April 26, 1960 J. G. RISCOL 2,933,967

ELECTROMAGNETIC PICKUP ASSEMBLY FOR STRINGED INSTRUMENTS

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FIG. 1.

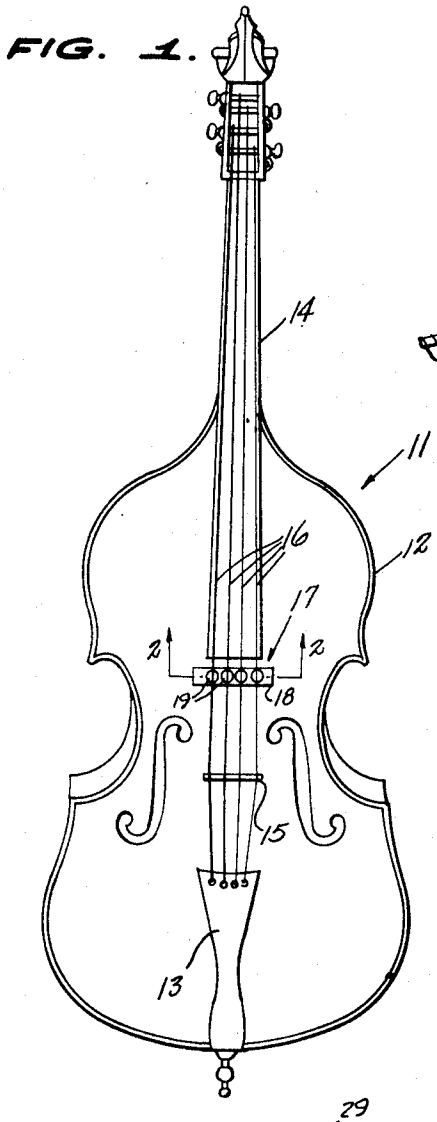


FIG. 2.

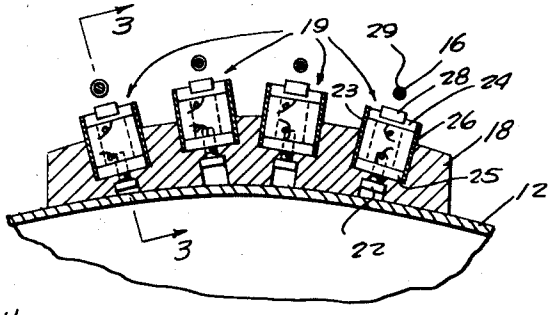


FIG. 3.

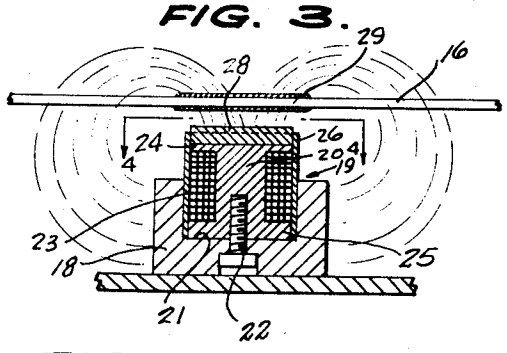
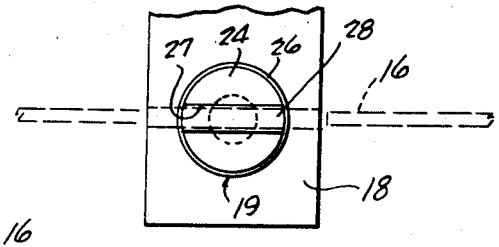


FIG. 4.



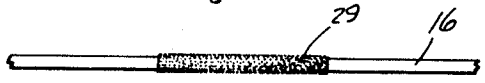


FIG. 5.

FIG. 6.

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ELECTROMAGNETIC PICKUP ASSEMBLY FOR STRINGED INSTRUMENTS

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8 Claims. (Cl. 84—1.16)

This invention relates to stringed musical instruments, and more particularly to an electromagnetic pickup assembly for stringed instruments of the type using nonmagnetic strings, such as violins, cellos, guitars, bass viols, and the like.

A main object of the invention is to provide a novel and improved electromagnetic pickup assembly for stringed instruements of the type using strings of nonmagnetic material, such as gut, nylon, and the like, the pickup assembly being simple in construction, being compact in size, and being provided with means for controlling the vibrations of the strings in a manner to improve the tone of the generated sound and to prevent undesired carry-over of the string vibrations.

A further object of the invention is to provide an improved electromagnetic pickup assembly for a stringed instrument of the type using strings of nonmagnetic material, said assembly involving relatively inexpensive components, being durable in construction, being easy to install on an instrument, and enhancing the tone quality of the instrument.

A still further object of the invention is to provide an improved electromagnetic pickup assembly for a stringed instrument, said assembly being arranged so that it may be installed as a unit transversely beneath the strings of the instrument, requiring only slight modification of the instrument strings, whereby substantially natural tone quality is produced by said strings, and being provided with means to introduce a desired amount of damping action on said strings.

Further objects and advantages of the invention will become apparent from the following description and claims, and from the accompanying drawings, wherein:

Figure 1 is a plan view of a stringed musical instrument provided with an improved electromagnetic pickup assembly constructed in accordance with the present invention.

Figure 2 is an enlarged cross sectional view taken on the line 2—2 of Figure 1.

Figure 3 is an enlarged cross sectional view taken on the line 3—3 of Figure 2.

Figure 4 is a fragmentary horizontal plan view of a portion of the electromagnetic pickup assembly, said view being taken on the line 4—4 of Figure 3.

Figure 5 is an enlarged elevational view of the portion of one of the strings disposed over a pickup coil of the electromagnetic pick-up assembly of Figures 1 to 4.

Figure 6 is an elevational view similar to Figure 5 but showing a modified form of magnetic element employed on the strings, in accordance with the present invention.

Referring to the drawings, 11 designates a typical stringed instrument which may be provided with an improved electro-magnetic pickup assembly according to this invention, for example, a cello. The instrument 11 is provided with a hollow body 12, the tail piece 13, the neck member 14, the bridge member 15, and a plurality of strings 16 of nonmagnetic material secured under tension between the tail piece 13 and the neck member 14

in the usual manner, said strings being made of suitable nonmagnetic material, such as gut, nylon, or the like, as commonly employed on musical instruments of this type.

As is well understood, the tone quality of stringed instruments, such as a cello, violin, or the like, depends largely on the material employed for the strings, and therefore it is desirable to employ the usual type of strings for such an instrument in order to maintain its natural tone quality, hence, the desirability of using the nonmagnetic strings 16, slightly modified in a manner presently to be described.

Designated generally at 17 is a string vibration pickup device comprising a permanently magnetized, generally rectangular main body 18 which is secured on the instrument body 12, transversely beneath the strings 16 between the neck member 14 and the bridge 15, preferably adjacent the end of the neck member, as shown in Figure 1. The main body 18 is formed with respective cylindrical recesses spaced by the same distances as the strings 16 and located so that the recesses will be centered beneath the strings 16 when body 18 is secured on the instrument in the manner illustrated in Figure 1. Seated in each of the recesses is a pick-up coil 19, each coil comprising an axial core 20 of magnetic material which is secured in the seat 21 of the member 18 in any suitable manner, for example, by a fastening bolt 22 extending upwardly through the bottom of the member 18 and threadedly engaging axially in the core element 20, as shown in Figure 4. A coiled conductor 23 is wound on the core 20, defining a unit sensitive to variations in magnetic flux adjacent thereto. Surrounding the coil wound conductor 23 and the top and bottom flanges 24 and 25 of the core 20 is a relatively thin sleeve member 26 of magnetic material which serves as a means to increase the damping action of the unit and hence to limit string vibration carry-over, as will be presently described.

The terminals of the respective coil wound conductors 23 are connected to the input terminals of a suitable musical instrument amplifier of conventional construction and forming no part of the present invention.

The top flange 24 of each of the core members 20 is formed with a groove 27 extending diametrically thereof and extending in the same direction as the associated string 16, as shown in Figure 4. Secured in the grooves are respective strips 28 of nonmagnetic metal which are located immediately subjacent to the strings 16 and which extend parallel thereto, as is clearly shown in Figures 3 and 4.

As will be apparent from Figure 3, the strips 28 are diametrically received in the top end portions of the magnetic shells 26 and extend slightly above the top rims of said shells.

Each string 16 is provided immediately above its associated transducer unit 19 with an element 29 of magnetic material, which may be in any suitable form, for example, which may be in the form of a coating of iron filings or iron powder applied to the strings and secured thereto by any suitable adhesive, the elements 29 being of a length slightly greater than the length of the subjacent strips 28 and being relatively thin so as not to appreciably change the normal manner of vibration of the associated strings. Alternatively, the magnetic element may comprise a winding 29' of relatively fine soft iron wire, such as shown in Figure 6, of a length slightly greater than the length of the subjacent strip 28, and positioned in the same manner as the element 29 shown in Figure 3. As a further alternative, the magnetic element may comprise a thin sleeve of magnetic material clamped on the string and of a length similar to that of the elements 29 and 29' shown in Figures 5 and 6, being positioned over the subjacent strip 28 in the same manner as shown in Figure 3.

The permanent magnet bar 18 is suitably polarized in a manner to provide a magnetic flux at each of the strings 16 passing through the subjacent core 20 of the associated transducer unit 19. As will be readily apparent from Figure 3, flux emanating from the sides of the permanently magnetized bar 18 will pass into the magnetic core 20 and the lines of flux will be cut by the magnetic element 29 responsive to the vibration of the associated string 16. The movement of the magnetic element 29 in the magnetic field causes corresponding distortions or disturbances of the field, changing the strength of the flux passing through the turns of the coil wound conductor 23 accordingly, and thereby inducing correspondingly varying currents in the transducer coil 23. Thus, the vibrations of the string 16 are translated into electrical currents which are induced in the respective transducer units 19 and are transmitted to the reproducing amplifier.

The damping strips 28, being of nonmagnetic material, but being conductive, will generate eddy currents therein, due to the varying magnetic fields in which they are located, and will in turn develop magnetic fields which react with the movable magnetic elements 29 to dampen the vibrations of the strings 16 and prevent excessive amplitudes of string vibration, thereby reducing string vibration carry-over. The amount of damping is determined by the thickness of the conductive, nonmagnetic damping bars 28.

The shell member 26, being of magnetic material, acts to concentrate the magnetic lines of force in the transducer unit and increases the damping action by increasing the flux density in the region of the associated magnetic element 29.

As above mentioned, when each string 16 is vibrated, a corresponding signal is generated in its associated transducer unit 19 which is transmitted in the form of a varying electric current to the instrument amplifier input. The vibrations of the strings are dampened by the reaction of the nonmagnetic conductive strips 28, as above described, which causes the strings to come to rest without any tendency for carry-over vibrations.

Since the magnetic elements 29 are relatively short and cover a very small percentage of the length of each string 16, the strings vibrate substantially in their normal manner and substantially natural tone quality is produced by the instrument, enhanced by the absence of carry-over vibrations resulting from the improved dampening of the strings provided by the presence of the damping strips 28, as well as by the presence of the shield elements 26 of magnetic material surrounding the transducer coils 23.

By using the substantially normal strings 16 of nonmagnetic material, the true tone of the instrument is always available, and the volume thereof may be reinforced by the associated instrument amplifier without any deterioration in quality and without forcing the instrument.

The magnetic particles comprising the coating 29 may be deposited in any suitable manner, for example, by electrolytic action or by any other well known method. The nonmagentic slugs 28 may be of any desired shape to create any desired damping effect.

While a specific embodiment of an improved electromagnetic pickup device for stringed instruments has been disclosed in the foregoing description, it will be understood that various modifications within the spirit of the invention may occur to those skilled in the art. Therefore, it is intended that no limitations be placed on the invention except as defined by the scope of the appended claims.

What is claimed is:

1. In a musical instrument of the stringed type wherein the strings are of non-magnetic material, an electromagnetic pickup means arranged adjacent the strings and extending a short distance therealong, said strings being provided opposite said pickup means only with a coating of thin, light weight magnetic material.

2. The structure of claim 1, and wherein said coating comprises iron powder material.

3. The structure of claim 1, and wherein said coating comprises windings of magnetic wire wrapped around the strings.

4. The structure of claim 1, and wherein said coating comprises thin sleeves of magnetic material.

5. In a musical instrument of the stringed type wherein the strings are of non-magnetic material, an electromagnetic pickup means arranged adjacent the strings and extending a short distance therealong, said strings being provided opposite said pickup means only with a coating of thin, light weight magnetic material, said pickup means comprising an elongated permanent magnet arranged transverse to the strings, and respective pickup coils mounted on said permanent magnet adjacent the strings.

6. In a musical instrument of the stringed type wherein the strings are of non-magnetic material, an electromagnetic pickup means arranged adjacent the strings and extending a short distance therealong, said strings being provided opposite said pickup means only with a coating of thin, light weight magnetic material, said pickup means comprising an elongated permanent magnet arranged transverse to the strings, respective pickup coils mounted on said permanent magnet adjacent the strings, and respective conductive non-magnetic damping members mounted on the coils.

7. In a musical instrument of the stringed type wherein the strings are of non-magnetic material, an electromagnetic pickup means arranged adjacent the strings and extending a short distance therealong, said strings being provided opposite said pickup means only with a coating of thin, light weight magnetic material, said pickup means comprising an elongated permanent magnet arranged transverse to the strings, respective pickup coils mounted on said permanent magnet adjacent the strings, and respective damping strips of non-magnetic material mounted on the coils and extending in the same direction as said strings.

8. In a musical instrument of the stringed type wherein the strings are of non-magnetic material, an electromagnetic pickup means arranged adjacent the strings and extending a short distance therealong, said strings being provided opposite said pickup means only with a coating of thin, light weight magnetic material, said pickup means comprising an elongated permanent magnet arranged transverse to the strings, respective pickup coils mounted on said permanent magnet adjacent the strings, and respective damping strips of non-magnetic material mounted on the coils and extending in the same direction as said strings, each pickup coil comprising an axial core of magnetic material, a conductor coil wound on the core, and a relatively thin shell of magnetic material surrounding the coil, the strips of non-magnetic metal being seated in the top ends of the cores and extending diametrically in the top end portions of the magnetic shells.

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