APPROXIMATELY TUNING AN ELECTRIC GUITAR

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APPROPRIATE FOR ELECTRONICALLY TUNING AN ELECTRIC GUITAR

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ABSTRACT OF THE DISCLOSURE

Apparatus for electronically tuning an electric guitar comprising means for producing oscillations at a selected frequency lying within the fundamental frequency range of said electric guitar, sound reproducing means for rendering said oscillations audible, and means for coupling said oscillations to said sound reproducing means.

The present invention relates to tuning of electric guitars. More particularly, it relates to a method and apparatus for electronically tuning an electric guitar whereby highly accurate and reliable tuning of the guitar is accomplished.

Heretofore electric guitars have been tuned to pitch pipes, to other instruments, generally pianos, or to one of its own strings. Of course, if the guitar string to which the other strings of the guitar are to be tuned is not itself in tune, the guitar cannot be properly tuned. Similarly, if the instrument to which the guitar is to be tuned is not properly tuned, it is not possible to properly tune the guitar.

In tuning electric guitars, generally, one of the guitar strings is tuned to a selected musical note, i.e., the tuning note, produced by a tuning instrument. Then, the other guitar strings are tuned to the first tuned string. Usually, the number one string of the guitar, which is the E string above middle C, is stopped and plucked to produce the first A above middle C. The note produced is compared to the comparable note generated by the tuning instrument and its tension adjusted until its A is the same as that generated by the tuning instrument. Subsequently, the other strings of the fingerboard are tuned in the same manner to the tuned string.

However, since a note produced by different musical instruments will have a different tone color, tuning one instrument to another is an approximation at best, and can be accomplished accurately only by experts. In addition, when tuning electric guitars by prior art techniques, the tuning note is not passed through the guitar amplifier and speaker. Furthermore, different musical instruments generally produce a given note at different phonic levels. The sensitivity of the human ear varies as the frequency of the sound, with maximum sensitivity at about one thousand cycles per second (c.p.s.). Because of this characteristic of the human ear, the accurate comparison of identical musical notes produced by different instruments can at times be troublesome.

Accordingly, it is an object of the present invention to provide a method and apparatus for tuning electric guitars which is accurate and reliable.

More particularly, it is an object of the present invention to provide an electronic guitar tuning method and apparatus used for conducting the steps of the method which assures that tuning of the guitar will be properly carried out.

Another object of the present invention is to provide apparatus for conducting the guitar tuning method of the present invention which is portable and which can be conveniently carried on the person.

Yet, another object of the present invention is to provide a method of tuning electric guitars which is simple and rapid while being highly accurate.

Still, a further object of the present invention is to provide apparatus for tuning electric guitars which delivers a selected fundamental frequency tone whose frequency can be adjusted.

It is a further object of the present invention to provide a tuning note whose frequency and amplitude characteristics can be adjusted to closely approximate the note which it is desired that the guitar string reproduce.

In accordance with present invention, the foregoing objects are realized by using a tuning note which is electronically generated for tuning the electric guitar. Since electronic sources of sounds tend to exhibit good tonal stability for much longer durations than musical instruments put to normal use, tuning in accordance with the present invention will be accurate and reliable.

Specifically, in the method of the present invention, a selected signal tone is electronically generated. One of the strings of the electric guitar is plucked to generate a musical note whose fundamental frequency is to correspond to that of the electronically generated signal tone. The string of the guitar is brought into tune by adjusting its tension until the note generated thereby coincides with the signal tone.

To conduct the steps of the method of the present invention, apparatus for electronically tuning the electric guitar is provided which comprises means for producing oscillations at a selected frequency lying within the fundamental frequency range of electric guitars, generally, from about 80 to 685 c.p.s. Means are provided for coupling the generated oscillations to a suitable sound reproducing means, such as a speaker or earphone, whereby the sound is rendered audible for comparison with a selected note generated by the electric guitar.

By electronically generating the tuning note to be used in tuning electric guitars, it is readily seen that electric guitars can be highly accurately and reliably tuned simply and rapidly. Furthermore, because of the small size of the electronic apparatus required, the tuning apparatus can be made portable for convenient carrying on the person. Additionally, because of the nature of electronic circuits, the oscillator can be selectively adjusted to make the frequency and amplitude characteristics of the oscillation generated thereby closely approximate a note which is produced by the electric guitar.

The invention possesses other objects and features of advantage, some of which, with the foregoing will be set forth in the following description of the preferred form of the invention which is illustrated in the drawing accompanying and forming part of the specification. It is to be understood, however, that the showing made by the said drawing and description may be adopted within the scope of the invention as set forth in the claims.

FIGURE 1 is a schematic diagram of one system used for electronically tuning an electric guitar.

FIGURE 2 is a schematic diagram of a preferred oscillator circuit for generating selected tuned signal.

FIGURE 3 is a partial schematic diagram illustrating the output circuit of FIGURE 2 connected to an earphone.

FIGURE 4 is a perspective view of a portable electronic tuning unit of the present invention.

FIGURE 5 is a longitudinal cross sectional view of portable tuning unit of FIGURE 4.

Referring to FIGURE 1, the electric guitar 10 is tuned by adjusting an oscillator 11 to produce oscillations at a
selected fundamental frequency, usually 432 c.p.s., which corresponds to the first A above middle C. By constructing oscillator 10 so that the harmonic content of its output signal closely approximates that of note generated by the guitar, i.e., the tone color of the two signals being the same, extremely accurate tuning can be accomplished. However, in usual practice such accuracy is not absolutely necessary, and excellent tuning is accomplished by tuning the guitar to a tuning note whose frequency content consists only of the fundamental frequency component of the guitar used in the tuning.

The number one E string 1 is stopped by pressing the string against a fret 12 of the fingerboard 13 to generate an A note. The A note generated by the guitar 10 is compared audibly by the person tuning the guitar to the tuning note generated by oscillator 11. Accurate tuning is accomplished by turning the peg 14 to adjust the tension of the E string 1 until the A note generated by the guitar 10 corresponds to the tuning note. The remaining strings of the guitar 10, i.e., number two B string 2, number three G string 3, number four D string 4, number five A string 5, and number six E string 6, are then tuned either in the same manner as E string 1 or relative to the tuned E string 1. Of course, one may start the tuning process with any of the strings of the guitar 10. Furthermore, any note having a fundamental frequency in the range of guitar 10 may be used as the tuning note.

In one of the preferred ways of tuning guitar 10 in accordance with the present invention, the tuning note generated by oscillator 11 is coupled to the input terminal 16 of the guitar amplifier 17. Hence, the tuning note is amplified and projected by guitar speaker 18 in the same manner as the note which is produced by the guitar string being tuned.

Referring now to FIGURE 2, a preferred oscillator 11 is illustrated. Oscillator 11 is a twin-T oscillator which employs a single active device, preferably a transistor 21, and only resistors and capacitors as the frequency determining passive elements. At the low frequencies required for tuning, the twin-T oscillator has the outstanding features of simplicity, small size, inexpensive components, excellent frequency stability, and having its output easily adjusted in amplitude and frequency.

Considering now twin-T oscillator 11 in detail, a PNP transistor, for example, a 2N3708, is connected with its emitter grounded and its collector connected to resistor 24 and the negative terminal 26 of a power supply (not shown). The positive terminal of the power would be at ground potential. The collector 23 also is connected through a regenerative feedback circuit 27 to the base 28 of transistor 21. By proper selection of the resistors and capacitors, the oscillating circuit can be adjusted by varying circuit 27, the oscillator 11 can be adjusted to oscillate at any frequency with the frequency range of electric guitar 10.

The regenerative feedback circuit 27 includes a first resistor 31 and a second resistor 32 serially connected between collector 23 and base 28 to define a first conduction path theretwixet. A first capacitor 33 and a second capacitor 34 are serially connected between collector 23 and base 28. The serially connected capacitors define a second conduction path between the collector 23 and base 28 of transistor 21 and the above noted first conduction path. The common junction 36 of resistors 31 and 32 is coupled to ground 37 through a third capacitor 38. Similarly, the common junction 39 of capacitors 33 and 34 is connected to ground 37 through a resistance means including a fixed resistor 41 and rheostat 42. Ground 37 is connected to the wiper arm 43 of rheostat 42. Hence, as the wiper arm 43 is moved the resistance value between junction 39 and ground 37 varies. The resultant variation in the resistance causes a corresponding variation in the frequency of the oscillations generated. Of course, variation in the frequency can be accomplished by varying other circuit components of the regenerative circuit 27.
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Rheostat 42—maximum value 5K ohms
Potentiometer 47—maximum value 500K ohms
Capacitor 33—0.01 mf.
Capacitor 34—0.02 mf.
Capacitor 38—0.047 mf.
Capacitor 49—0.047 mf.
Battery—9 volts

While the present invention has been described in detail with respect to a particular method and apparatus for conducting the steps of the method, numerous modifications are possible without departing from the scope thereof. Hence, the present invention is not intended to be limited except as by the terms of the following claims.

What is claimed is:

1. Apparatus for electronically tuning an electric guitar comprising means for producing oscillations at a selected frequency lying within the fundamental frequency range of said electric guitar, sound reproducing means for rendering said oscillations audible, and means for coupling said oscillations to said sound reproducing means; said means for producing oscillations including a transistor having a base, emitter and collector arranged in a common emitter circuit configuration, said emitter connected to a reference potential point; a collector resistor electrically connected at one end to said collector, the other end of said collector resistor adapted for connection to a power supply; a regenerative feedback circuit electrically connected between said collector and base, said feedback circuit comprising first and second resistors serially connected between said collector and base to define a first circuit path therebetween, first and second capacitors serially connected between said collector and base to define a second circuit path therebetween, a third capacitor electrically connected between the reference potential point and a junction defined by the common circuit point of said first and second resistor, and a third resistor electrically connected between the reference potential point and a junction defined by the common circuit point of said first and second capacitors, said resistors and capacitors selected to cause said oscillator to oscillate at said selected frequency; said coupling means electrically connected to said collector; a fourth capacitor and a variable resistance divider serially connected between said collector and said reference potential point, said divider provided with an output terminal, and wherein said third resistor is variable, and said coupling means is a bayonet connector connected to said output terminal of said variable resistance divider.

2. The apparatus of claim 1 wherein said first, second and third resistors and capacitors are adjusted to cause said oscillator to oscillate at a frequency equal to the fundamental frequency of the first A note of the musical scale above the middle C note, and said resistance divider is adjusted so that the amplitude of the oscillations approximately equals the amplitude of the A note generated by said guitar when operated.

3. The apparatus of claim 1 further including a housing, a circuit board mounted within said housing, said resistors, capacitors and transistors mounted to said circuit board, a battery having positive and negative terminals, said battery mounted within said housing, said terminals electrically connected to power said transistor, and wherein said bayonet connector is mounted to extend exteriorly of said housing.

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