July 13, 1965 A. W. TONDREAU ETAL 3,194,870

SELF-CONTAINED ELECTRICAL MUSICAL INSTRUMENT

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Fig. 1.

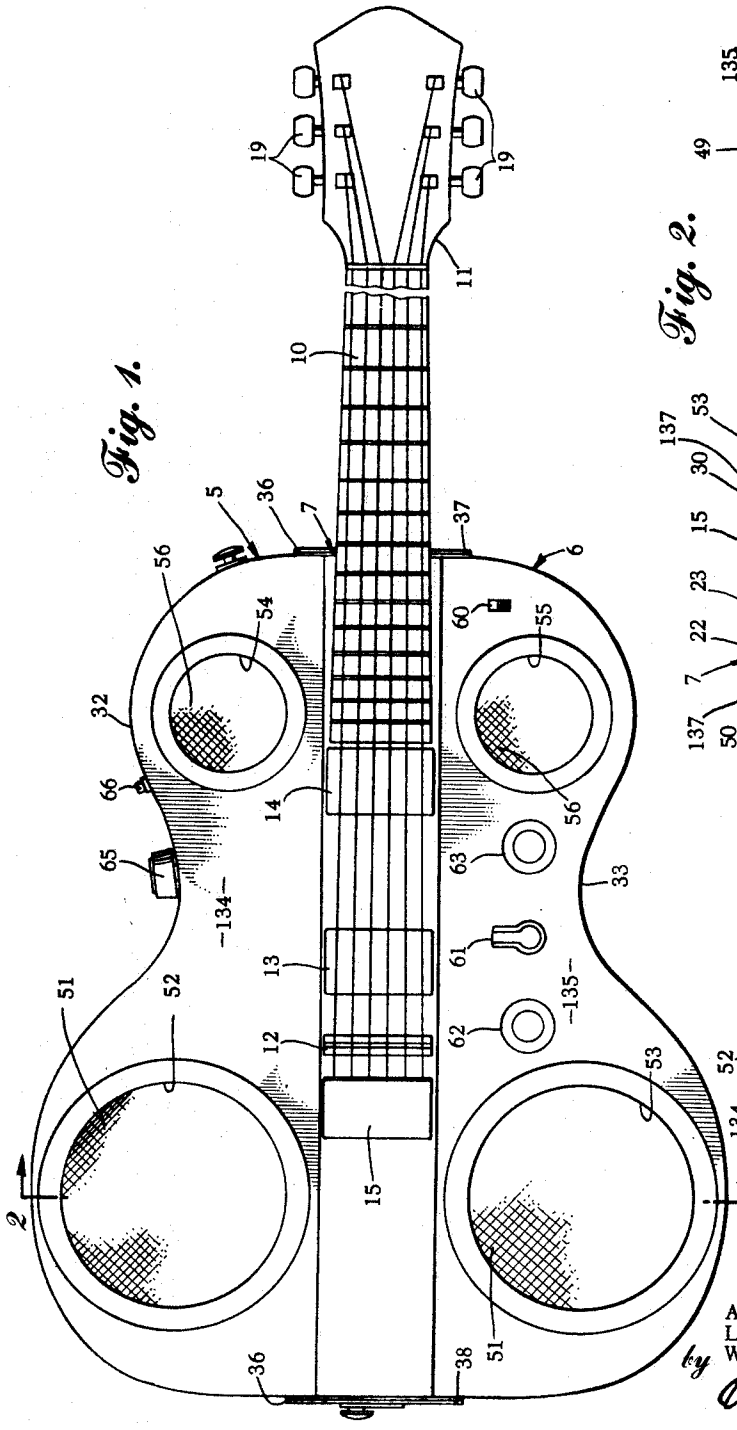

Fig. 2.

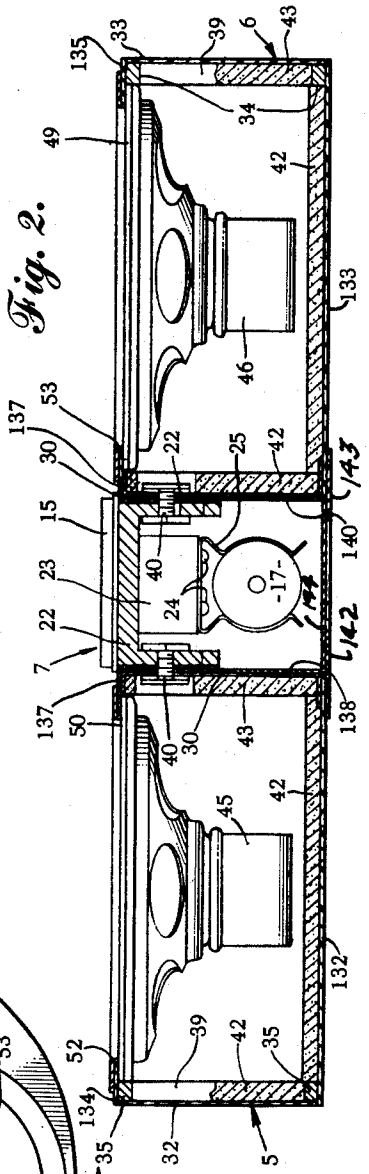

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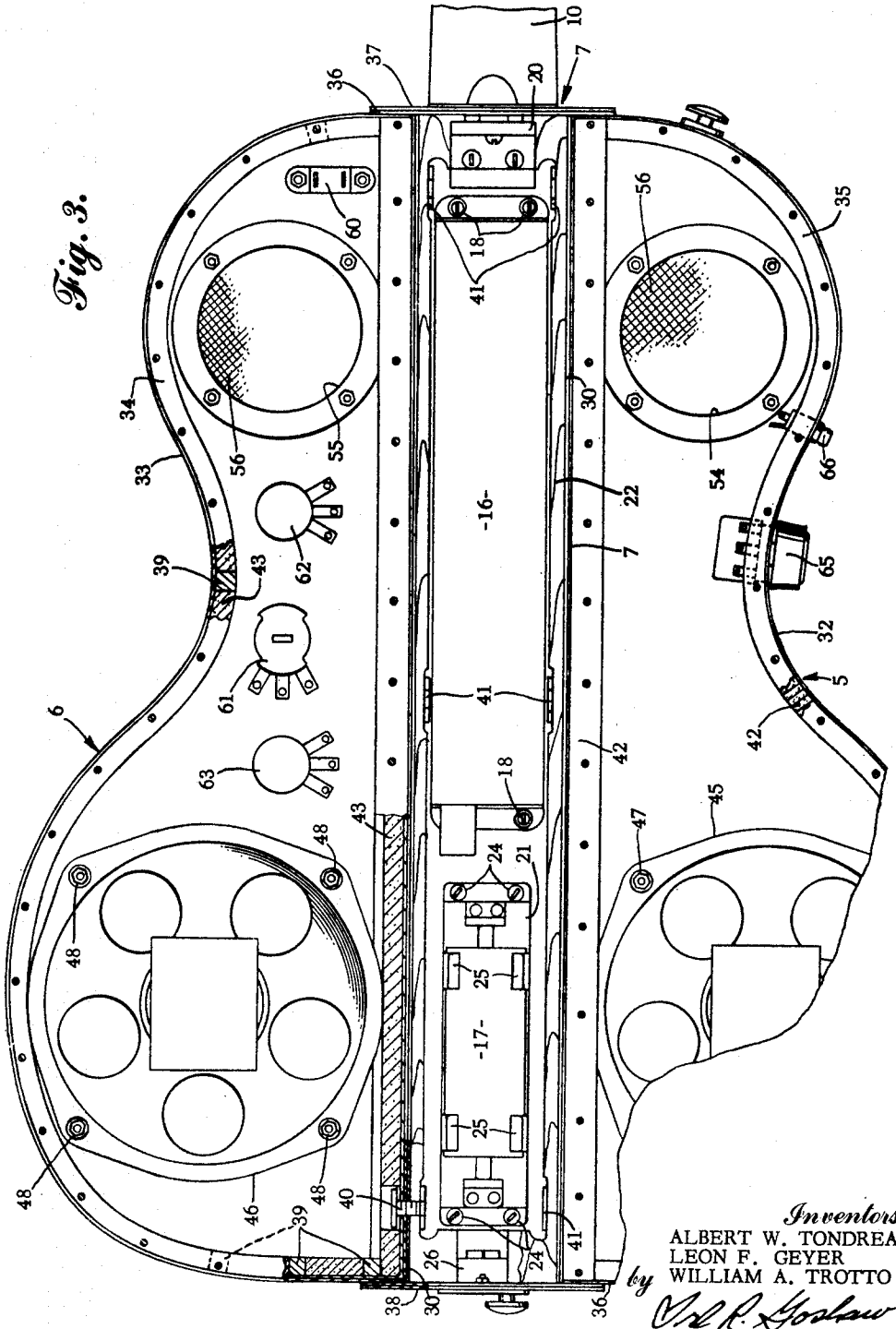
Fig. 3.



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SELF-CONTAINED ELECTRICAL MUSICAL INSTRUMENT

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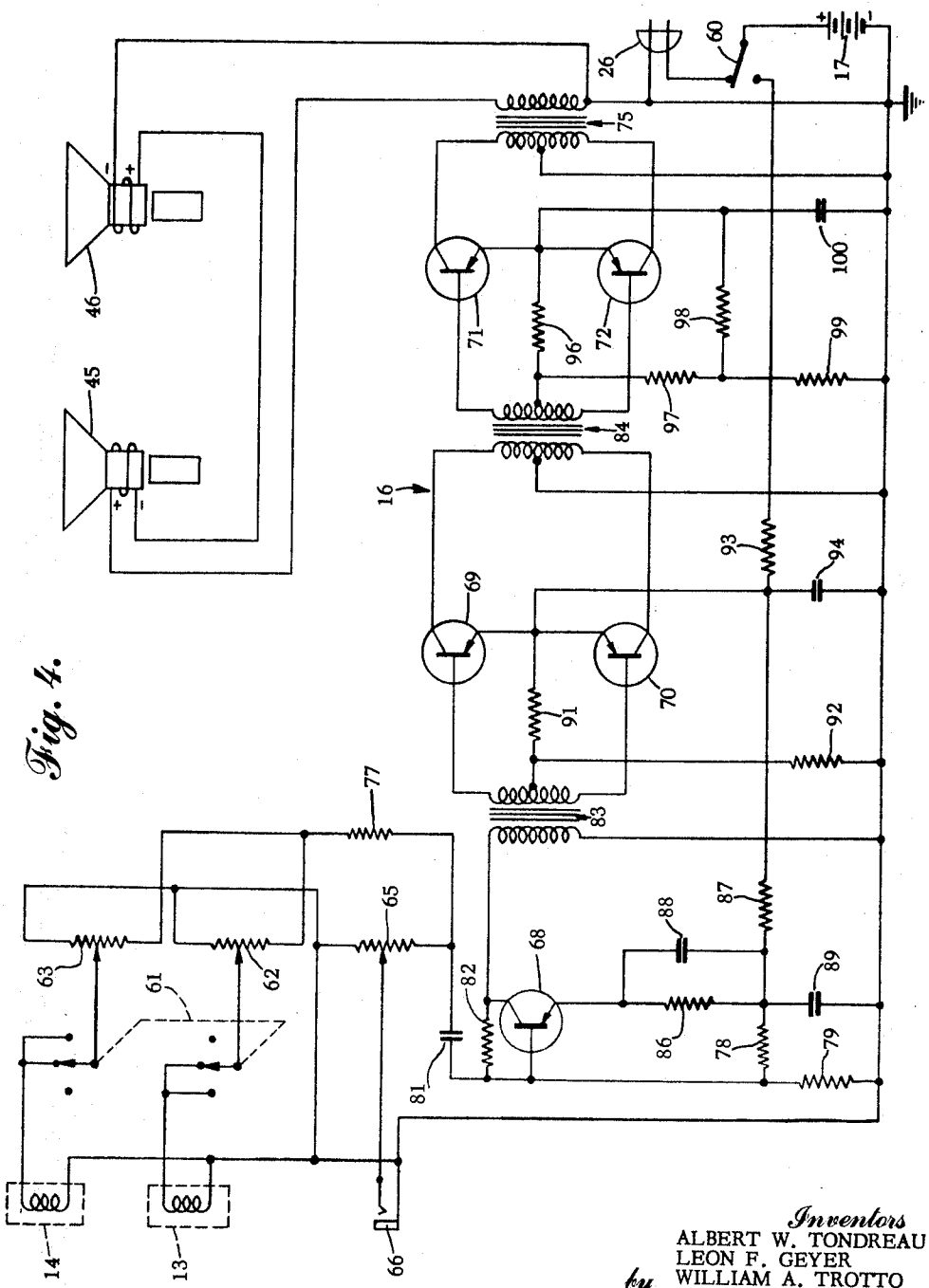

Fig. 4.

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SELF-CONTAINED ELECTRICAL MUSICAL INSTRUMENT

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12 Claims. (Cl. 84—1.16)

This invention relates to an electrical musical instrument, and particularly to self-contained types of stringed musical instruments, such as guitars, banjos, and the like.

The use of magnetic pickup or detecting elements for stringed instruments, such as guitars, banjos, violins, etc., in which the detecting elements feed amplifiers and loudspeakers energized from the normal electrical house supply, is well known. When using such amplifying devices, an electrical cord extends from the instrument to the amplifier and from the amplifier to the house supply, the amplifier being positioned in any suitable place on a stage or platform. It is obvious that the instrument cord will hamper and interfere with the movements of the musician and limit his maneuverability. Furthermore, the amplifier and loudspeaker, which are generally a single unit, are placed away from the musician, and particularly so if it is required that the musician be near a microphone for a vocal rendition. There is, thus, a discrepancy between the position of the source of the sound in the speaker and the position of the musician which is unnatural.

The present invention is a self-contained electrical musical instrument which permits the musician to move about freely since there is no more of a limiting factor in the musician's movements than there would be with a non-electrical musical instrument. Since the instrument is self-contained, it is realized it must have the normal pickup units and house the amplifier, speakers, and power supply. Since the speakers and pickup units are attached to the same instrument, insulation has been provided to prevent feedback. Also, a pair of pickup units are provided, either of which may be connected to the amplifier, or both of which may be connected simultaneously to provide special tonal effects. In addition, a microphone input is provided so that the musician may render a vocal selection while being free to move about the stage or platform. Individual volume controls for each of the pickup units and the microphone permit a very flexible control of the tonal effects, volume, and combination of voice and strings.

The principal object of the invention, therefore, is to provide a self-contained electrical musical instrument.

Another object of the invention is to provide an electrical stringed instrument which has pickup units and houses an amplifier, loudspeakers and a power supply.

A further object of the invention is to provide an electrical guitar having a plurality of pickup units to obtain tonal effects and a microphone input with respective volume controls, all of which are without external connections.

A better understanding of this invention may be had from the following description when read in connection with the accompanying drawings, in which:

FIG. 1 is a plan view of a guitar embodying the invention;

FIG. 2 is a cross-sectional view taken along the line 2—2 of FIG. 1;

FIG. 3 is a bottom view of the guitar shown in FIGS. 1 and 2 with the bottom plate removed; and

FIG. 4 is a schematic diagram of the electrical circuit embodied in the invention.

Referring, now, to the drawings in which the same reference numerals refer to the same elements, the guitar shown in the drawings is composed of three sections, a side section **5**, a similar side section **6**, and a central section **7**, the latter section being rectangular in general form and on which is mounted a finger board **10** with an end **11** with its tuning keys **19**. Also on this section is a bridge **12**, a string anchor **15**, an electro-magnetic vibration pickup unit **13** near the bridge **12**, and a second electro-magnetic pickup **14** near the finger board **10**. Within the central section is a transistor amplifier **16** having the circuit shown in FIG. 5 and a power supply **17** of the rechargeable, sealed nickel-cadmium type supplying a voltage of approximately 11 volts. The amplifier is mounted on the central section by four screws such as shown at **18**. The battery **17** is mounted on a riser **23** which is attached to a U-shaped frame **22** of the central section **7** by screws **24**. The battery **17** is detachably held by spring clips **25**, a plug **26** being connected to the battery **17** when a power switch **60** is off. (See FIG. 4.) The central section is provided with an insulation **30** of any suitable type, such as felt or Celotex.

The two side sections **5** and **6** are of similar construction, the outer portions having curved side panels **32** and **33**, respective bottom panels **132** and **133**, and respective top panels **134** and **135**. The material of these panels may be of wood, metal, formica, or the like. The side, bottom and top panels are cemented to curved frame members **34** and **35** of aluminum or other suitable material, which are square in cross-section and between which are spaced posts such as shown at **39**. The side sections **5** and **6** are attached to the central portion **7** by six bolt and nut combinations holding aluminum angles **137** and **138** to the side sections, one of which is shown in cross-section at **40** and the others at **41**. A pair of gibs **142** and **143** are attached by suitable screws to angles **138** and **140** to permit a sliding door **144** to provide access to the amplifier **16** and battery **17**. As mentioned above, suitable insulation **30**, such as felt, Celotex, or similar material as shown in FIG. 2, separates the frame U-shaped member **22** from the side sections **5** and **6**, and is attached by gluing or cementing to the interior surfaces of the side sections **5** and **6**. The end plates **37** and **38**, which aid in holding side sections **5** and **6** to central section **7**, are insulated from the central section **7** as shown at **36**. Each side section has attached to the inner surface thereof acoustic absorbing material **42** and **43**, such as Celotex.

Two loudspeakers **45** and **46** are positioned in the large ends of the side sections and are attached to the front surfaces of the respective sections **134** and **135** by bolts, such as shown at **47** and **48**, layers of insulation **49** and **50** being positioned between the rims of the speakers and the respective front panels. Openings **52** and **53** are covered by any suitable material, such as a wire cloth mesh **51**, which permits the sound to be emitted from the speakers. Openings **54** and **55** in the smaller ends of the side sections and also covered by a wire mesh **56** provide communication between the respective speakers and the free atmosphere to permit diaphragm breathing.

On the front of the guitar are four controls, such as a power switch **60**, a pickup selector switch **61**, a potentiometer **62** for controlling the volume from pickup unit **13**, and a potentiometer **63** for controlling the volume from pickup unit **14**. As shown in FIG. 4, the connecting switches for the pickup units **13** and **14** are interconnected, as shown by the dotted line, so that in the position shown in FIG. 4, both pickup units are connected to the input of the amplifier, while the right-hand position of the switches connects only pickup unit **14** to the amplifier, and the left-hand position of the switches connects only pickup unit **13** to the amplifier. A greater amount of harmonics is detectable by the pickup unit

13, since it is positioned near the bridge 12, while more of the basic frequencies are detectable by the pickup unit 14. Any desired balance of tonal effects is, therefore, obtainable by manipulation of the potentiometers 62 and 63 when both pickup units are connected to the amplifier.

Located along the side of section 5 is a potentiometer control button 65 and a microphone input jack 66 which may be connected to the amplifier with or without the magnetic pickup units 13 and 14 when the potentiometers 62 and 63 are at their zero positions. Thus, the musician has complete control of the output from his strings and the volume of his voice or other voices during the playing of the instrument. The microphone may be attached to the guitar.

As mentioned above, the invention is particularly free of feedback by eliminating electrical, mechanical, and acoustical coupling, the circuit shown in FIG. 4 aiding in preventing this feedback. Referring, now, to FIG. 4, the amplifier comprises the single voltage amplifier transistor 68 and two pushpull stages comprising transistors 69 and 70 for a low power stage and transistors 71 and 72 for a high power output stage, the output feeding the loudspeakers 45 and 46 in series over a transformer 75. The series connected speakers permit matching of impedances between transformer and speakers, the speakers being properly phased as shown by the polarity indications.

The input to the transistor 68 is over loading resistor 77 and voltage divider resistors 78 and 79 and coupling condenser 81. A resistor 82 is connected between the base and collector of transistor 68. The remainder of the circuit is the standard type including a transformer 83 and a transformer 84, bias resistor 86 and filter resis- 94 are used in the second stage of the amplifier. Bias resistors 91 and 92, filter resistor 93, and filter condenser 94 are used in the second stage of the amplifier. Bias resistors 96 and 97, a thermistor resistor 98, a filter resistor 99, and a filter condenser 100 are used in the high power stage of the amplifier. Since this circuit has been specially designed to provide the minimum of feedback or electrical coupling between the magnetic pickup units 13 and 14 and the microphone, a typical operative circuit has the following values for the elements shown in FIG. 4.

The three potentiometer units 62, 63, 65 and fixed resistor 77 have a resistance of 10,000 ohms, condenser 81, a capacitance of 50 microfarads, resistor 79, a resistance of 4700 ohms, resistor 86, a resistance of 330 ohms, resistor 78, a resistance of 1500 ohms, and resistor 87, a resistance of 2700 ohms. Condensers 88 and 89 have capacitances of 50 microfarads each. For the second stage, resistor 91 has a resistance of 33 ohms, resistor 92, a resistance of 1200 ohms, resistor 93, a resistance of 220 ohms, and condenser 94 a capacitance of 50 microfarads. In the last stage, resistor 96 is 7½ ohms, resistor 97 is 100 ohms, resistor 99 is 150 ohms, thermistor 98 is 100 ohms, and condenser 100 is 50 microfarads. A peak current of 150 mils is obtainable for operation of the amplifier with a model 9VO battery of the type mentioned above. This circuit and battery will function continuously for four hours or more.

The above instrument, therefore, is completely self-contained since it houses the electrical amplifier, power supply, and speakers, which, through the three-section construction of the instrument itself, the positioning of the amplifier and power supply within the central section of the instrument and the speakers in opposite sides, not only is a mechanically and acoustically balanced instrument provided but one which eliminates electrical feedback when operated in the proper manner.

We claim:

1. A self-contained electrical musical instrument comprising three sections, two of said sections being side sections and the third section being a central section having a rectangular cross-section to which the side sections are attached, said central section supporting the finger board and tuning keys of said instrument, at least one magnetic pickup unit positioned under the strings of said instrument, an amplifier in said central section, connections from said pickup unit to said amplifier, a potentiometer for controlling the transmission between said pickup unit and said amplifier, speakers in said sections, connections between said speakers and said amplifier, a power supply connected to said amplifier and positioned in said central section, and insulation surrounding the wall of said side sections and said central section.

2. A self-contained electrical musical instrument in accordance with claim 1 in which said speakers are positioned in the large ends of said side sections of said instrument, openings being provided in said side sections at the other ends of said instrument for interconnecting the back of said speakers with the free atmosphere.

3. A self-contained electrical musical instrument in accordance with claim 1 in which a pair of magnetic pickup units are provided under said strings, together with a switch for interconnecting said pickup units to said amplifier and means for independently varying the volume of either of said pickup units.

4. A self-contained electrical musical instrument in accordance with claim 3 in which a microphone input is provided on said instrument, said input being connected to said amplifier.

5. A self-contained electrical musical instrument having a shell, a finger board, tuning keys and strings, said shell comprising three sections, two of said sections being side sections and the third section being a central section having a rectangular cross-section to which said side sections, said finger board and said strings are attached, a loudspeaker in each of said side sections, a pair of openings in said side sections adjacent said speakers, a second pair of openings in said side sections communicating with said speakers, an amplifier mounted in said central section, a power supply mounted in said central section, said power supply being connected to said amplifier and said amplifier being connected to said speakers, pickup units mounted on said central section and connected to said amplifier, and means for varying the input from said pickup units to said amplifier.

6. A self-contained electrical musical instrument in accordance with claim 5 in which an additional input to said amplifier is provided for voice signals.

7. A self-contained electrical musical instrument in accordance with claim 5 in which a multiple switch is provided between said pickup units and said amplifier, said switch being adapted to connect said pickup units to said amplifier, and means for independently varying the volume of signals from each of said pickup units to said amplifier.

8. A musical instrument having strings, the vibrations thereof being adapted to be detected, electrically amplified and reproduced, said instrument comprising a shell having a plurality of sections, a finger board, tuning keys, and at least one vibration pickup mounted on one of said sections, a sound reproducer within another of said sections, of said shell, an electrical amplifier and electrical power supply within said first-mentioned section, means for interconnecting said vibration pickup to said amplifier, said means including a volume control, means for connecting said amplifier to said sound reproducer, and means for connecting said power supply in said first-mentioned section to said amplifier.

9. A musical instrument in accordance with claim 8 in which said electrical power supply is a rechargable battery positioned within said first-mentioned section.

10. A musical instrument having strings, the vibrations thereof being adapted to be detected, electrically amplified and reproduced, said instrument comprising a shell having a plurality of sections, a finger board, tuning keys, and at least one vibration pickup mounted on one of said

sections, a sound reproducer within another of said sections of said shell, an electrical amplifier and electrical power supply within said first-mentioned section, means for interconnecting said vibration pickup to said amplifier, said means including a volume control, means for connecting said amplifier to said sound reproducer, a pair of vibration pickups on said first-mentioned section and a pair of sound reproducers, one within each of two other sections of said shell, being provided.

11. A musical instrument in accordance with claim **10** in which a pair of openings is provided in each respective section of said shell housing a sound reproducer therein and a switch for connecting said pickup units to said amplifier.

12. A stringed electrical musical instrument adapted to have the string vibrations thereof detected, amplified and reproduced within the instrument, power for said amplification being provided within said instrument comprising a sectionalized shell for containing different elements for reproducing the vibrations of said strings, a battery, an amplifier, said battery and amplifier being located in a centralized section of said shell, an electrical-to-sound wave transducer in a rear section of said shell, and a string vibration pickup located on said centralized section

of said shell, the positioning of said battery and amplifier in said shell with respect to said transducer providing balance to said instrument when transported by a player during the playing of said instrument.

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ARTHUR GAUSS, *Primary Examiner.*