United States Patent

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[54] **ELECTROMAGNETIC PICKUP FOR A STRINGED MUSICAL INSTRUMENT**
5 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **84/1.15**
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[50] **Field of Search** 84/1.15, 1.16, 1.14, 294, 295, 296

[56] **References Cited**

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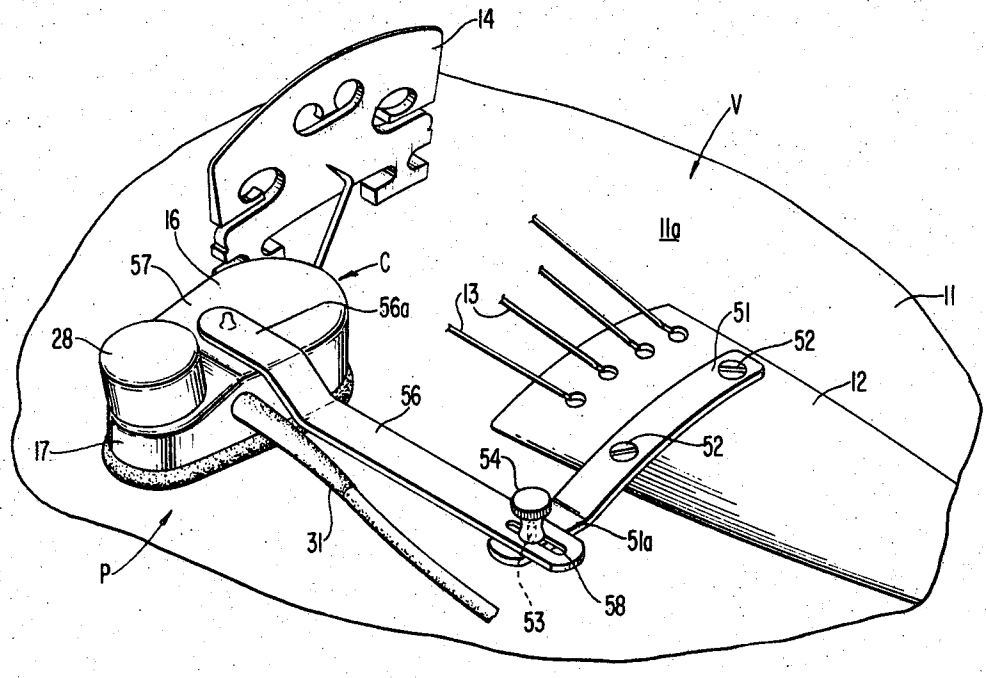
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ABSTRACT: A device for sensing the vibrations of a stringed, musical instrument which includes an electromagnet having a diaphragm carrying a needle. The electromagnet being supported on the instrument isolated vibrationwise from the instrument body with the outer end of the needle engageable with the instrument bridge so that the device senses and amplifies the vibrations of the bridge during the playing of the instrument.



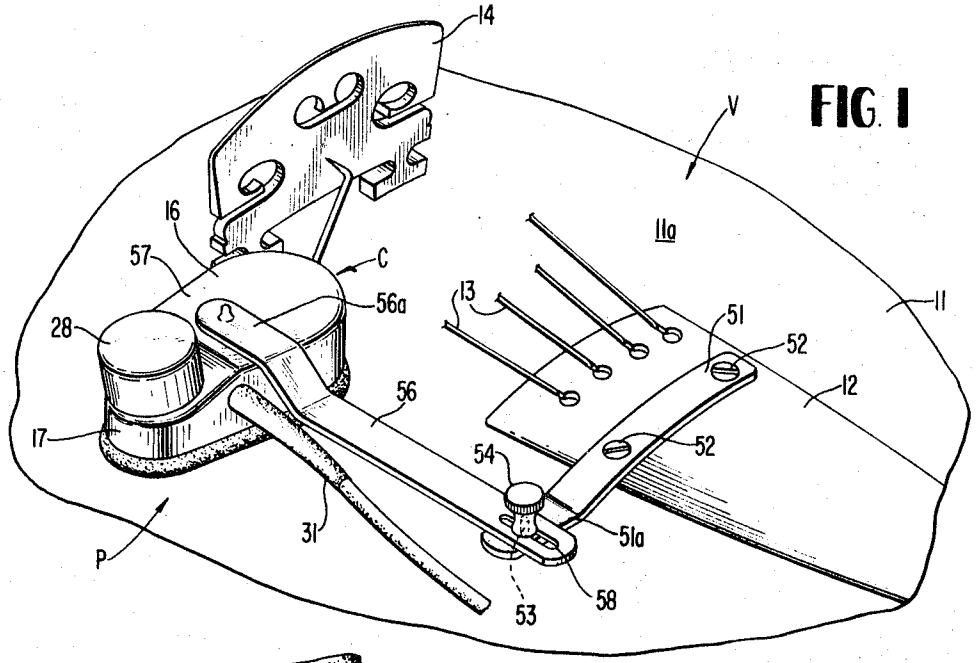


FIG. 1

FIG. 2

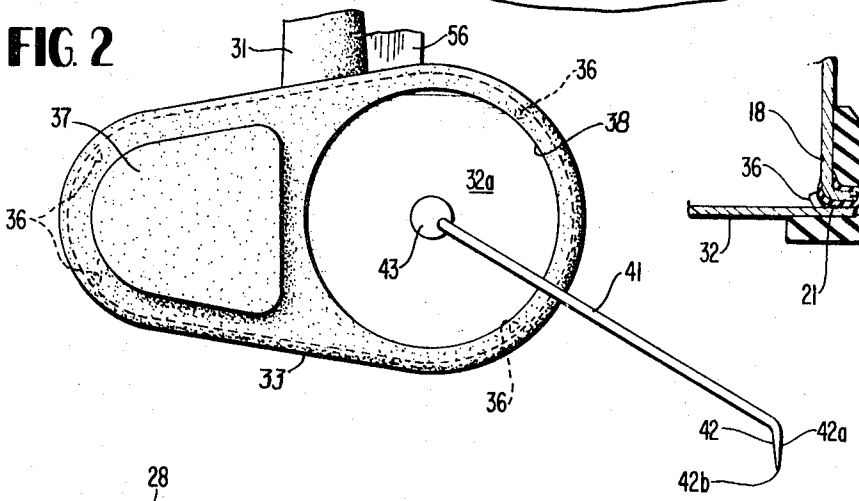


FIG. 4

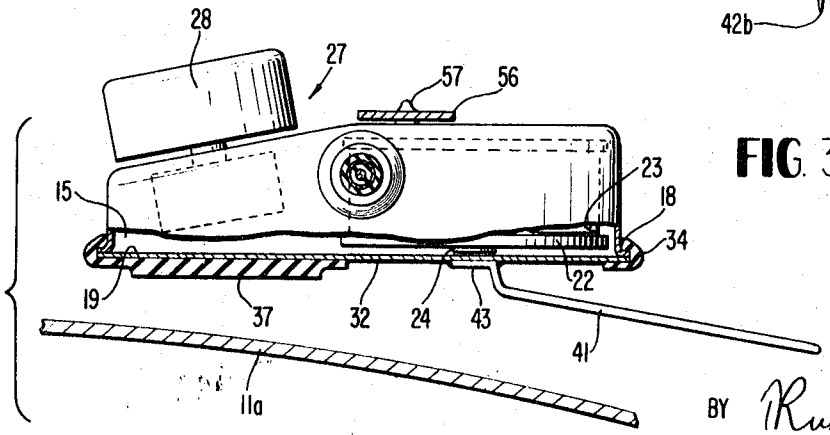


FIG. 3

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ELECTROMAGNETIC PICKUP FOR A STRINGED MUSICAL INSTRUMENT

Many devices are in use today for association with musical instruments to amplify the musical sounds produced by the instrument as it is played. Such present-day devices are generally of the electric type for translating the mechanical vibrations produced by the instrument into electrical impulses which are amplified and fed into a suitable loud speaker system. One such device, which is of the electromagnetic type, is shown in U.S. Pat. No. 2,486,264 issued to Harry De Armond and entitled "Violin Microphone." The device of this patent utilizes a floating diaphragm of thin magnetic material which engages the body of the instrument so as to sense the body vibrations when the instrument is played and translate these mechanical vibrations into electrical impulses. The device of this patent is particularly adapted for use on a stringed musical instrument and, in particular, a violin, and although it performs satisfactory, the quality of the musical sounds produced with the use of such a pickup is less than that desired particularly where a large sound amplification factor is employed such as would be required during the playing of the instrument in enclosures which are acoustically poor and/or in the presence of a high level of background noise.

Efforts are continually being made to improve the purity and fidelity of amplified musical sounds from a stringed musical instrument by the use of devices which more faithfully sense the mechanical vibrations of the instrument with only limited success. It has been recognized that one of the most sensitive parts of a stringed musical instrument which more faithfully follows the vibrations of the strings is the bridge on which the strings are supported but efforts to sense the bridge vibration utilizing electrical pickups have fallen short of the desired result, particularly as far as the violin is concerned, whose musical notes, particularly when they are amplified, are accompanied by pleasant sensations by an audience only when such notes are virtually completely free of distortion.

Accordingly, a primary object of this invention is to provide a new and novel electromagnetic pickup for a stringed musical instrument.

Another object of this invention is to provide a new and novel electromagnetic pickup for a stringed musical instrument which permits the amplification of the musical notes produced on the instrument to a relatively high level with a fidelity and purity of sound that is virtually distortion free.

A further object of this invention is to provide a new and novel electromagnetic pickup for a stringed musical instrument such as a violin which responds only to the vibrations of the violin bridge as the violin is played and permits the amplification of these vibrations over a wide range and including virtually all of the frequencies which the human ear can detect without interference in a distortion-free manner into sound highly pleasing to the ear.

Still another object of the invention is to provide a new and novel electromagnetic pickup which is capable of producing improved quality of sound corresponding directly to an improvement in the quality of the musical instrument with which the pickup is utilized.

This invention further contemplates the provision of a new and novel electromagnetic pickup for a violin which is low in initial cost, which is of lightweight, compact construction, which may be quickly and easily installed on a violin in an adjustable manner and which completely avoids interference with the playing of the instrument by the musician while faithfully reproducing the mechanical vibrations of the violin's bridge over a wide range of frequencies as it is played for translation of these vibrations into sound of extremely high purity and fidelity regardless of the degree of amplification.

Other objects and advantages of the invention will become apparent from the following description taken in connection with the accompanying drawings.

The objects of this invention and other related objects are accomplished by providing a pickup which includes a casing

having a top wall and a sidewall, the edge portion of which defines an opening in which is disposed a floating diaphragm of magnetic material. A variable rheostat having an adjusting knob and an electromagnet are positioned in the casing with the electromagnet adjacent the diaphragm and a cover of rubber material is detachably mounted on the casing to retain the diaphragm in the casing opening. The cover is provided with an opening for exposing a portion of the diaphragm to which the inner end of an elongated feeler is secured with the feeler extending through the opening outwardly from the casing and terminating in an outer end. Means are provided for adjustably supporting the pickup in suspended position on a musical instrument such as a violin having a bridge with the feeler outer end in engagement with the bridge to permit the vibrations of the bridge to be translated into electrical impulses by the pickup for the reproduction of sound.

The novel features which are believed to be characteristic of the invention are set forth in particularity in the appended claims. The invention itself, however, both as to its organization and method of operation may be best understood by reference to the following description taken in conjunction with the accompanying drawings.

FIG. 1 is a perspective view of a portion of a stringed musical instrument and in particular a violin together with the pickup of the invention in an operative position;

FIG. 2 is an enlarged view of a portion of the pickup of FIG. 1 as viewed from below;

FIG. 3 is a side elevation view partially in section of the pickup of FIG. 1 in the operative position; and

FIG. 4 is an enlarged sectional view of a portion of the pickup of FIG. 3.

Referring now to the drawing and to FIG. 1 in particular, there is shown an electromagnetic pickup constructed in accordance with the invention and designated generally by the letter P. The pickup P is shown mounted in an operative position on a stringed musical instrument such as a violin, only a portion of which is shown in FIG. 1 for clarity, the violin and therefore the portion shown being representatively designated by the letter V. It should be understood that although the pickup of the invention is particularly adaptable for use on a violin, it is also suitable for use on other stringed instruments such as a guitar, viola, etc.

The violin V with the invention is utilized may be of conventional construction including a body 11 shown partially in FIG. 1 having an upper surface 11*a*, a tailpiece 12 and a plurality of strings 13 attached to violin neck (not shown) and the tailpiece 12 in the conventional manner as shown and extending over and in supported relationship with a bridge 14. As is well known, the bridge 14 is suitably mounted on the upper surface 11*a* of the body 11 and is formed from suitable material such as wood, plastic or the like in a conventional configuration as shown in FIG. 1.

The pickup P of the invention incorporates many of the component parts of the electromagnetic pickup in the aforementioned patent, the differences in construction between the patented pickup and that of applicant's by means of which the novel results of applicant's invention are obtained being explained in detail hereinafter. As shown best in FIGS. 1, 4, the pickup P includes a casing designated generally by the letter C which is of substantially oblong shape having an interior 15 and which is provided with a top wall 16 and a continuous sidewall 17 having a marginal edge portion 18 defining an opening 19 in the bottom of the casing C. Preferably, the marginal edge portion 18 is flared outwardly slightly along its lower edge at 18*a*, as shown best in FIG. 4. The flared portion 18*a* is provided with a relatively thin coating 21 of resilient insulating material such as rubber by dip coating or the like for a purpose to be explained hereinafter.

As shown in the aforementioned patent, an electromagnet 22 which includes a coil 23 and a core 24 is positioned within the interior 15 of the casing C. A variable rheostat designated generally by the numeral 27 is supported on the casing C and includes an adjusting knob 28 for varying the amplification of

the pickup P, the construction of the variable rheostat 27 being similar to that shown and described in the aforementioned patent.

Circuit means are provided on the casing C for electrically connecting the electromagnet 22 and rheostat 27 to an associated source of electrical power (not shown). The circuit means include a multiconductor power cord 31 which extends through the casing sidewall 17 as shown best in FIG. 1, the conductors of the cord 31 being connected to the rheostat 27 and the electromagnet 22 in a conventional manner as shown in the aforementioned patent. As is well known, the power cord 31 is connected to an amplifier and loud speaker system, neither of these components being shown for clarity, as well as to the associated source of electrical power.

A diaphragm 32 of thin magnetic material, preferably metal, is positioned in the casing opening 29, the diaphragm 32 being of substantially oblong shape to conform generally to the shape of the opening 19. As shown best in FIG. 3, the marginal edge of the diaphragm 32 overlies the rubber coated marginal flange 18*a* of the casing sidewall 17 in engagement with the rubber coating 21 so as to insulate the diaphragm 32 from the metal of the cross casing C.

A cover 33 of resilient insulating material such as rubber having an upstanding marginal flange 34 is detachably mounted on the marginal edge portion 18 of the casing sidewall 17 in surrounding relationship with the marginal flange 18*a* and with the diaphragm 32. Thus, the cover 33 retains the diaphragm in a floating position in the casing opening 19 sandwiched between the insulating material of the cover 33 and the rubber coating 21. In the preferred embodiment, the diaphragm 32 is provided with the plurality of prongs or projections 36 which are punched from the metal of the diaphragm and which engage the rubber coating 21 on the marginal flange 18*a* to center the diaphragm in the proper position in the casing opening 19 adjacent the electromagnet 22 and prevent lateral movement of the diaphragm as shown best in FIG. 3.

As shown best in FIG. 2, the cover 33 includes a thickened portion 37 formed integrally therewith and a circular opening 38 for externally exposing a portion 32*a* of the diaphragm 32. The pickup P of the invention also includes an elongated feeler 41 which is preferably of circular cross-sectional shape and which has an outer end 42 and an inner end 43, preferably L-shaped as shown, secured by soldering or the like centrally to the diaphragm portion 32*a* so as to extend outwardly from the casing C through the cover opening 38. The feeler 41, which in the illustrated embodiment is "needle" shaped and formed from metal, is tapered towards its outer end 42, a portion 42*a* being preferably bent as shown angularly relative to the remaining portion of the feeler 41 and terminating at a point 42*b*, for engagement with the bridge 14 as shown in FIG. 1.

Means are provided for supporting the casing C on the violin V in an elevated, operative position above the body upper surface 11*a* in spaced-apart, isolated relationship with the body 11 with the feeler outer end 42 in engagement with the bridge 14. More specifically, an arm 51 of metal or the like is provided which is secured by suitable means such as screws 52 to the violin tailpiece 12 transversely of the violin V so that an end portion 51*a* of the arm projects laterally outward from the tailpiece 12 as shown. As is well known, the tailpiece 12 of the violin V is isolated vibration wise from the violin body 11 by conventional resilient means so that body vibrations produced as the violin is played are not transmitted to the tailpiece. Therefore, the arm 51 and other casing supporting parts, as well as the casing C described in detail hereinafter are not subjected to the vibrations of the violin body. An upstanding threaded pin 53 is provided on the arm portion 51*a* which is arranged for threaded engagement with a retaining member or thumbscrew 54.

The casing supporting means also includes a bracket 56 arranged to be positioned in longitudinally extending relationship with the axis of the violin V and includes an end portion 56*a* which is fixably secured by suitable means such as soldering or the like at 57 to the top wall 16 of the casing C as shown best in FIG. 1. The other end of the bracket 56 is provided with a longitudinally extending slot 58 which is arranged to accommodate the threaded pin 53 on the arm 51 so that longitudinal adjustment of the bracket 56 may be obtained by selectively positioning the slot relative to the pin 53 following which the thumbscrew 54 is tightened to engage and secure the bracket 56 in the adjusted position.

In the operation of the pickup of the invention, the bracket 56 is positioned generally as shown in FIG. 1 with the pin 53 on the arm 52 extending through the bracket slot 58. The casing C is positioned so that the feeler end 42*b* is adjacent to the bridge 14 and the thumbscrew 54 is preferably threadedly engaged with the pin 53 up to a position such that free movement of the bracket 56 is permitted. The casing C is then moved forwardly of the violin V so that the feeler end 42*b* engages and penetrates to a limited extent the material of the bridge 14 centrally intermediate the vertical side edges of the bridge and adjacent the bottom edge of the bridge as shown, the slot 58 being moved relative to the pin 53 to accommodate this movement. The thumbscrew 54 is then tightened down into retaining engagement with the bracket 56 to releasably secure the casing C in this position with the feeler point 42*b* in penetrating engagement with the bridge 14.

The power cord 31, preferably extending through the chinrest (not shown) of the violin V is connected to the associated source of power, amplifier and loudspeaker system in the conventional manner so that the violin V may now be played. As the violin V is played, the vibrations of the bridge 14 responding to the vibrations of the strings 13 are transmitted through the feeler 41 to the diaphragm 32, these mechanical vibrations being translated in the well-known manner by the electromagnet 22 into electrical impulses for the reproduction of sound, the degree of amplification of the sound being determined by manual adjustment of the knob 28 of the variable rheostat 27.

It can be seen that there has been provided with the novel arrangement of the invention an electromagnetic pickup by means of which musical notes of the highest purity and fidelity may be produced from a stringed musical instrument and, in particular a violin, throughout wide range of amplification and virtually free of distortion, these outstanding results have been obtained by utilizing in part a well-known electromagnetic pickup, the construction of which has been modified so as to permit the sensing of vibrations of the violin bridge completely free of vibrations from the violin body. In addition, not only are notes of high quality produced from a relatively inexpensive instrument regardless of the background noise level and regardless of the degree of amplification through the pickup of the invention, but when the pickup is used on a stringed instrument of higher quality, corresponding higher quality musical sounds are obtained, a result not previously obtained with present day electromagnetic pickup devices.

Having thus described the invention, what I claim is:

1. An electromagnetic pickup for a stringed muscial instrument of the type including a body, a tailpiece, a plurality of strings, and a bridge for supporting said strings in spaced relationship with the upper surface of said body, comprising, in combination, a casing having a top wall and a sidewall having a marginal edge defining an opening in said casing, an electromagnet positioned in said casing, a variable rheostat having an adjusting knob supported on said casing, circuit means on said casing for electrically connecting said electromagnet and said rheostat to an associated source of electrical power, a diaphragm of magnetic material positioned in said opening, a cover of resilient insulating material detachably mounted on said casing marginal edge portion for retaining said diaphragm in said casing opening, said cover having an opening for externally exposing a portion of said diaphragm, an elongated feeler member having an inner end secured to said diaphragm, said feeler member extending outwardly from said casing through said cover opening and having an outer end arranged for engagement with said bridge, means for supporting said

casing on said instrument in an elevated, operative position over said body upper surface and in spaced-apart, isolated relationship with said body with said feeler member outer end in engagement with said bridge to permit the vibrations of said bridge to be translated into electrical impulses by said pickup for the reproduction of sound.

2. An electromagnetic pickup in accordance with claim 1 wherein said feeler member comprises a tapered, needle-shaped member of metallic material having a pointed outer end, said pointed outer end being arranged to penetrate said bridge to a limited extent in said operative position of said casing.

3. An electromagnetic pickup in accordance with claim 2 including a coating of resilient insulating material on said marginal edge portion of said casing, said diaphragm having a marginal edge portion engageable with said coating in the retained position of said diaphragm in said casing opening to insulate said diaphragm from said casing.

4. An electromagnetic pickup in accordance with claim 3 including a plurality of upstanding integrally formed prongs on said diaphragm marginal edge portion, said prongs being arranged to engage said coating on said casing marginal edge portion to resist lateral movement of said diaphragm relative to said opening.

5. An electromagnetic pickup in accordance with claim 1 wherein said mounting means include an arm secured to said tailpiece in transversely extending relationship with said instrument and having an end portion extending laterally outward from said tailpiece, an upstanding pin mounted on said arm end portion, a bracket secured at one end to said casing and arranged to be positioned in longitudinally extending relationship with the axis of said instrument, said bracket having a slot adjacent its other end for accommodating said pin in a selected position relative to said slot for longitudinal adjustment of said bracket, a retaining member mounted on said pin extending through said bracket slot for engagement with said bracket to releasably retain said bracket in the selected, longitudinally adjusted position for engagement of said bridge with said feeler member.