An electric guitar circuit includes two hum-bucking pickups connected to a selector switch by which various combinations of connections and phasings may be used to select the type of sound desired. In addition, the selected signal is further subject to a volume control, a high-frequency tone control, and a mid-range frequency tone control, the circuit being physically embodied in the guitar. By way of example, in one position of the selector switch, the two pickups are connected in series with each other. The mid-range frequency tone control is used to suppress the harshness found in that frequency range in transistorized audio amplifiers.

12 Claims, 3 Drawing Figures
ELECTRIC GUITAR CIRCUIT

BACKGROUND OF THE INVENTION

1. Field of the Invention
This invention relates to the electrical circuitry or control circuitry of a stringed musical instrument, such as a guitar.

2. Prior Art
It has been conventional to provide a guitar with electrical pickups and associated electrical circuitry, with the adjustable controls mounted on the guitar for access, during use, by the musician. However, the range of sounds and variety of sounds obtainable from prior circuitry has been to some extent restricted to a group of conventional sounds and effects. Further, guitars of the type described have been used with tube-type audio amplifiers, the better ones of which have a linear output. However, the industry has largely converted to transistorized audio amplifiers, and these do not have the same frequency response whereby, when used with conventional electric guitars, there is a harshness of tone quality in the mid-range.

SUMMARY OF THE INVENTION

In this invention, a selector switch is employed to connect the output derived from the pickups in various modes, including one selector switch setting in which the pickups are connected in series. Further, the circuit includes a mid-frequency tone control which suppresses the amplitude of signals over a range corresponding to a non-linear range of boost obtained by transistorized amplifiers. Thus, when a particular guitar circuit is adjusted to match the non-linear boost of the transistorized amplifier, the one can in effect cancel the other so as to produce a linear result, thereby obtaining the mellowness from a transistor amplifier which previously was obtained from a tube-type audio amplifier.

Accordingly, it is an object of the present invention to provide an improved electric guitar circuit.

Another object of the present invention is to provide pickup connections such that novel sounds are obtainable from the guitar.

A further object of the present invention is to provide a guitar which can be used interchangeably with either linear or non-linear audio amplifiers while obtaining substantially the same result in sound.

Many other advantages, features and additional objects of the present invention will become manifest to those versed in the art upon making reference to the detailed description and the accompanying sheets of drawings in which preferred structural embodiments incorporating the principles of the present invention are shown by way of illustrative example.

ON THE DRAWINGS

FIG. 1 is a schematic diagram of an electric guitar circuit such as provided for a bass guitar in accordance with the present invention;

FIG. 2 is a schematic diagram of an electric guitar circuit for a six or twelve string guitar having any body configuration in accordance with the present invention; and

FIG. 3 is a diagram illustrating the effect of the mid-range frequency tone control.

AS SHOWN ON THE DRAWINGS

The principles of the present invention are particularly useful when embodied in an electric bass guitar circuit such as shown in FIG. 1, generally indicated by the numeral 10. The circuit 10 includes pickup structure generally indicated at 11, a selector switch generally indicated at 12, a volume control 13, a high-frequency tone control 14, and a mid-range frequency tone control 15.

The pickup structure 11 includes a first pickup 16 and a second pickup 17. The pickup 16 includes a first coil 18 and a second coil 19 identical to it and connected in series therewith but in out-of-phase relationship thereto. In like manner, the pickup 17 includes a first coil 20 corresponding in polarity with the coil 18 and connected in series with a second coil 21 of like construction and in out-of-phase relationship therewith.

The selector switch 12 enables various combinations, connections and uses of the pickups 16, 17 as described in greater detail below. The output of the selector switch 12 includes a movable contact connected to a line 22 which goes to the input of the volume control 13 and the output 23 of the volume control 13 goes to a conventional jack (not shown) and from it through such line 23 to an audio amplifier 24 and loudspeaker 25. The other movable contact of the switch 12 is grounded for selective engagement with stationary contacts. The high-frequency tone control 14 includes a capacitor 26 and a variable resistor 27. The size of the capacitor 26 is selected in order to select the frequency range to be affected by the tone control 14. A representative size is .05 MFD. In addition to the tone control 14 being connected to the output from the pickup structure 11, the mid-range frequency tone control 15 is likewise also connected thereto. The mid-range frequency tone control 15 includes a variable resistor 28, a capacitor 29 and an inductor or choke 30. In this embodiment, the capacitor 29 has a representative size of .05 MFD. The inductor 30 includes a pair of coils 31, 32 connected in series with each other and in out-of-phase relationship with each other. The volume control 13 and the tone control 14 are old per se but are disclosed herein for reasons of completeness of disclosure, all of the circuitry shown leading up to line 23 being built into the body of the guitar so that only a single shielded conductor 23 leads to the amplifier.

FIG. 3 shows a typical frequency response of a transistorized audio amplifier which includes a non-linear portion 33 extending over the mid-frequency range, here about 700 to 7000 cycles per second. When the variable resistor 28 is properly adjusted, the non-linear portion 33 is progressively brought down from the uppermost portion illustrated in FIG. 3 to that shown at 33a, from which can be seen that the amplifier output is substantially linear. Actually, the signal is reduced over such midfrequency range, and the non-linear property of the amplifier raises the signal to that shown at 33a.

The selector switch 12 has four positions and although shown diagrammatically for ease in illustration, the switch 12 typically comprises a single wafer rotary switch having switch elements on opposite sides thereof with a movable contact on each side adapted to slide with the other to any of four positions.

The pickup coil 16 is typically disposed on the guitar near the fingerboard while the pickup 17 is typically
disposed close to the bridge. As drawn, showing the first position, the output of the first pickup 16 or fingerboard pickup is utilized alone, as the winding of the pickup 17 is not grounded.

When the selector switch is advanced to the next position to the right, since the stationary contacts are connected together, the pickup 16 is used in the same way. However, the pickup 17 is then also brought into the circuit in an identical way. Thus in the second position, both pickups are used, being connected in parallel with each other and being in phase with each other.

When the selector switch 12 is moved to the third position, both ends of the winding of the pickup 16 are grounded, thereby short-circuiting any signal generated therein, while the pickup 17 has one of its leads connected to the output line 22 and the other lead grounded. Thus in this position, only the bridge pickup is used.

In the fourth position of the selector switch, an unusual tonal result is achieved. Here the pickups 16 and 17 are connected in series with each other in out-of-phase relation to each other.

The coils 18-21 are preferably wound alike, a representative specification being 4000 turns of No. 42 wire. The coils 31, 32 should be provided with twice as many turns of the same size wire. The wiring details shown inside the selector switch 12 constitute representative connections for achieving the combinations of pickup selection described above.

Whatever selection is made, the output from the pickup structure 11 appearing on the line 22 is further subject to the effect of the tone controls 14 and 15 and the volume control 13, thus giving the musician a wide range of selection of sounds that can be controlled directly from his instrument.

FIG. 2 illustrates an electric guitar circuit 33 which is similar to the guitar circuit 10 in its basic respects, although more complications, options and features are included to give a greater sophistication in the instrument such as is desired by a lead or soloist guitarist. The guitar circuit 33 includes pickup structure generally indicated at 34 including a first pickup 35 having a pair of coils 36 and 37 connected in series in out-of-phase relationship, and a second pickup 38 having a pair of coils 39, 40 connected in series in out-of-phase relationship with each other, the polarity of the coil 39 corresponding to that of the coil 36. In this embodiment, both of the terminals from the pickup 38 can be switched around independently of the output terminal from the pickup 35. The circuit 33 includes a rotary selector switch 40 of the wafer type having three active sides, each of which has a movable contact 40a, 40b, 40c mechanically ganged together and movable to slide onto any one of six stationary contacts such as 40a, respectively. For purposes of explanation, the vertical row of contacts 40a at the left is herein referred to as the first position with succeeding positions following to the right. In the first position, the pickup 35 and the pickup 38 are connected together in series with the pickups being in phase with each other.

In the second position, only the pickup 35 is in the circuit.

In the third position, the pickup 35 is used as in the first position, but with the pickup 38 connected in parallel therewith and in-phase.

In the fourth position, the pickup 38 has been reversed so that it is still in parallel with the pickup 35 but in out-of-phase relationship thereto. In this combination, it is possible for the out-of-phase signal to be too strong, particularly in the lower frequencies, and therefore there is preferably included a capacitor 41 of a size that passes the frequencies of a tone control described below.

In the fifth position, only the pickup 38 is employed.

In the sixth position, the pickup 35 is connected in series with the pickup 38 but in out-of-phase relation to each other.

Whatever the position of the selector switch, the output of the pickup structure 34 passes to an output line 42 which leads to the input of a volume control 43, the output of which, or wiper, is connected to the input of an audio amplifier 44 leading to a loudspeaker 45. Also connected to the output from the selector switch 40 is a tone control 46 which passes the higher frequencies and a mid-range frequency tone control 47. The tone control 46 includes a capacitor 48 which is made smaller than that used with the tone control 14, here .02 MFD, the same size as the capacitor 41.

The mid-range frequency tone control 47 includes a variable resistor 49 which is like the variable resistor 28, an inductor or choke 50 which is identical to the choke 30 and a capacitor 51, here .01 MFD.

When the volume control 43 is set to full volume, all of the signals on the output line 42 pass through a cable 52 leading from the guitar to the amplifier 44. However, when the volume level is reduced, there is a tendency for the higher frequencies to be reduced faster or earlier than the lower frequencies. To compensate for this condition and to avoid such reduction, there is provided a capacitor 53, here .0003 mfd, which permits the highest frequencies to bypass the volume control 43, thus eliminating the uneven loss thereof. Again, all of the output signals passing through the line 42 not only can be varied in accordance with selection of one of six positions of the selector switch 40, but each of such six types of signals can be further varied by the optional setting of the volume control and the two tone controls as explained.

Although various minor modifications might be made or suggested by those versed in the art, it should be understood that I wish to embody within the scope of the patent warranted hereon, all such embodiments as reasonably and properly come within the scope of my contribution to the art.

I claim as my invention:

1. A circuit for an electric guitar, comprising:
   a. a pickup structure having an output line for being connected to the input of an amplifier; and
   b. a mid-range frequency tone control circuit connected between the output line of said pickup structure and a reference potential, said tone control circuit suppressing neither the highest nor the lowest audio frequency signals of said output line, said mid-range tone control circuit comprising a variable resistor, a capacitor, and an inductor connected in series with each other.

2. A circuit according to claim 1 including an adjustable volume control having an input and an output connected in series in said output line, and a high-frequency bypass capacitor connected between the input and the output of said volume control.

3. A circuit according to claim 1 in which said inductor has two coils connected in series in out-of-phase relation to each other.

4. A circuit according to claim 1 in which said pickup structure comprises
a first pickup having a pair of coils connected in series in out-of-phase relation to each other, and a second pickup having a pair of coils connected in series in out-of-phase relation to each other; and a selector switch arranged to connect said pickups in series.

5. An electric guitar circuit, comprising:
   a. a first pickup having a pair of coils connected in series in out-of-phase relation to each other;
   b. a second pickup having a pair of coils connected in series in out-of-phase relation to each other; and
   c. a selector switch having contacts for connecting said pickups in series with each other and to the input of an audio amplifier.

6. A circuit according to claim 5 in which said contacts connect said pickups in out-of-phase relation to each other.

7. A circuit according to claim 5 in which said contacts connect said pickups in in-phase relation to each other.

8. A circuit according to claim 5 in which said contacts are arranged alternatively to connect said pickups in parallel.

9. A circuit according to claim 8 in which the parallel connection made by said contacts connects said pickups in in-phase relation to each other.

10. A circuit according to claim 8 in which the parallel connection made by said contacts connects said pickups in out-of-phase relation to each other.

11. A circuit according to claim 10 including a capacitor connected in series with one of said pickups to limit the output of out-of-phase signal.

12. A circuit according to claim 5 in which said contacts are arranged alternatively to connect said pickups to the amplifier individually.

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