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tone control for stringed instruments

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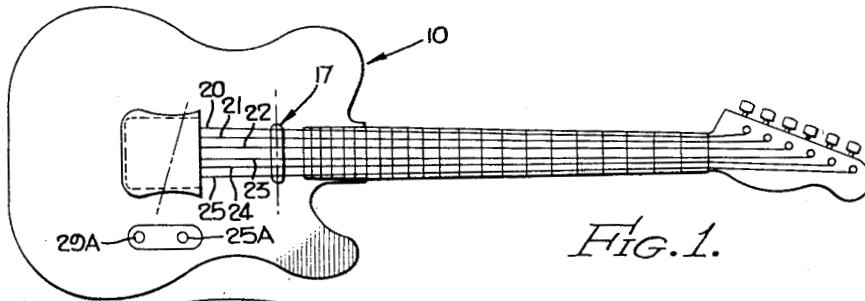


FIG. 1.

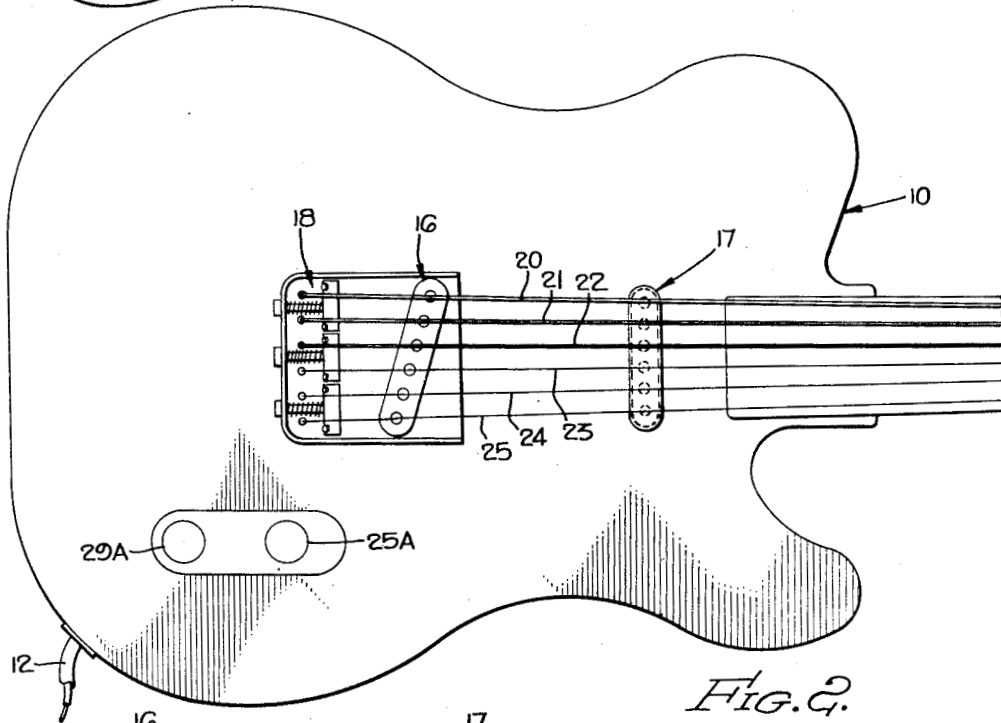


FIG. 2.

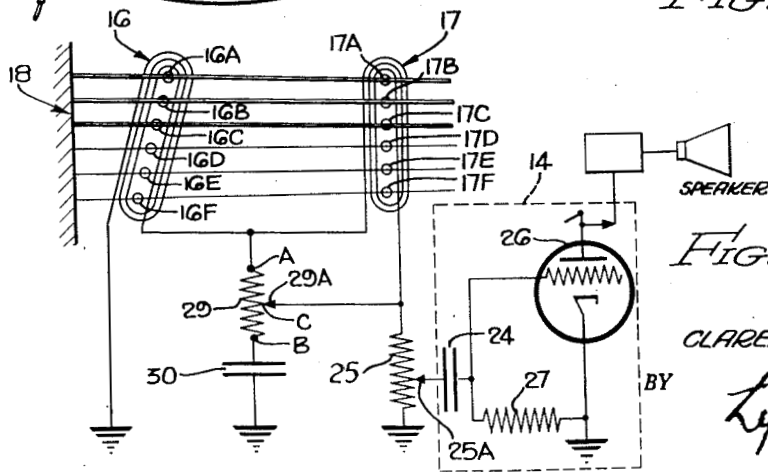


FIG. 3.

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TONE CONTROL FOR STRINGED INSTRUMENTS

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7 Claims. (Cl. 84—1.15)

The present invention relates to improved means and techniques for controlling or for producing desired tonal effects in a stringed instrument such as a guitar.

In general, the present arrangement involves two coils, one of which is considered to be more responsive to the fundamental frequency of a vibrating string or strings and the other one of which is considered to be more responsive to the harmonic content of the same string or strings. These two coils are interconnected in a novel manner in the input circuit of a vacuum tube amplifier.

For purposes of definition, the aforementioned coil which is more responsive to the fundamental frequency is termed the rhythm coil, whereas the other coil referred to as being more responsive to the harmonic content, is termed the lead coil. An adjustable resistance is interconnected with such rhythm and lead coils and has a manually adjustable tap, movement of which serves to shunt out the rhythm coil in varying degrees, or to allow all of the signals from such rhythm coil to have effect on the input circuit of the amplifier, or shunt out in varying degrees the high frequency characteristics of the lead rhythm coils, using for that purpose a high frequency bypass condenser which is also interconnected with the tone control resistance and the two coils. Using these techniques, a single control, i. e., an adjustable potentiometer resistor serves as a fader from one coil to the other, as well as a tone control. An advantage of this arrangement resides in the fact that "presence" is provided through most of the range of movement of the tap on the potentiometer resistance since, during most of such range, harmonics from the lead coil are permitted to have their effect on the input circuit of the amplifier.

It is, therefore, generally an object of the present invention to provide an improved tone control arrangement having the features and advantages indicated above.

A specific object of the present invention is to provide an improved tone control of this character in which "presence" is provided during most of the range of movement of the tone control element.

Another specific object of the present invention is to provide an improved tone control arrangement of this character which is relatively simple and inexpensive.

The features of the present invention which are believed to be novel are set forth with particularity in the appended claims. This invention itself, both as to its organization and manner of operation, together with further objects and advantages thereof, may be best understood by reference to the following description taken in connection with the accompanying drawings in which:

Figure 1 illustrates a top plan view of a guitar embodying features of the present invention;

Figure 2 is a top plan view, on an enlarged scale, of a portion of the guitar shown in Figure 1 with the cover for the lead coil removed;

Figure 3 represents, partly in schematic and partly in structural form, control circuitry which is incorporated in the guitar illustrated in Figure 1 and embodies important features of the present invention.

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The guitar 10 has the control circuitry illustrated in Figure 3 contained therein and the output of such control circuitry is conveyed over the cable 12 (Figure 2) to the input circuit of a remotely located amplifier which is indicated generally by the dotted rectangle 14 in Figure 3.

The guitar is provided with a lead coil 16, as defined above, as well as a rhythm coil 17, also as defined above.

It is noted that the lead coil 16 is relatively close to the structure 18 which supports one end of each of the six guitar strings 20, 21, 22, 23, 24 and 25, whereas the rhythm coil 17 is located relatively remote from the supporting structure 18 to thereby respond more to the fundamental frequency or vibration of such strings.

The lead coil 16 comprises a plurality of turns of wire, the length of the coil being somewhat longer than the distance between the outermost strings, 20, 25 and the axis of such coil is inclined somewhat with respect to the axis of any one particular string. The coil 16 is wound around six pole pieces, 16A, 16B, 16C, 16D, 16E and 16F, which are disposed underneath corresponding strings 20, 21, 22, 23, 24 and 25, but spaced therefrom and in inductive relationship to the same.

Similarly, the rhythm coil 17 comprises a plurality of turns of wire, the axis of the rhythm coil 17 extending substantially perpendicular to the strings, and the length of the coil 17 is somewhat longer than the distance between the outermost strings 20 and 25. The coil 17 is wound around the six pole pieces, 17A, 17B, 17C, 17D, 17E and 17F, which are disposed underneath corresponding strings 20, 21, 22, 23, 24 and 25, but spaced therefrom in inductive relationship. The strings 20, 21, 22, 23, 24 and 25 are, of course, of magnetizable material, and movement of such strings, as in the strumming of the guitar or playing of the guitar, results in voltages induced in the coils 16, 17. These voltages are transferred to the input circuit of the amplifier circuit 14 using the circuitry which is now described.

The coils 16 and 17 are serially connected with one terminal of the coil 17 grounded and one terminal of the coil 16 being returned to ground through the volume control resistance potentiometer 25 which has its movable tap 25A capacitatively coupled by condenser 24 to the control grid of the first audio amplifier tube 26, the cathode of tube 26 being grounded, and the control grid of tube 26 being returned to ground through resistance 27. The junction point of coils 16, 17 is returned to ground through the serially connected tone control potentiometer resistance 29 and condenser 30, one terminal of condenser 30 being grounded, and the movable tap 29A on the resistance 29 being connected to the ungrounded terminal of resistance 25.

The resistance 29 may have a magnitude of one-fourth of one megohm. The condenser 30 may have a value of one-tenth of a microfarad. The volume control resistance 25 may have a magnitude of one megohm. The resistance 27 may have a magnitude of five megohms. It is understood that these values are illustrative and, of course, practice of the invention is not limited to these specific values, since it is understood that these values may be within a range of values and yet produce the operation and results which are now described.

The operation of the circuitry is now described in relationship to the position of the tap 29A on the tone control resistance 29. The two extreme positions of tap 29A are denoted by the letters A and B and an intermediate position of tap 29A is represented by the letter C. When the tap 29A is at position A, the rhythm coil 17 is short circuited so that any voltage induced in the coil 17 has substantially no effect on the control grid of tube 26. Thus, in position A, the rhythm coil 17 is short circuited and the lead coil furnishes all of the signal,

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i. e., a tone is produced which is more responsive to the harmonic content of the vibrating strings. Further, in position A the control circuitry which involves resistance 29 and condenser 30 is ineffective because of the high resistance of resistance 29.

In the other extreme, position B, the two coils 16 and 17 are, of course, serially connected and both furnish signal, but such signal produced by both coils 16 and 17 has the high frequency components thereof effectively removed by the condenser 30 which serves to bypass such high frequencies.

Thus, in position B, a tone is produced which is responsive both to the fundamental as well as to the harmonic content of the vibrating strings, but the high frequency components are effectively removed.

Movement of the tap 29A from position A to position B thus provides different shunting effects on the rhythm coil 17; in position A the coil is rendered ineffective, but in some intermediate position between points A and B the coil 17 is rendered fully effective; and further movement of the tap 29A from such intermediate position, as indicated by movement from position B to position C, results in more and more of the high frequency components of the voltages induced in both coils 16 and 17 to be effectively removed.

Thus, movement of the tone control tap 29A results in shunting of the rhythm coil 17 in varying degree, or such tap 29A may be positioned to allow all the signal of the rhythm coil 17 to pass through and have its effect on the control grid of tube 26, or, the tap 29A may be moved to shunt out in varying degree the high frequency response of the lead and rhythm coils through the high frequency bypass condenser 30. In this way the movable tap 29A serves as a fader from one coil to the other as well as a tone control involving condenser 30. In addition, this arrangement has the advantage of providing "presence," through most of the range of movement of tap 29A by permitting in such range, harmonics from the lead coil 16 to have their effect on the control grid of tube 26.

While the particular embodiments of the present invention have been shown and described, it will be obvious to those skilled in the art that changes and modifications may be made without departing from this invention in its broader aspects and, therefore, the aim in the appended claims is to cover all such changes and modifications as fall within the true spirit and scope of this invention.

I claim:

1. A control of the character described comprising a lead coil, a rhythm coil, a volume control potentiometer, said lead coil, rhythm coil and volume control potentiometer being serially connected, tone control circuitry involving a serially connected tone control potentiometer resistance and bypass condenser, such control circuitry being connected in shunt with said lead coil, and the movable tap on the tone control potentiometer resistance being connected to the junction point of said rhythm coil and volume control potentiometer.

2. In a control of the character described comprising, a first coil more sensitive to harmonic content of a vibrating string, a second coil more responsive to the fundamental vibration of said string, amplifying means, said first and second coils being serially connected in a serial circuit, said serial circuit including an impedance element, means coupling said impedance element to said amplifying means, tone control circuitry involving a serially connected tone control potentiometer and a bypass condenser, said tone control circuitry being connected in shunt with said second coil and said impedance means, one terminal of said tone control potentiometer being connected to one terminal of said second coil, and the movable tap on said tone control potentiometer being connected to the other terminal of said second coil.

3. In a control of the character described, a first coil

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more sensitive to the harmonic content of a vibrating string, a second coil more responsive to the fundamental of said string, amplifying means, means coupling said first and second coils to said amplifying means, said coupling means comprising tone control circuitry, said tone control circuitry involving a tone control potentiometer resistance serially connected with a bypass condenser, one terminal of said tone control potentiometer resistance being connected to one terminal of said second coil, and the movable tap on said tone control potentiometer resistance being connected to the other terminal of said second coil.

4. In a control of the character described, a first coil more sensitive to the harmonic content of a vibrating string, a second coil more responsive to the fundamental of said string, impedance means, a serial circuit comprising said first coil, said second coil and said impedance means, tone control circuitry involving a tone control potentiometer resistance and a bypass condenser, said tone control circuitry being connected in shunt with said second coil and said impedance means, and the movable tap on said tone control potentiometer resistance being connected to the junction point of said impedance means with said second coil.

5. In a control of the character described, a first coil more sensitive to the harmonic content of a vibrating string, a second coil more responsive to the fundamental of said vibrating string, amplifying means, means coupling said first and second coils to said amplifying means, said coupling means comprising tone control circuitry, said tone control circuitry involving an adjustable potentiometer resistance having one terminal thereof connected to one terminal of said second coil and the movable tap connected to the other terminal of said second coil so that in one position of said tap, said second coil is short-circuited to thereby effectively decouple said second coil from said amplifying means.

6. In a control of the character described, first means more sensitive to the harmonic content of a vibrating string, second means more responsive to the fundamental of said vibrating string, tone control circuitry involving a tone control potentiometer resistance serially connected with a bypass condenser, amplifying means, means coupling said first and second means to said amplifying means, said coupling means comprising said tone control potentiometer resistance and said condenser, said tone control potentiometer resistance having one of its outside terminals and the tap thereon connected in shunt with said second means, said serially connected potentiometer resistance and condenser comprising a serial circuit which is connected in shunt with said first means, said tap being connected to one terminal of said amplifying means, the other terminal of said amplifying means being connected through said condenser to the other terminal of said potentiometer resistance so that movement of the tap on said tone control potentiometer resistance decouples said second means from said amplifying means in varying degrees, in one range of movement of said tap, and in a different range of movement of said tap, the high frequency components produced by said first and second means is effectively decoupled in varying degrees from said amplifying means.

7. In a control of the character described, first means more sensitive to the harmonic content of a vibrating string, second means more responsive to the fundamental of said vibrating string, amplifying means, means coupling said first and second means to said amplifying means, said coupling means comprising a potentiometer resistance serially connected with a bypass condenser and interconnected with said first and second means, said potentiometer resistance having one of its outside terminals and the tap thereon connected in shunt with said second means, said serially connected potentiometer resistance and condenser comprising a serial circuit which is connected in shunt with said first means, said tap

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being connected to one terminal of said amplifying means, the other terminal of said amplifying means being connected through said condenser to the other terminal of said potentiometer resistance such that in one extreme position of the tap on said potentiometer resistance said second means is effectively decoupled from said amplifying means, in the other extreme position of said tap, the high frequency components produced by said first and second means are effectively decoupled from said amplifying means, and in an intermediate position of said tap both said first and second means are fully coupled to said amplifying means without decoupling of the

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high frequency components produced by said first and second means.

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