Jan. 30, 1962 L. PAUL 3,018,680

ELECTRICAL MUSICAL INSTRUMENT

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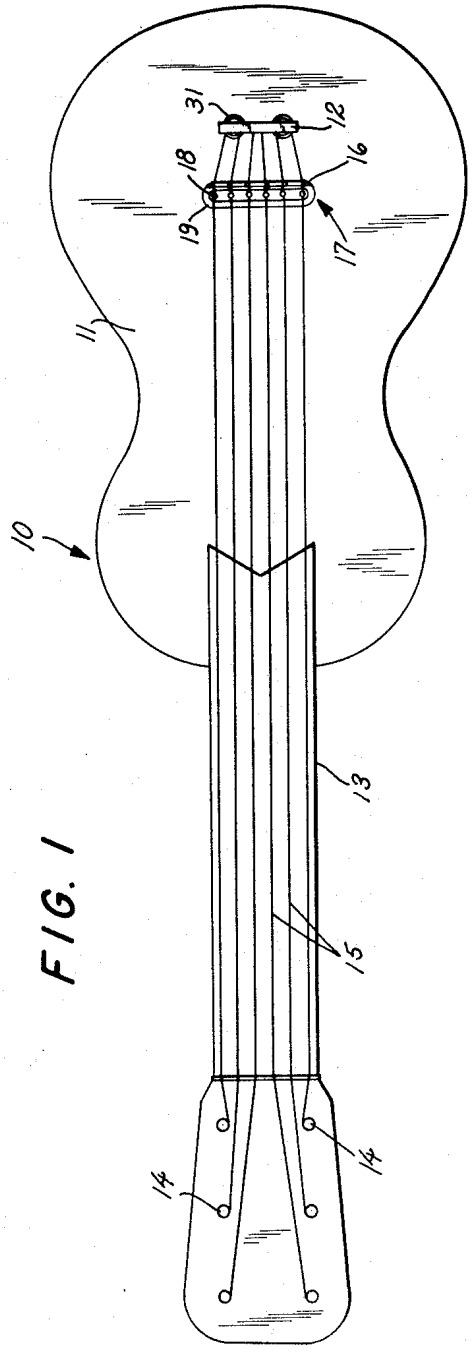


FIG. 1

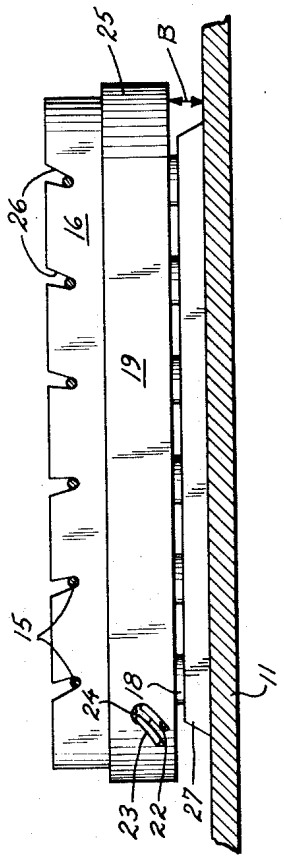


FIG. 3

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FIG. 2

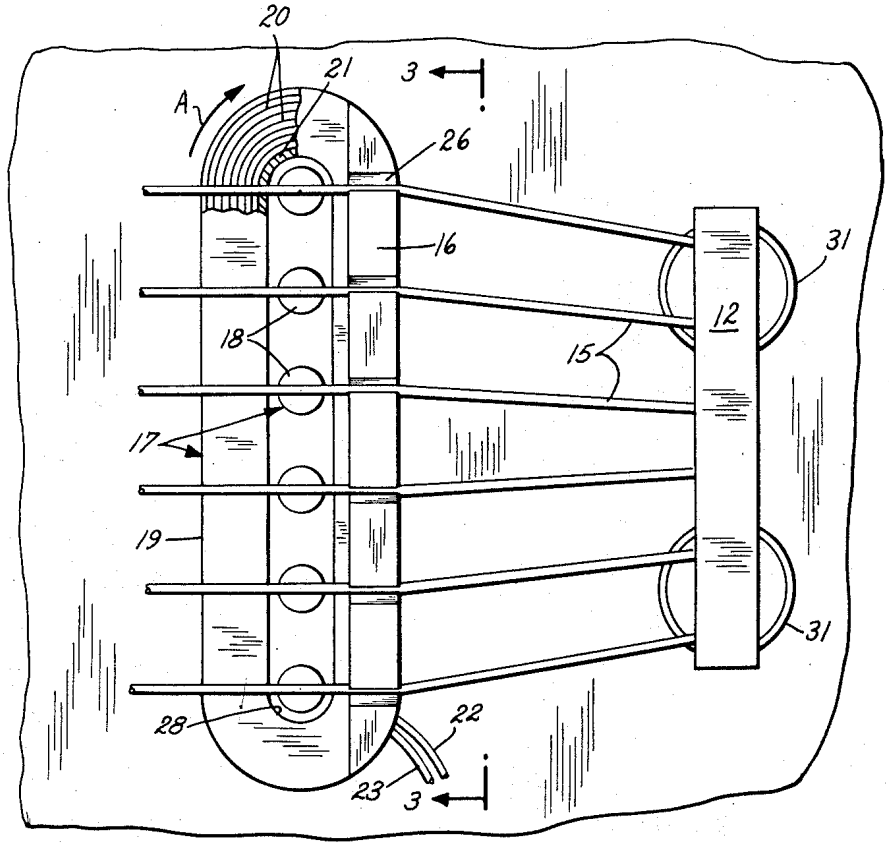
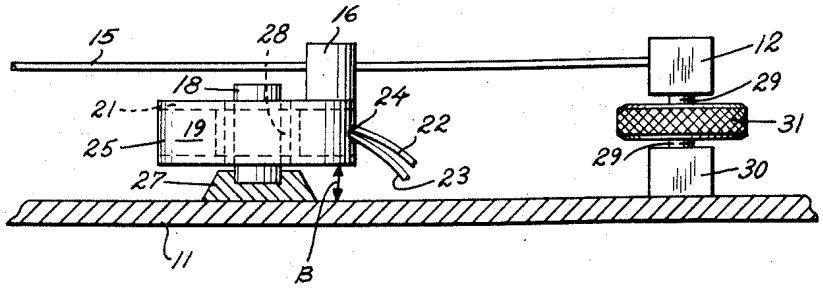



FIG. 4

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# 3,018,680
# ELECTRICAL MUSICAL INSTRUMENT

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2 Claims. (Cl. 84—1.16)

This invention relates to improvements for a stringed musical instrument having a magnetic pick-up, the improvements more particularly residing in a novel technique of employing the magnetic pick-up to convert string vibration into electrical variations, and in a novel arrangement of parts for carrying out this technique.

The principal object of this invention is to produce tones without the harshness and metallic sound usually produced by most electrical instruments.

The type of magnetic pick-up contemplated for use in the present invention is that having a coil and either a permanent magnet or an electromagnet core, and in which electrical currents or variations are induced in the coil capable of being amplified and passed through a loud speaker for producing the sound of a musical instrument.

Illustrative of present techniques employed to induce currents in the coil of the pick-up is that requiring placement of the pick-up in close proximity to metallic strings which when vibrated vary the magnetic field of the pick-up magnetic core, or if non-metallic strings are used, that requiring attachment to the strings of a suitable armature which when vibrated also varies the magnetic field of the pick-up magnetic core.

While the technique of the present invention may also incorporate the above method of inducing coil currents, as a primary mode of producing a signal it contemplates actual movement of the pick-up coil through the magnetic field of the pick-up magnetic core. The pick-up, consisting of a coil and magnetic core, structurewise is no different than that readily purchasable in commerce, but in practice the coil is arranged to be freely movable relative to the magnetic core and by direct mechanical connection to the strings is made to vibrate therewith. As will be more fully described subsequently herein, a preferred manner of providing this mechanical connection is to affix the coil to a novel "floating" bridge suspended from the strings of the instrument.

In the drawings:

FIG. 1 is a plan view of a musical instrument having a magnetic pick-up;

FIG. 2 is an enlarged fragmentary view of a portion of the instrument of FIG. 1 showing the pick-up in greater detail and with the coil casing partly broken away;

FIG. 3 is a view taken on line 3—3 of FIG. 2; and

FIG. 4 is a side view projected from FIG. 2.

Referring in detail to the drawings, in FIG. 1 the numeral **10** generally designates a suitably illustrative type of stringed instrument such as a guitar, the same having a body **11** on which is suitably mounted a tail piece **12**, and a neck **13** in the end of which are suitably disposed a number of upstanding pegs **14**. Stretched between the tail piece **12** and pegs **14** are the six strings **15** of the guitar **10**. Also shown in FIG. 1 is a bridge **16** which functions to properly space the strings **15** one from the other, and a magnetic pick-up generally designated **17**.

As best seen in FIG. 2, structurewise the pick-up **17** is conventional, having a magnetic core consisting of six upstanding permanent magnets **18** each stationarily positioned under one of the strings **15**, and a coil **19** surrounding the magnets **18** and consisting of magnetic wire **20** wound around an insulating bobbin **21** in the direction of the arrow A. The ends of the coil wire **20** are suitably connected to conductors **22** and **23** which extend through an opening **24** in the protective casing **25** of the



coil **19** and are connected to an amplifier and loud speaker unit (not shown). The tops of the magnets **18** extend to within close proximity of the strings **15** in the event that these strings are metallic and it is desired to induce electrical currents in the coil **19** using prior art techniques. This is to say that as just described the pick-up **17** functions conventionally to electrically amplify the sound of the guitar **10**, the strings **15** when metallic and when set in motion serving to vary the magnetic field of the magnets **18** and thereby induce currents characteristic of this string motion in the coil **19**.

However, apart from this method of inducing a signal in the coil **19**, and representing a departure from prior art techniques, it is proposed to induce currents in the coil **19** by actually moving the same through the magnetic field of the magnets **18**. The arrangement of parts shown in detail in FIGS. 3 and 4 is one preferred mode of carrying out this improved technique.

Referring to FIG. 3, it is shown that the strings **15** are individually seated in one of six inclined slots **26** provided in the upper edge of the bridge **16**. Due to the inclination of the slots **26** and as a result of tightening up on the pegs **14**, the strings **15** in obvious manner are made to support the bridge **16** in spaced relation above the body **11**. Affixed to the bottom edge of the bridge **16**, by any suitable manner, is the coil **19**, and accordingly it too is free of contact with the body **11** or for that matter with any other parts of the guitar **10** other than its bridge **16**.

As best seen in FIG. 4, the coil **19** is thus freely suspended about the magnets **18** which extend upwardly from a suitable base **27** secured to the body **11** through a central coil opening **28**. In this regard, the tail piece **12** is supported by threaded members **29** threadably disposed therein and in a base **30** secured to the body **10** and is thus adjustable vertically merely by rotation of the knobs **31** provided on each of the members **29** to insure that there is a clearance B between the coil **19** and the guitar body **10**. The mounting or linking of the coil **19** to a bridge **16** freely suspended from the strings **15** in effect provides a mechanical system through which string vibration is faithfully transmitted to the coil **19**. Thus, when the strings **15** are set in motion, the coil **19** is made to move through the magnetic flux of the field of the magnets **18** with the result that currents or electrical variations are induced in the coil **19** characteristic of the string vibration. Employing the above technique of inducing currents in the coil **19** of a magnetic pick-up **17** and amplifying these currents and passing the same through a loud speaker, it has been possible to produce tones which are free of distortion and which lack the harshness and metallic sound usually produced by most electrical instruments.

It will be understood that the improved technique of the present invention is not to be limited to use solely with a guitar but has wide application to any stringed musical instrument, and further that the arrangement of parts herein described is but one preferred embodiment for carrying out this improved technique and may be widely modified within the invention as defined by the appended claims.

In this connection, a modification which is readily suggested by the embodiment just described and which will be understood to be within the teachings of the present invention, is that in which the coil **19** and the magnets **18** are merely interchanged. In other words, the magnets **18** can be affixed in any suitable manner to the "floating" bridge **16** and the coil **19** stationarily mounted to the guitar body **11**, and the same advantageous results obtained as with the embodiment hereinbefore described.

What is claimed is:

1. A magnetic pick-up for an instrument having a body and neck and means on each between which a plurality of strings are stretched in spaced relation to the body, the pick-up comprising a bridge having inclined slots therein in which the strings of the instrument are individually seated to maintain proper spacing of one string to the other and which seated strings when tensioned are adapted to support the bridge in spaced relation to the body, a plurality of permanent magnets secured to the body, and a coil surrounding the permanent magnets and affixed to the bridge and otherwise free from contact with any parts of the instrument, whereby string vibration causes movement of the coil through the magnetic flux of the magnetic field of the magnets inducing currents in the coil characteristic of the string vibration.

2. A magnetic pick-up for an instrument having a body and neck and means on each between which a plurality of strings are stretched in spaced relation to the body, the pick-up comprising a bridge having string retaining means spaced along an upper edge thereof for individually seating each of said strings in proper spaced relation to each other with said bridge extending substantially perpendicularly of said strings, the location of said string retaining means along said upper bridge edge relative to said spaced strings being such that the strings



are located on opposite sides of the center of said bridge causing said strings, when tensioned, to exert opposing pressures on said string retaining means to support the bridge in spaced relation to the body, means for creating a magnetic field secured across the body beneath said strings and in close proximity to the lower edge of said bridge, and a coil surrounding the magnetic field creating means affixed to said bridge along its lower edge and otherwise free from contact with any parts of the instrument, whereby string vibration causes movement of the coil through the magnetic flux of the magnetic field inducing currents in the coil characteristic of the string vibration.

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