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[54] **METHOD OF ELECTRICALLY REPRODUCING MUSIC AND IMPROVED ELECTRICAL PICKUP FOR PRACTICING THE SAME**

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[21] Appl. No.: **180,424**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 77,946, Oct. 6, 1970, abandoned.

[52] **U.S. Cl.**.....**84/1.15**, 84/1.16, 84/DIG. 12

[51] **Int. Cl.**.....**G10h 3/08**

[58] **Field of Search**.....84/1.01, 1.04, 1.14–1.16, 84/DIG. 12

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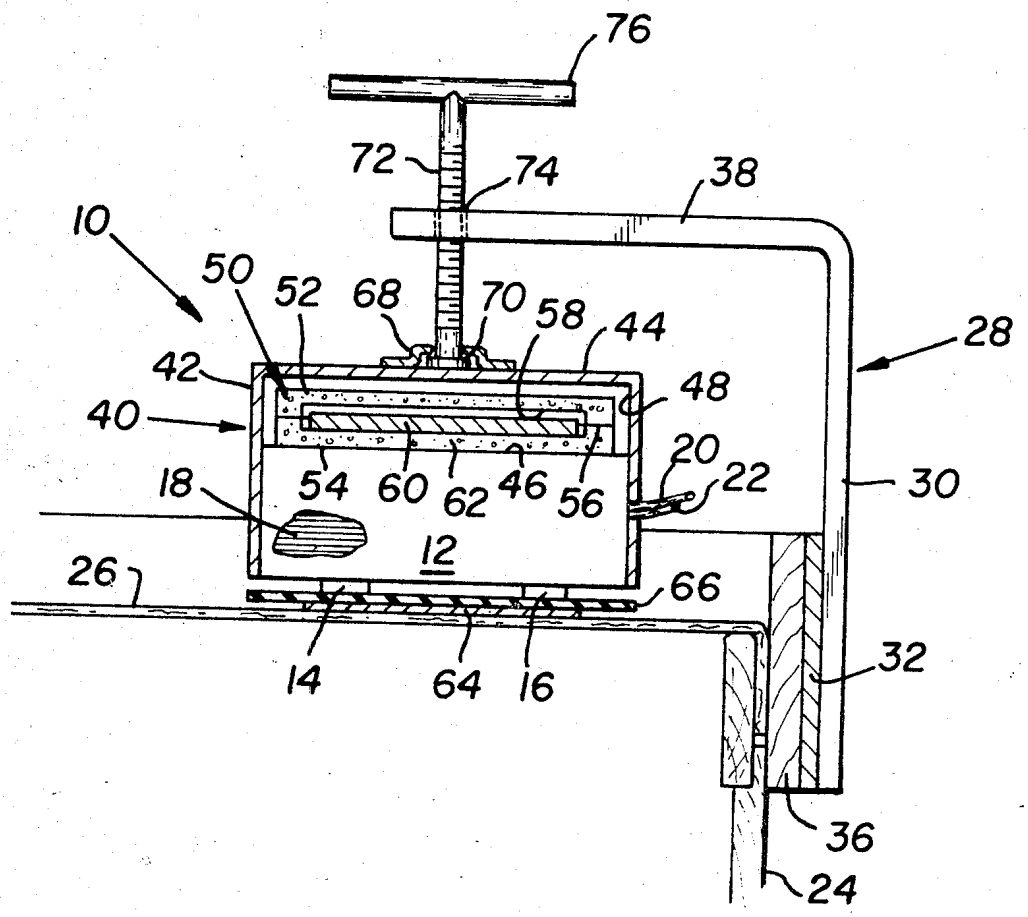
[57] **ABSTRACT**

Improvements in the electrical reproduction of the audio output of musical instruments having vibrating surfaces reproducing said audio output, illustrative examples of which are a drum and a guitar. Product aspects of the invention are demonstrated by the use of an improved electrical pickup that is mounted for vibration in unison with the vibrating surface and thus provides a vibrating magnetic field. A field-influencing magnetic body is confined within a compartment of the electrical pickup that is bounded by resilient walls that in practice causes said body to be set into vibration along with the pickup but in an out-of-phase vibratory pattern. The effect of the vibrating magnetic body is to provide a signal-producing movement relative to the magnetic field that effectively results in audio output reproduction.

3 Claims, 6 Drawing Figures



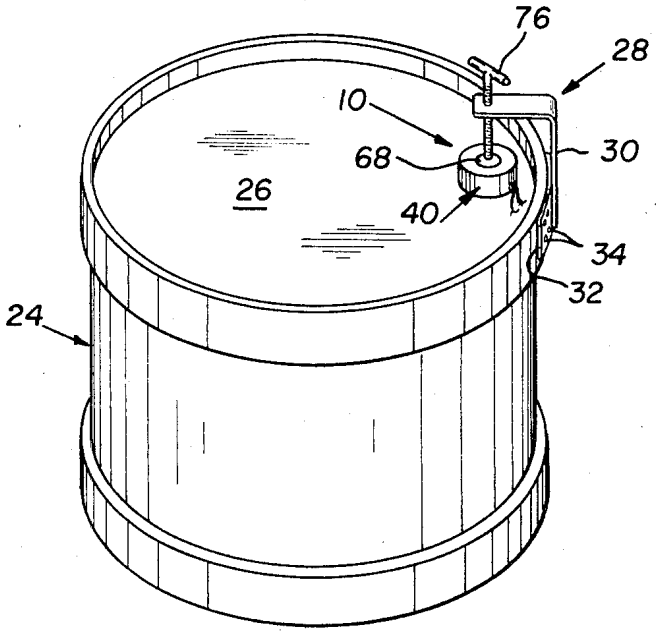


FIG. 1

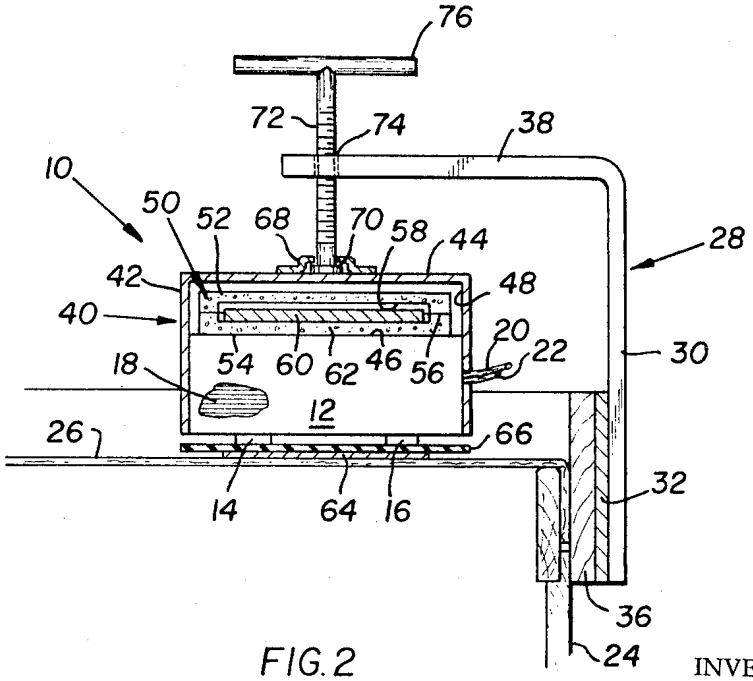


FIG. 2

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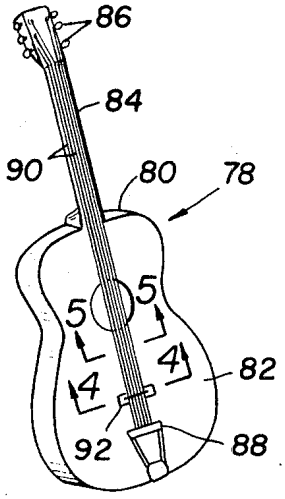

FIG.3

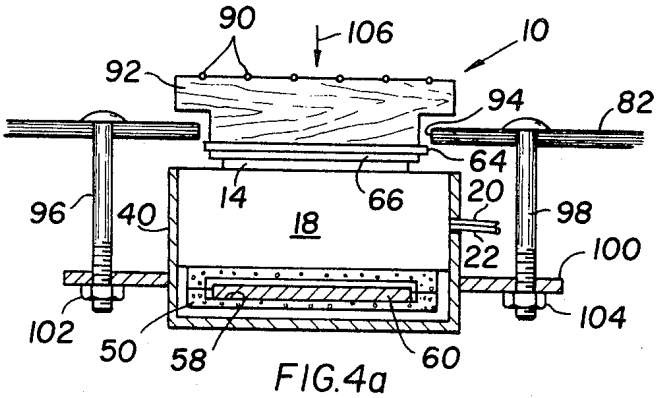

FIG.4a

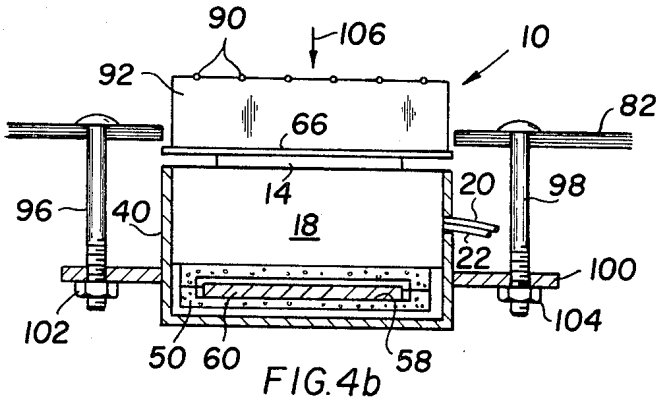

FIG.4b

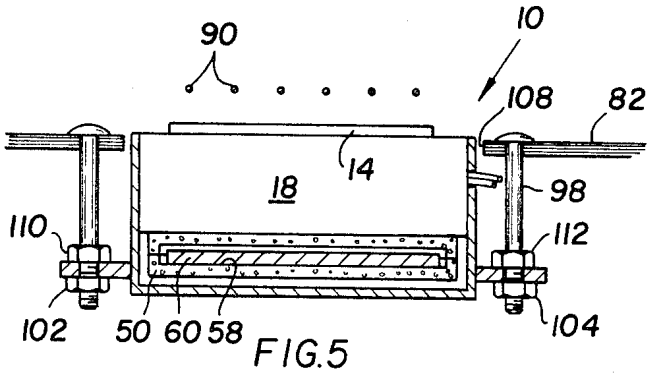

FIG.5

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METHOD OF ELECTRICALLY REPRODUCING MUSIC AND IMPROVED ELECTRICAL PICKUP FOR PRACTICING THE SAME

This is a continuation-in-part of application Ser. No. 77,946, filed Oct. 6, 1970 now abandoned.

The present invention relates generally to improvements in the electrical reproduction of music, and more particularly to an improved electrical pickup, characterized by selective reproduction of the low and high frequency content of an audio output, which may be used with noteworthy results on a wide range of musical instruments that have a sound-producing vibrating surface. For purposes of illustration only, and not limitation, the pickup hereof is described in connection with a drum and a guitar.

More particularly, the preparation of the aforesaid instruments, and particularly a drum, for electrical sound reproduction has heretofore been very difficult to achieve. Among other reasons is the requirement that for the proper functioning of a conventional electrical pickup at least one of the signal-producing components thereof remain stationary while the others vibrate so that the resultant relative movement therebetween can be utilized to produce electrical signals that are used, in a well understood manner, to in turn produce sound. Specifically, the aforesaid stationary mounting complicates, both in set-up time and equipment, the proper application of the pickup to the drum, and to a lesser extent to the guitar.

Moreover, the vibration experienced during a normal playing interval of a drum, as contrasted with a non-percussion musical instrument, further complicates the problem.

Still further, the full range of the drum audio output, exemplified by high frequency brush stroke sounds on the one hand and booming sounds produced by beating the drumhead on the other hand, has been difficult to faithfully reproduce by any known electrical pickup even when properly installed on the drum. It is similarly difficult to faithfully reproduce the full range of musical tones of a guitar or like stringed musical instrument.

Broadly, it is an object of the present invention to provide an improved electrical pickup, distinct in its mode of operation as well as construction, overcoming the foregoing and other shortcomings of the prior art. Specifically, among other noteworthy aspects, the entire pickup hereof is mounted on the instrument vibrating surface, such as the drumhead or guitar body, and functions properly merely upon being set into vibration by this surface, thereby obviating the need for mounting or holding any of the components in stationary relation to said instrument vibrating surface.

An improved pickup demonstrating product aspects of the present invention includes a conventional electrical pickup and, when applied to a drum or like percussion instrument, also includes appropriate mounting means for applying said pickup and an interposed field-influencing body under firm pressure against the drumhead or vibrating surface, with the result that sound reproduction is confined to the high frequency portion of the audio output, such as the brush strokes. Adjacent the remote side of the pickup there is provided a confined, but nevertheless freely vibrating additional field-influencing body which is set into vibration by the vibration of the electrical pickup. However, the patterns of vibration of this body and of the pickup differ so that there is the requisite signal-producing relative movement therebetween, this time confined to parameters which are related to the low frequency portion of the drum audio output, such that corresponding drum sounds are readily produced therefrom. In this way, the pickup hereof is constructed and functions to faithfully reproduce the full range of the musical instrument to which it is applied, and furthermore does so with an exclusion of extraneous sounds since such sounds are not produced by the instrument's vibrating surface.

The aforesaid pickup and mounting is also used and applied, substantially as just described, for stringed and like instruments, except that in some instances the interposed field-influencing body which causes reproduction of the high frequency musical tones is dispensed with. In such instances, metallic strings of the instrument are situated within the pickup magnetic field and thus, when set into vibration, directly result in the reproduction of the high frequency musical tones.

The above brief descriptions, as well as further objects, features and advantages of the present invention, will be more fully appreciated by reference to the following detailed description of presently preferred, but nonetheless illustrative embodiments in accordance with the present invention, when taken in conjunction with the accompanying drawings, wherein:

FIG. **1** illustrates the method of producing the musical tones of a drum in accordance with the method of the present invention and contains a perspective view of such instrument having an improved electrical pickup practicing the method hereof applied thereto;

FIG. **2** is a partial elevational view, on an enlarged scale, illustrating structural details of the pickup. Moreover, since the illustrative embodiment is generally cylindrical or circular in shape, including both the external and internal parts thereof, plan views illustrating such shape have been omitted as being unnecessary;

FIGS. **3**, **4***a*, **4***b* and **5** illustrate application of the pickup hereof to a guitar, FIG. **3** being a perspective view showing several ways of mounting such pickup to this exemplary stringed instrument;

FIG. **4***a* is a side elevational view, on an enlarged scale and in section taken on line **4**—**4** of FIG. **3**, illustrating a mounting most similar to that of the drum of FIGS. **1** and **2** in that it includes use of an interposed field-influencing body to reproduce the high frequency tones of the strings;

FIG. **4***b* is a view similar to FIG. **4***a*, except that another type of mounting is illustrated therein; and

FIG. **5** is also a side elevational view, but taken in section on line **5**—**5** of FIG. **3**, and illustrates still another pickup mounting in which the vibrating metallic strings of the instrument directly result in the reproduction of the high frequency tones thereof.

DRUM PICKUP

Reference is now made to the drawings and particularly FIGS. **1** and **2**, wherein there is shown an improved electrical pickup, generally designated **10**, demonstrating both product and method aspects of the present invention. Specifically, pickup **10** includes as a part thereof a conventional electrical pickup, generally designated **12**, conventionally constructed to the extent

that it includes north and south pole pieces **14, 16**, respectively, which, as generally understood, are effective in producing a magnetic field. As an alternative to the permanent magnets **14, 16**, use can, of course, also be made of electromagnets (not shown) since for purposes of the invention all that is necessary is the production of a magnetic field. As is further generally understood, the conventional electrical pickup **12** also includes an electrical conductor which is wound into a coil **18** in an orientation relative to the magnetic field of the pole pieces **14, 16** such that any shifting in this field cuts the coil **18** so that, in a well understood manner, an electrical signal is produced in the coil **18**. As further generally understood, the conductor from which the coil **18** is made includes leads **20** and **22** which will be understood to be electrically connected to an amplifier, speakers, and other such sound reproducing equipment as is necessary to convert the transmitted electrical signals into musical tones which, of course, are related to those musical tones of the musical instrument to which the pickup **10** is applied.

In the illustrated embodiment, the percussion musical instrument **24** in question is one type of drum, but it will be understood that the invention is not limited to use therewith but can be used also with other types of drums, cymbals, and generally with any percussion instrument which has a vibrating surface which produces the musical tones or sounds of the musical instrument. At this point, it should furthermore be noted that the conventional electrical pickup **12** need not be limited to the construction described but that changes may be made thereto such as, for example, the single coil **18** may in fact consist of two coils electrically connected in opposing or so-called humbucked relation.

Thus far, what has been described is conventional and merely forms the background for the invention, the significant aspects of which will now be described. Specifically, and in accordance with the present invention, the improved electrical pickup **10** hereof is mounted directly to the drum **24** such that it is set into vibration during the playing of this instrument when the vibrating surface, in this instance the drum head **26**, is set into vibration. To achieve this objective, there is provided an L-shaped mounting bracket **28**, the vertically oriented leg **30** of which is appropriately secured, as by welding, to a mounting plate **32** which, in turn, is screwed or otherwise connected, as at **34**, to the upper drum rim **36**. The other horizontally oriented leg **38** is thus advantageously projected in a clearance position above a peripheral area of the drum head **26**, the significance of which clearance position will become obvious as the description proceeds.

At this point, it is convenient to note the manner in which the conventional electrical pickup **12** is embodied in the improved pickup **10**. In the illustrated embodiment, the improved pickup **10** is provided with a generally cylindrical cup-shaped external body **40**, the side wall **42** of which is of an appropriate size to accommodate the electrical pickup **12** at one end thereof with the closing end wall **44** thereof spaced from the top surface **46** of pickup **12** so as to define an internal compartment **48** between wall **44** and surface **46**.

Disposed within compartment **48** is a cylindrical puff-shaped body **50** formed of a porous elastomeric material which may be a conventional sponge or the like. Specifically body **50** is formed in two halves **52** and **54** which may be adhesively secured together at their periphery, as at **56**. Prior to this adhesive connection, however, the medial portions of the body halves **52** and **54** have facing portions thereof removed so that when they are combined the remaining walls cooperate to bound an internal compartment **58**. Disposed in the compartment **58** is a generally circular magnetic body **60** fabricated or iron or other such metal which is capable of being magnetized and thus of affecting any magnetic field in which it is placed. In this regard, the medial portion **62** of the body half **54** which, as illustrated, occupies an interposed position between the pickup **12** and the metal body **60** is of a sufficient extent to prevent the magnetic capture of the body **60** by the pole pieces **14** and **16**. On the other hand, the separation represented by the medial portion **62** is not that extensive as to remove the body **60** from the magnetic field produced by the pole pieces **14, 16**, and in fact it is to be understood that the adjacent location of the body **60** and the pickup **12** is such that the body **60** is within the magnetic field of the pickup **12**.

Also electrically cooperating with the conventional electrical pickup portion **12** of the improved pickup **10**, but on the side remote from the body **60**, is another magnetic body **64**. As illustrated, the magnetic body **64** is electrically insulated by a thin layer **66** of felt, paper or the like from direct contact with the pole pieces **14** and **16** and further occupies a critical interposed position between the electrical pickup **12** and the vibrating surface **26**. As generally understood, if a magnetic body, such as the bodies **60** or **64** are moved relative to the electrical pickup **12** within the magnetic field thereof, or if the pickup **12** is moved relative to either of these magnetic bodies, in either case the magnetic bodies are known to have that effect on the magnetic field of the electrical pickup which causes a shifting in the lines of force thereof. This shifting, in turn, cuts the coil **18** and is similarly known to produce electrical signals therein which, after being transmitted through the conductors **20** and **22** to amplifiers and other sound-reproducing equipment, can be used, or at least it has been so found, to faithfully produce the audio output or sounds of the drum **44**.

In the above connection, an important aspect and contribution of the present invention is the recognition that the relative vibratory movement which is permitted between the lower body **64** and electrical pickup **12** is confined to the high frequency movement of the vibrating surface **24**, whereas in contrast thereto the relative vibratory movement between the other magnetic body **60** and the electrical pickup **12** is confined to the low frequency movement of the surface **26**. It is in this manner that the improved pickup **10** hereof effectively contributes to the reproduction of the full range of auditory output of the drum **10** including, for example, the low frequency output thereof as exemplified by the booming sounds produced by beating of the drumhead **26** and, at the other extreme, the reproduction of the high-frequency output as exemplified by brush stroking of the drumhead **26**.

The foregoing selective vibration of the lower magnetic body **64** is achieved by the direct application, under pressure, of the improved pickup **10** against the vibrating drumhead **26** in the manner as illustrated.

That is, upper body wall **44** is provided with an enclosure **68** for the depending end **70** of a threaded rod **72** which is threadably disposed, as at **74**, in the horizontally oriented bracket leg **38**. At its upper end, rod **72** has a handle **76** affixed to it to facilitate threaded adjustment thereof. It is contemplated that rod **72** be threadably adjusted so as to firmly press the lower end of electrical pickup **12** against the diaphragm **64** and the diaphragm **64**, in turn, pressed firmly into the vibrating surface **26**. The extent of applied pressure will be understood to be such that there can be little relative vibration between the vibrating surface **26** and the electrical pickup **12** save for very high frequency vibration. That is, in the same way that vibration is felt when pressing against a vibrating surface, the electrical pickup **12** similarly "senses" that same extent of vibration when it is pressed, as just described, firmly against the peripheral portion of the vibrating drumhead **26**. In practice, it has been found that this sensed vibration is effective in producing electrical signals in the coil **18** which result in the faithful reproduction of brush strokes applied to the drumhead **26**.

The low frequency audio output of the drum **24** is converted into corresponding electrical signals preparatory to subsequent amplification and conversion back to audio output by the relative vibratory movement between the electric pickup **12**, which vibrates in unison with the vibrating surface **26**, and the upper magnetic body **60** which also vibrates, but in an out-of-phase vibration pattern relative to the pickup **12**. That is, the vibration of the pickup **12** sets into vibration the elastomeric body **50** which is located in the oversized compartment **48** and the movement thereof, in turn, sets into vibration the body **60** which is located in the oversized internal compartment **58** of body **50**. Moreover, as best understood, the vibration pattern thus induced in the body **60** is related to the low-frequency or high-amplitude movements of the vibrating surface **26** since, in practice, it has been found that this vibratory movement of the body **60** is effective in reproducing the low frequency sounds of the drum.

The manner in which the vibrating pickup **12** sets into vibration the body **60**, as just described, can perhaps best be likened to what occurs when a person shakes dice, wherein the movement of the dice within the confined area formed by the person's clenched fingers is related to the overall movement of the person's hand. In any event, as already noted, it has been found that the relative vibration between the body **60** and electrical pickup **12** results in faithful reproduction of the low frequency audio output of the drum **24**.

In experimenting with the improved pickup **10**, a transparent cup **40** was utilized in conjunction with a resilient body **50** having a transparent window therein so that the vibration of the magnetic body **60** could actually be observed during operation of the improved pickup **10**. During such observation, vibration of the improved pickup **10** was clearly visible, but the magnetic body **60** appeared to remain stationary. This observation confirmed that during operation of the improved electrical pickup **10**, and more particularly, as a result of vibration of the drum surface **26**, such vibration sets into vibration the electrical pickup **12** and also the magnetic body **60** in accordance with different vibration patterns so that there is relative movement therebetween which is related to the vibration of the vibrating surface **26**. As a consequence of this relative movement, the magnetic body **60** causes shifting in the magnetic field of the pickup **12** which, in turn, induces electrical signals in the coil **18** which are transmitted via the conductors **20** and **22** to sound-reproducing equipment.

GUITAR PICKUP

in FIGS. **3**, **4***a*, **4***b* and **5**, the same reference numbers are used to designate parts already described in connection with FIGS. **1** and **2** that are similar in construction or similar in function. The major difference is that the pickup **10** hereof is shown applied to a guitar **78** including a body **80** having a top sounding board or vibrating surface **82**. Appropriately extended from the body **80** is a neck **84**, in the end of which are suitably disposed a number of upstanding pegs **86**. Stretched between a tail piece **88** and the pegs **86** are the six strings **90** of the guitar **78**. Also shown in FIG. **3** is a bridge **92** which functions to properly space the strings **90** one from the other and in a clearance position above the body surface **82**.

Reference is now made to the first mounting embodiment for the pickup **10** illustrated in FIG. **4***a*. Strings **90** will be understood to be fabricated of plastic or other nonconductive material and are seated, as already noted, in bridge **92**, which will be understood to be fabricated of wood or similar nonconductive material. Bridge **92** is extended through an opening **94** in the surface **82** and is supported in a clearance position above the surface from below. Specifically, bolts **96** and **98** are operatively arranged in depending relation from the surface **82** into the interior of the body **80** and are connected, at their lower end, to a bracket **100** by nuts **102**, **104** threadably engaged to the bolts **96**, **98**.

Welded or otherwise fixedly secured to the bracket **100** is the outer housing or cup **40** of the pickup **10**. As illustrated in FIG. **4***a*, the internal construction of the pickup **10** is similar to that already described in connection with FIG. **2** in that within the cup **40** there is an elastomeric body **50** having an oversized compartment **58** for the low-frequency magnetic body or diaphragm **60**. At its opposite end, the pickup **10** includes the usual pole pieces, one such pole piece **14** being illustrated in crossing relation to the lengthwise orientation of the strings **90**. Immediately above the pole pieces is an insulating felt layer **66** and then a high-frequency magnetic body or diaphragm **64** in interposed position between the felt layer **66** and the bottom of the wooden bridge **92**. Completing the construction of the pickup **10** is a coil **18** having conductors **20** and **22** through which the electrical signals are transmitted to sound-reproducing equipment.

It should be readily appreciated from the description of the mode of operation of the pickup **10** provided in connection with FIGS. **1** and **2** that vibration of the strings **90** produces corresponding vibration of bridge **92** and also of the body surface **82**. Specifically, the vibration of bridge **92** is transmitted to the diaphragm **64** which is in an interposed position between it and the signal-producing components of the pickup **10** and ultimately causes reproduction of the high-frequency musical tones of the instrument. It should be noted

that, in the mounting of FIG. 4*a*, the pressure-applying bracket **28** has been dispensed with since the diaphragm **64** is firmly confined between the pickup pole pieces **14** and the bridge **92** by virtue of the established depending position for the pickup **10** provided by the bolts **96**, **98** and the downward bias or urgency **106** provided by the taut instrument strings **90**.

During playing use of the guitar **78**, vibration of the strings **90** is transmitted to the body surface **82** and is, in turn, transmitted to the pickup body **40** in much the same way as the previously described drum head **26** was effective in transmitting vibration to the pickup. In response to this vibration, the diaphragm **60** is set into vibration in a pattern which is related to but is nevertheless out of phase with the vibration of the pickup body **40**. As a consequence, the relative movement between the diaphragm **60** and the magnetic field of the pickup **10** results in shifting in this magnetic field which, in a well understood manner, in turn results in signals being produced in the coil **18** and transmitted through the conductors **20**, **22** to the amplifiers and other sound-reproducing equipment. In practice, it has been found that diaphragm **60** is effective in causing reproduction of the low-frequency musical tones of the guitar **78**.

Reference is now made to the mounting embodiment of FIG. 4*b* which will be understood to be similar in all respects to that described in connection with FIG. 4*a*, except that bridge **92** is fabricated of metal and thus can itself effectively serve the purposes served by the diaphragm **64** which can therefore be dispensed with. For brevity's sake, the description of the mode of operation of the pickup **10** in its mounting of FIG. 4*b* will not be repeated except to note that it is vibration of the bridge **92** as produced therein by the strings **90** which is effective in causing reproduction of the high-frequency musical tones of the instrument, and that diaphragm **60** is instrumental in causing faithful and accurate reproduction of the low-frequency musical tones of the instrument when it is set into vibration within the oversized compartment **58** of the resilient pad **50** when the pickup body **40** is itself set into vibration by the vibrating body surface **82**.

Reference is now made to FIG. **5** in which still another mounting variation for the pickup **10** is illustrated. As shown, pickup **10** will not be, and indeed is not located where the bridge **92** is located. Rather, a different location is selected at which the upper portion or pole pieces of the pickup are projected through an opening **108** in the body surface **82** in sound-reproducing relation to the instrument strings **90** which extend in a clearance position over the pickup **10** between the pegs **86** and bridge and tail piece **92**, **88**. and it will be understood that the strings **90** are metallic or otherwise fabricated of conductive material and, being within the magnetic field of the pickup **10**, are thus capable, when set into vibration, of directly causing sound-reproducing signals in the pickup coil **18**. Specifically, these signals reproduce the high-frequency musical tones of the instrument whereas diaphragm **60** in the oversized compartment **58** bounded by the resilient walls **50** are effective, as already noted, in causing reproduction of the low-frequency musical tones of the instrument when set into vibration by the vibrating pickup body **40**. Since, in this embodiment the strings **90** do not exert a downward holding force **106** on the pickup **10**, use preferrably is made of additional nuts **110** and **112** to hold the pickup **10** in its depending position on the bolts **96** and **98**.

SUMMARY

From the foregoing, it should be readily appreciated that there has been described herein an improved electrical pickup **10** which, among other noteworthy aspects, is characterized in that it is directly mounted to the vibrating surface of the musical instrument. This is in contrast to prior art electrical pickups wherein at least one part thereof, whether it be the permanent magnets, coil, or field-influencing magnetic body, is required to be stationarily mounted, and remaining parts thereof mounted for vibration in unison with the vibrating surface. Thus, by eliminating the need for any stationary mounting in any of the parts of the electrical pickup, significant and critical problems heretofore encountered in the installation of the electrical pickup have been obviated. Further, the faithfulness with which the improved pickup **10** reproduces the audio output of a musicel instrument is greatly enhanced, as is also the extent of the range of the audio output. Still further, by varying the mass of the magnetic body **60**, different noteworthy musical effects can be achieved. For example: a small cymbal can be made to sound like a large, gong-like cymbal by using a comparatively large mass magnetic body **60**; a large cymbal can be thinned out in the low frequencies by using a comparatively small mass magnetic body **60**; and a tympani effect can be achieved on a small tom-tom by using a comparatively large mass magnetic body **60**.

Also, as already noted, the improved pickup **10** is not limited to use in conjunction with only a drum and a guitar or the like, but can also be used with good results to electrically reproduce the sounds of a piano, the said pickup **10** being applied to the sounding board of the piano.

It should furthermore be noted that the improved pickup **10** hereof is directly operated by, and thus only reproduces the sounds of, the vibrating surface of the musical instrument. It is thus unaffected by extraneous noise, as is a conventional microphone or the like. This is of obvious significant advantage in recording music in that it eliminates the need for sound-proof studios and the procedures therein which are now used to avoid distracting extraneous noise or sounds in the recorded tape or record.

A latitude of modification, change and substitution is intended in the foregoing disclosure, and in some instances some features of the invention will be employed without a corresponding use of other features. Accordingly, it is appropriate that the appended claims be construed broadly and in a manner consistent with the spirit and scope of the invention herein.

What is claimed is:

1. An improved electrical pickup for a musical instrument having a vibrating body producing the musical tones thereof comprising an electrical pickup having means producing a magnetic field and at least one coil in electrical signal-producing relation to said magnetic field, a resilient body having internal walls bounding an internal volume of a predetermined extent, means mounting both said electrical pickup and said

resilient body for movement in unison with said vibrating body, and a magnetic means disposed within said internal volume of a smaller extent than said internal volume and free of any connection with any of said internal walls bounding said internal volume so as to have a vibratory pattern which differs from that of said electrical pickup and thereby being electrically effective to cause shifting in said magnetic field due to the relative vibrations between said magnetic means and said electrical pickup, whereby said shifting magnetic field produces electrical signals in said coil related to said vibration of said vibrating body of said instrument.

2. An improved electrical pickup for a stringed musical instrument having vibrating strings producing the musical tones thereof comprising an electrical pickup having means producing a magnetic field and at least one coil in electrical signal-producing relation to said magnetic field, a resilient body having internal walls bounding an internal volume of a predetermined extent, a bridge in supporting relation to and adapted to be vibrated by said vibrating strings of said stringed instrument, means mounting both said electrical pickup and said resilient body in depending relation from said bridge for movement in unison therewith, and a magnetic means disposed within said internal volume of a smaller extent than said internal volume and free of any connection with any of said internal walls bounding said internal volume so as to have a vibratory pattern which differs from that of said electrical pickup and thereby being electrically effective to cause shifting in said magnetic field due to the relative vibration between said magnetic means and said electrical pickup, whereby said shifting magnetic field produces electrical signals in said coil related to said vibration of said vibrating strings of said instrument.

3. An improved electrical pickup for a musical instrument having a vibrating body producing the musical tones thereof comprising an electrical pickup having means producing a magnetic field and at least one coil in electrical signal-producing relation to said magnetic field, a resilient body having internal walls bounding an internal volume of a predetermined extent, means mounting both said electrical pickup and said resilient body for movement in unison with said vibrating body, a first magnetic means having an interposed position between said electrical pickup and said vibrating body electrically effective to cause shifting in said magnetic field of said electrical pickup, and a second magnetic means disposed within said internal volume of a smaller extent than said internal volume and free of any connection with any of said internal walls bounding said internal volume so as to have a vibratory pattern which differs from that of said electrical pickup and thereby being electrically effective to cause shifting in said magnetic field due to the relative vibration between said magnetic body and said electrical pickup, whereby the aforesaid two shifting magnetic fields caused by said first and second magnetic means produce electrical signals in said coil related to said vibration of said vibrating body of said instrument.

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