and substantially paralleling said left *f*-hole, the median portion of the bottom edge of said bass-bar being arched directly beneath said bridge seating belly portion and being reduced in vertical cross-sectional dimension, said arched portion serving to divide the overall bass-bar into companion forward and rearward portions joined by said arched portion in a manner to provide (1) greater flexibility and amplitude of motion to the top plate (2) normal bass-bar function of transmitting and extending local vibrations of the top plate to marginal portions and edges of said top plate while providing, at the same time, a vibration responsive support for the tension imparted when a bridge is positioned for use on the bridge seating belly portion of said top plate directly above and in alignment with said arched portion.

10. The stringed musical instrument defined in and according to claim **9**, and, in combination, a companion impedance matching asymmetrical bridge having bass and treble feet, said bass foot being elongated in a direction at right angles to the vertical front and rear faces of the body of the bridge, having leading and trailing tip portions projecting forwardly and rearwardly of said front and rear faces, respectively, the longitudinal disposition of said bass foot being designed to coact in registrable alignment with the arched portion of the bass-bar and to compensate for the reduced structurally weakened but highly sensitive arch.

11. A stringed musical instrument in the violin and viol group comprising, a hollow resonant body characterized by forward, rearward and middle bouts and embodying a top plate, a conformable back, and ribs intervening and connecting the marginal edges of said top plate and back, said top plate having a predetermined convex bridge seating belly portion equipped with opposed left and right *f*-holes, said forward bout being provided forwardly of said bout with a projecting conventional neck, an elongated one piece bass-bar having an uninterrupted upper longitudinal edge secured along its entire length to the underneath side of said top plate, the median lower longitudinal edge of said bass-bar being arched directly beneath said bridge seating belly portion and being reduced in vertical cross-sectional dimension in a

manner to provide increased and greater amplitude of motion to the bridge seating belly portion of the top plate while at the same time achieving the normal bass-bar function, and a companion impedance matching asymmetrical bridge having a bass foot at one end and a treble foot at the other end, said bass foot being adapted to reside atop the bridge seating belly portion in registrable alignment with the underlying arched portion of the bass-bar in a manner to compensate for the weakened but responsively sensitive arched portion.

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RICHARD B. WILKINSON, Primary Examiner

J. F. GONZALES, Assistant Examiner

U.S. Cl. X.R.

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