United States Patent

[11] 3,602,627

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[54] SOUND PICK UP METHOD AND APPARATUS FOR STRINGED INSTRUMENTS

7 Claims, 2 Drawing Figs.

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[50] Field of Search 84/1.16, 1.15, 1.22, 1.25

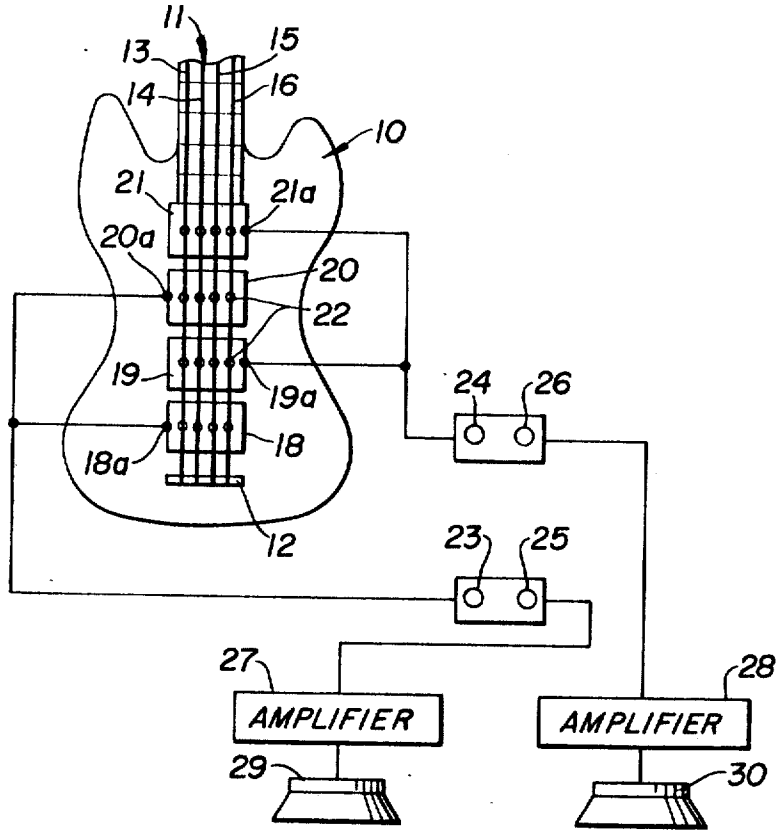
[56] References Cited

UNITED STATES PATENTS

2,964,985	12/1960	Webster	84/1.15
3,413,403	11/1968	Jacob	84/1.25
3,478,158	11/1969	Trainor	84/1.16
3,483,303	12/1969	Warner	84/1.15
3,493,669	2/1970	Elbrecht	84/1.16

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ABSTRACT: Method and apparatus is provided for electrical amplification of sounds produced by stringed instruments by sensing vibrations of the strings at four longitudinally spaced positions and forming respective signals with the signals from alternate positions combined to provide two output signals that are subsequently converted to acoustical signals. Sensing of the vibrations is effected by conventional pickups each comprising a group of transducers equal in number to the number of strings of the particular instrument to which the technique disclosed herein may be adapted. Alternate ones of the pickups have their transducers electrically connected together and to the same output providing two output signals that are the resultant of the vibration of each string at two different locations.



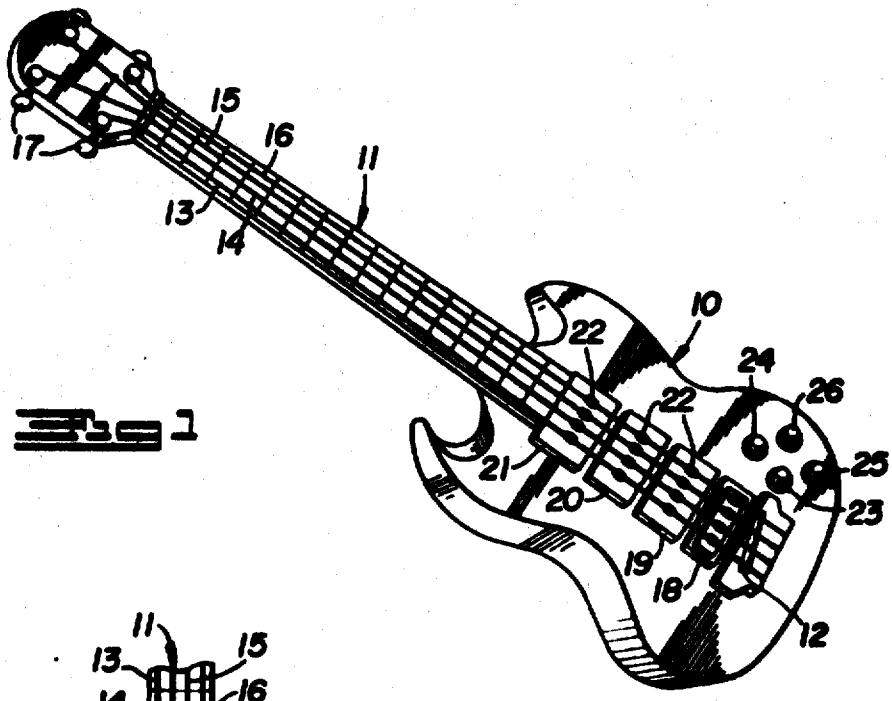


Fig 1

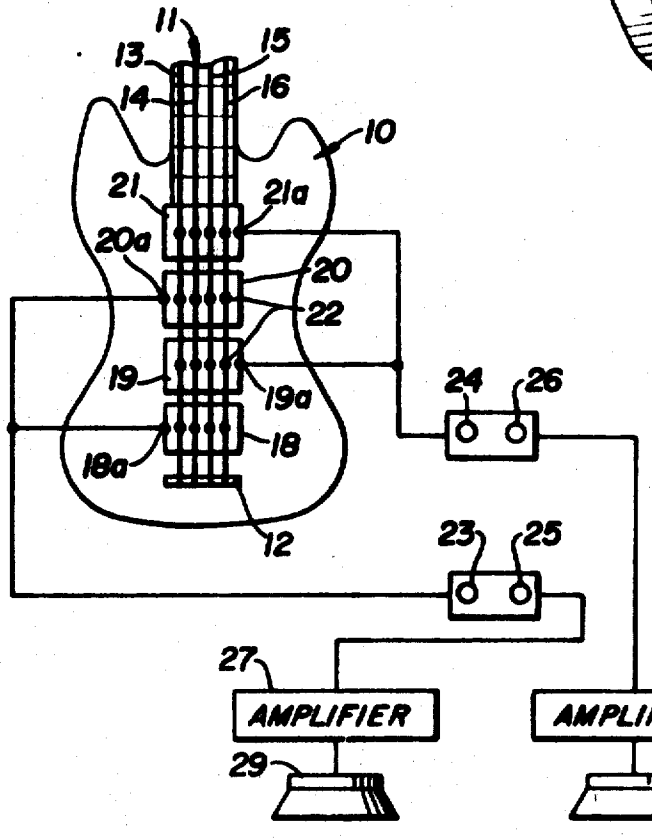


Fig 2

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SOUND PICK UP METHOD AND APPARATUS FOR STRINGED INSTRUMENTS

BACKGROUND OF THE INVENTION

It is a well known practice to utilize electronic amplification in connection with stringed musical instruments such as those instruments in the guitar family. This is accomplished through positioning of electromechanical transducers, sound pickup devices, on the soundboard in coupled relationship with the strings for response to the mechanical oscillations with the electrical output signal produced routed through an electronic amplifier circuit before being translated to an acoustical signal by an electroacoustic transducer. In addition to amplification for increased sound level, electronic tone control circuits have been incorporated to provide a further degree of control over the acoustical output. U.S. Pat. No. 2,964,985 is exemplary of the known prior art with respect to utilization of tone control and also illustrates the use of two electromechanical pickups for increased sound level of the output. In addition, the patent demonstrates the known prior art arrangements for a dual output.

BRIEF DESCRIPTION OF THE INVENTION

This invention provides a technique for greater enhancement of the acoustical output from electronically amplified signals produced by a stringed instrument such as a guitar. In accordance with this technique, mechanical oscillations of the several strings are sensed by four electromechanical transducers positioned in longitudinally spaced relationship along the strings with the electrical signals from alternately disposed transducers combined and independently subjected to electronic tone control and amplification with subsequent translation to respective acoustical outputs. This arrangement greatly enhances the tonal qualities of the output, in addition to greater amplification power, as a different tonal effect is obtained at the longitudinally spaced positions of the pickups along the strings. A relatively greater treble tone effect is obtained through placement of a pickup relatively nearer the bridge than a more remote placement; thus, combining the output signals of alternate pickups that are longitudinally spaced results in two acoustical outputs that have substantially different tonal qualities and combine to form an output of enhanced quality that is not obtained with the known prior art arrangements.

These and other objects and advantages of this invention will be readily apparent from the following detailed description of an embodiment thereof and the accompanying drawings.

In the drawings:

FIG. 1 is a perspective view of a stringed instrument of the guitar family to which this invention is applied.

FIG. 2 is a schematic representation of the electrical circuit showing interconnection with the several sound pickup devices.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

Having reference to the drawings, a guitar is shown in FIG. 1 which is of well known construction having a soundboard **10**, fingerboard **11**, a bridge **12** and a plurality of strings **13**, **14**, **15** and **16**. The strings are secured at one end to the soundboard **10** and extend over the soundboard and the fingerboard **11** to which they are secured at the opposite end by selectively adjustable tensioning devices **17**. Although the illustrated guitar is provided with four strings, it will be understood that the number is determined by the specific type of guitar and may be more, for example, six strings may be provided. Mounted on the soundboard **10** are four sound pickup devices **18**, **19**, **20** and **21** which are also of well-known construction and it will be noted that each comprises a plurality of electromechanical transducers **22** equal in number to the number of strings. Also mounted on the soundboard are the manually operable tone controls **23** and **24** and volume controls **25** and **26**. Suitable connector terminals (not shown) are also provided for electrical connection of the pickup devices and the tone and volume controls with the amplifier circuits and electroacoustic transducers.

The sound pickup devices **18**, **19**, **20** and **21** are of well-known construction and are readily commercially available with the appropriate number of electromechanical transducers **22**. These transducers may be of either the electromagnetic or the piezoelectric type as desired and are positioned in coupled relationship to the respective strings to convert the mechanical wave energy produced by oscillation of the strings to an electrical signal that may be readily controlled by appropriate electrical circuits. All transducers **22** in any one pickup device, **18**, **19**, **20**, or **21**, are electrically interconnected to provide a single output signal that is a composite of the individual electrical signals formed in response to mechanical oscillation of all strings at any particular instant. While brief, this description of the structural characteristics of the pickup devices will suffice for a complete understanding of this invention.

In accordance with this invention, oscillations of the several strings of the instrument are sensed at four positions longitudinally spaced relative to the strings with the resultant mechanical wave energy produced at each position converted to a respective electrical signal. The four pickups are relatively positioned as readily seen in the drawing in longitudinal alignment and oriented with respect to the strings to position each transducer **22** under and in closely coupled relationship to a respective string. The first pickup device **18** is shown longitudinally positioned closely adjacent the bridge while the fourth pick up device **21** is positioned adjacent the terminal end of the finger board **11** with the second and third pickup devices **19** and **20** interposed therebetween. This arrangement provides four electric signals which are characteristically different as affected by the relative distance of the pick up from the bridge with the pickup closest to the bridge having the predominent treble quality. Specifically relative spacing and positioning of the several pickup devices is determined by the physical configuration and size of the instrument and it's particular characteristics. In general, uniform spacing provides the advantageous results, but the spacing may be otherwise in accordance with individual tastes.

Electrical interconnection of the several sound pickup devices **18**, **19**, **20** and **21** and associated apparatus is most clearly shown in FIG. 2. The parallel electrical connection of all electromechanical transducers **22** in any one pickup device are not shown in this figure; however, the combined output is diagrammatically represented for each device at the respective terminal connection points **18***a*, **19***a*, **20***a* and **21***a*. Alternate pick up devices, such as **18**, **20** and **19**, **21**, are electrically interconnected as their terminal connection points to further combine the electrical signals in a particular arrangement to provide the tonal quality obtainable by practice of this invention. Separation of the two resultant electrical output signals is then maintained by two independent electrical circuits that are seen in FIG. 2 as including the tone controls **23**, **24**, volume controls **25**, **26**, respective electronic amplifiers **27**, **28** and respective electroacoustic transducers **29**, **30**. The amplifiers and electroacoustic transducers are also well known in this field and comprise commercially available components suitable for the particular apparatus with the amplifiers functioning in a conventional manner to increase the magnitude of the respective electrical output signals to a level adequate for driving the electroacoustic transducers to translate the electrical signals to an acoustical signal of the desired magnitude. The tone and volume controls which incorporate conventional circuits may be selectively manipulated to provide further desired variations in the two electrical signals in accordance with individual tastes or circumstances.

It will be readily apparent from the foregoing detailed description of an embodiment of this invention that a novel

method and apparatus is provided for enhancement of the tonal quality of the acoustical output of the electronically amplified sounds of a stringed instrument. This enhancement of tonal quality if obtained through combining of the electrical output of alternately disposed sound pick up devices and subsequent independent translation of these signals to acoustical signals which also provides a stereophonic effect.

Having thus described this invention, that is claimed is:

1. The method of electrically amplifying acoustical vibrations produced by a multistringed musical instrument consisting of

A. sensing mechanical oscillation of each of the several strings at at least four positions relatively spaced longitudinally along the strings and forming a respective electrical signal for each position with each signal including components formed by oscillation of all strings at that position,

B. combining the electrical signals formed at alternate positions to form at least two electrical output signals, and

C. independently translating each electrical output signal into a respective acoustical signal.

2. The method of claim 1 including subjecting each electrical output signal to operation of a respective electronic tone-control circuit.

3. The method of claim 2 including independently controlled amplification of each electrical output signal by respective electronic amplification circuits.

4. The method of claim 1 including independently controlled amplification of each electrical output signal by respective electronic amplification circuits.

5. In combination with a stringed musical instrument having a plurality of strings: apparatus for electronic amplification of mechanical oscillations of the strings comprising

A. at least four electrical pickups disposed in longitudinally spaced relationship along the strings, each of said pickups including a plurality of electromechanical transducers equal in number to the number of strings and which are each disposed in coupled relationship to a respective string forming an electrical signal at the output thereof in response to oscillation of the strings with the transducers in each respective pick up disposed at the same longitudinal position relative to the strings,

B. an electrical circuit connecting the output of each electromechanical transducer in alternately disposed pickups in parallel to provide at least two electrical output signals that are a composite of the signals of the several electromechanical transducers, and

C. at least two electroacoustic transducers coupled with said electrical circuit for independent translation of a respective electrical output signal to an acoustical signal.

6. The combination of claim 5 wherein said apparatus includes at least two tone control circuits which are each connected with said electrical circuit for selectively controlling the tone of the acoustical signal produced by a respective electrical output signal.

7. The combination of claim 6 wherein said apparatus includes at least two independently operable amplification circuits which are each connected with said electrical circuit for selectively controlling the amplitude of each respective electrical output signal.