

Nov. 29, 1966

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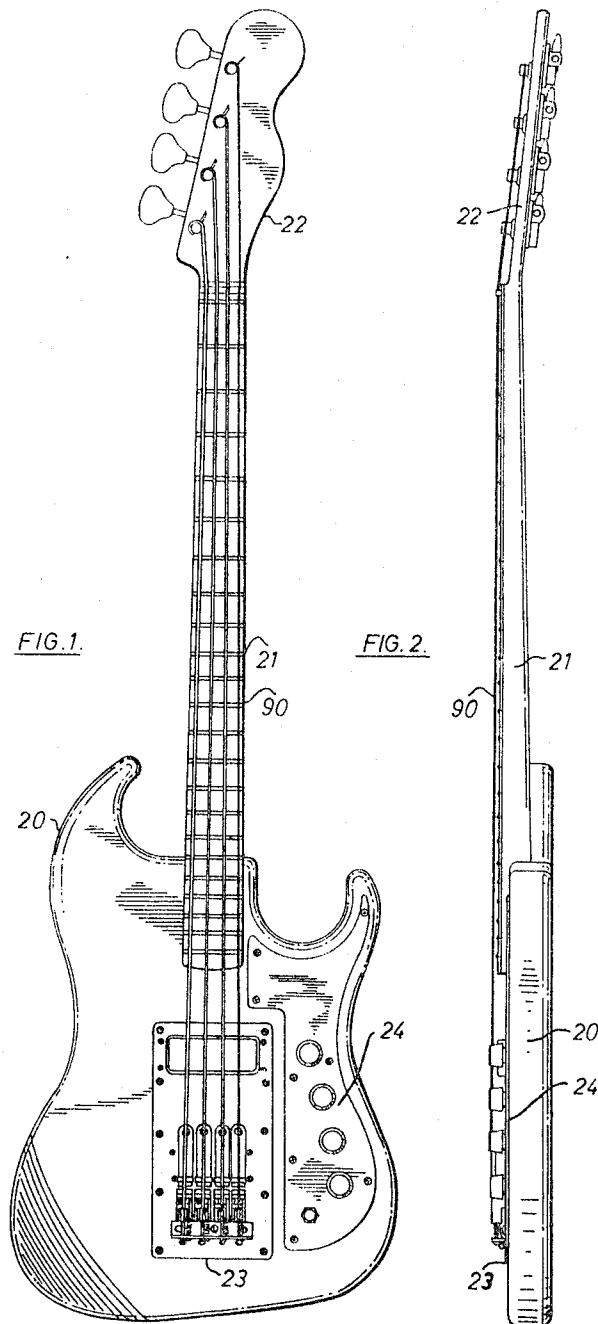
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STRINGED MUSICAL INSTRUMENTS WITH PICKUP AND DAMPING

MEANS BETWEEN BRIDGE AND FINGERBOARD

Filed April 23, 1964

3 Sheets-Sheet 1



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5 Sheets-Sheet 2

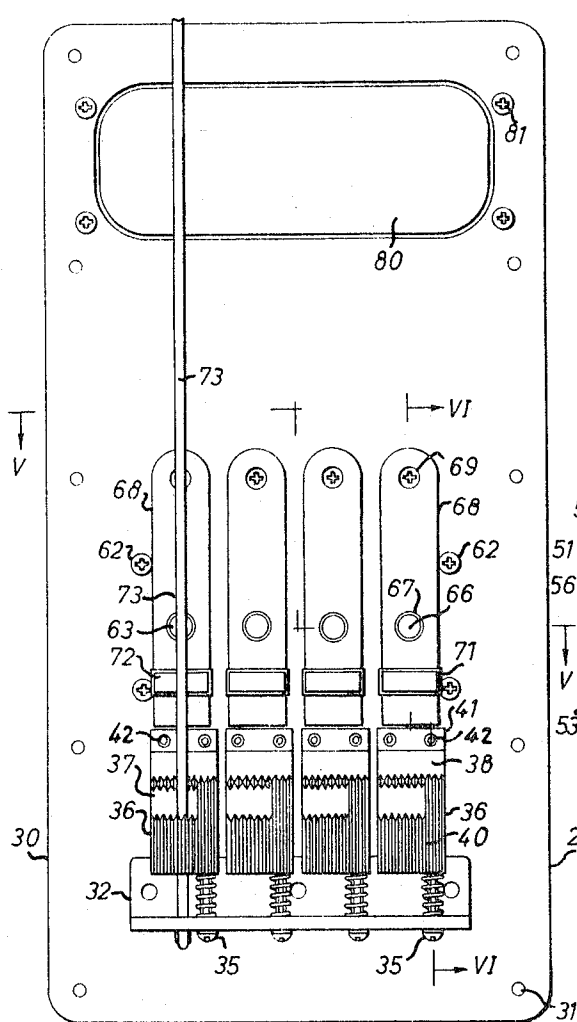
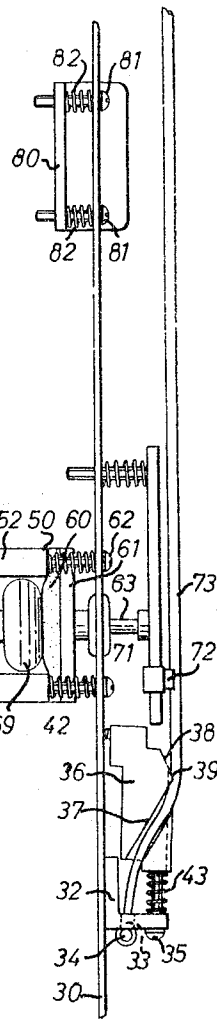
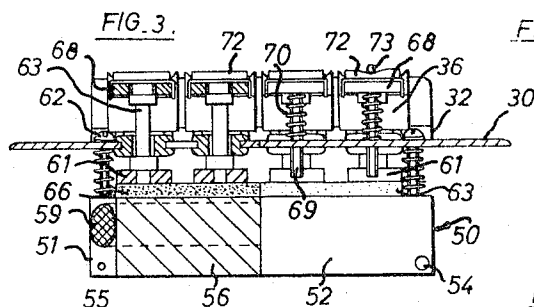


FIG. 4.

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3 Sheets-Sheet 3

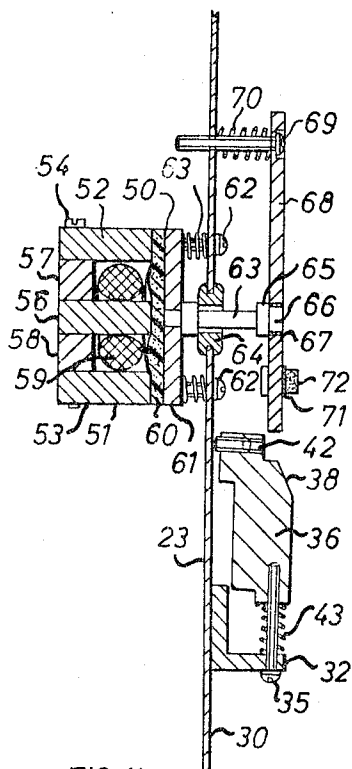


FIG. 11.

FIG. 6.

FIG. 10.

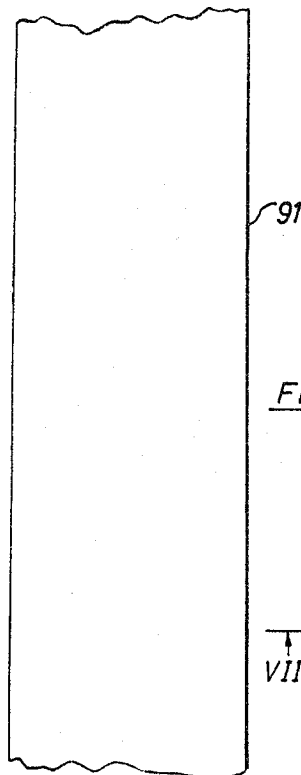


FIG. 7.

VIII

VIII

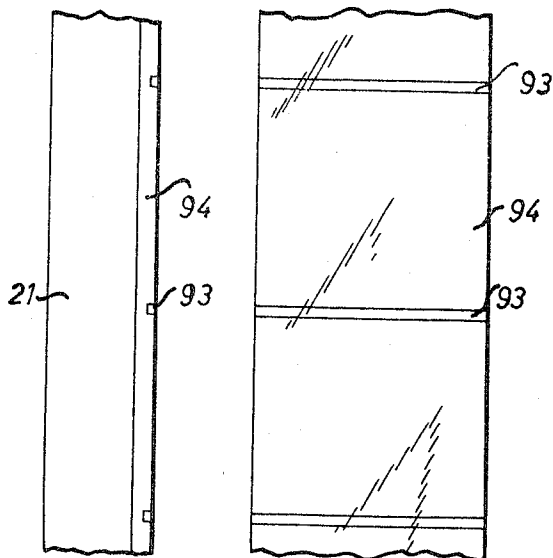


FIG. 8.

FIG. 9.

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1

3,288,906

STRINGED MUSICAL INSTRUMENTS WITH PICK-UP AND DAMPING MEANS BETWEEN BRIDGE AND FINGERBOARD

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17 Claims. (Cl. 84—1.16)

The present invention relates to stringed musical instruments and is more particularly concerned with pick-ups for deriving electrical signals from vibrations of strings in such an instrument.

It is well known in certain stringed musical instruments, particularly guitars, to provide one or more pick-up devices for deriving electrical signals from the vibrations of the strings. Customarily the strings are of magnetic material such as steel and the pick-up devices are electromagnetically operated so that signals are derived without any physical contact between the pick-up devices and a string. It is also known to provide in a bass stringed instrument, especially a bass guitar, some means for damping the vibrations of the strings, particularly when they have been plucked or played pizzicato.

The present invention envisages providing a device for both deriving electrical signals from vibrations of a string and damping vibrations of the string by a single member contacting a string.

According to the present invention a contact pick-up unit for a stringed musical instrument comprises a magnetic core structure including at least one permanent magnet, at least one air gap and an armature resiliently mounted in said air gap, a coil surrounding a part of the core structure, and a damping contact member for string engagement connected to said armature.

The contact pick-up device is preferably located on the body of a stringed instrument adjacent to, and on the fingerboard side of, the bridge over which a string or strings pass. The physical contact between the contact member and a string provides a damping action when a string is plucked and some of the vibrations of the string are transmitted through the contact member to the armature; the resultant vibrations of the armature cause an electrical signal to be induced electromagnetically in the coil. For a multi-stringed instrument the contact pick-up device may be provided with a number of armatures equal to the number of strings, and with a corresponding number of contact members, such that an individual armature can be associated with each string. The core structure may be common to all the armatures and a single coil can have signals induced in it corresponding to the vibrations of any one or all of the armatures. Alternatively the core structure may be sub-divided and two or more coils provided around different parts of the core structure so as to have signals induced in them as a result of vibrations in any one or group of the armatures. The conventional electromagnetic pick-up may also be provided on the body of the instrument and located nearer to the fingerboard than the contact pick-up and electric signals derived from the two pick-ups may be utilized singly or in combination to provide audio signals corresponding to a wide range of tonal qualities.

Since the contact pick-up does not rely on a string being of a magnetic material, as does a conventional electromagnetic pick-up, it may be used with a non-magnetic string, such as of gut or nylon, and may, therefore, be applied not only to a musical instrument, the strings of which are only intended to be plucked, but also to a conventional stringed instrument whose strings are

2

also intended to be bowed. Such contact pick-up may be applied to any of the string family of instruments, more especially a cello or double-bass. By using a composite string comprising a core of magnetic material and an outer coating of non-magnetic material such as nylon, it is possible to use not only the contact pick-up but also an electro-magnetic pick-up and for a string to be bowed as well as plucked. The contact member in the contact pick-up device is preferably slidably disposed on a strip-like member lying adjacent a string and extending in the longitudinal direction of the string away from the bridge and connected to an armature so that the point at which contact member engages the string can be varied over a range of positions, thereby enabling some selection of damping effect to be obtained.

In a preferred embodiment the magnetic core structure and armature or armatures form a unit which is resiliently attached to one side of a mounting plate, and a plurality of rod-like members connected one to each armature project each through a bushed hole in the plate and are each connected at its other end to a contact member. The connection between each rod member and its contact member is made through a strip member, one end of which is resiliently mounted on the plate and engages the rod-like member at a point intermediate its ends, whilst the contact member is slidable along the strip member. The contact member may include a small pad of felt or rubber or foamed plastic material. The connection between each rod-like member and its strip member is effected by providing the rod-like member with a shoulder and an outer end portion of reduced diameter received in a hole in the strip member.

The mounting plate may be extended to include a conventional electromagnetic pick-up and may also include a bridge or bridges for the strings and a conventional anchorage for the string, or a tremulant device, or a combined bridge and tremulant device. In this manner the bridge, anchorage or tremulant device, contact pick-up and electromagnetic pick-up can be mounted on the body of a stringed instrument as a complete unit.

The anchorage for the ends of the strings may be in the form of an angle section member upstanding from the mounting plate and there is preferably provided for each string an adjustable bridge saddle unit having an edge for engaging the string and serving as bridge proper, an inclined slot communicating with said edge for receiving part of a string between the edge and the angle shaped anchorage which is suitably bored to receive the string. Each bridge saddle unit is preferably adjustable in two directions, one along the mounting plate towards and away from the angle shaped anchorage member, and the other towards and away from the mounting plate. In this way the position of the edge serving as bridge proper can be adjusted for each string. The edge in each of the bridge saddle units is preferably provided with a series of grooves to provide a somewhat saw-toothed edge so that the sideward position of each string, and thus the spacing between adjacent strings, can be adjusted, as required.

The invention will be further described by way of example with reference to the accompanying drawings in which:

FIG. 1 is a front view of a solid body guitar embodying the present invention;

FIG. 2 is a side view of the guitar of FIG. 1;

FIG. 3 is a front view to an enlarged scale of a composite bridge, anchorage and pick-up unit as fitted in the guitar of FIG. 1;

FIG. 4 is a side view of the unit of FIG. 3;

FIG. 5 is a composite section along the line V—V of FIG. 3;

FIG. 6 is a composite section along the line VI—VI of FIG. 3;

FIG. 7 is a detail view of part of an alternative fingerboard;

FIG. 8 is a section along the line VIII—VIII of FIG. 7 showing the outline shape of the fingerboard;

FIG. 9 is a section corresponding to FIG. 8 showing an alternative outline shape of a fingerboard;

FIG. 10 is a detailed front view of a still further modified fingerboard, and

FIG. 11 is a detail side view of one form of fingerboard of FIG. 10.

There is illustrated in FIGS. 1 and 2, purely by way of example, a bass guitar comprising a body 20, a neck and fingerboard 21, a machine head 22, a combined anchorage, bridge and pick-up unit 23 and a control panel 24. The guitar is a bass guitar and is provided with four strings, but it is to be understood that the invention is in no way limited only to a bass guitar, and may be applied to or adapted for any form of guitar, having a solid body or a hollow body, or for any stringed musical instrument having any number of strings.

The combined unit 23 is illustrated in greater detail in FIGS. 3, 4, 5 and 6 and for the sake of clarity only one string has been illustrated in FIGS. 3, 4 and 5. The unit 23 comprises a mounting plate 30 suitably drilled as at 31 for attachment to the body 20 and carrying at one end an angle-shaped anchorage member 32, an upstanding arm of which is provided with string-receiving apertures such as 33, the end of a string being anchored by being passed through an aperture and wound around a toggle such as 34 in a conventional manner. The upstanding arm is also suitably drilled to pass a series of adjustment screws such as 35, each received in a threaded hole in a bridge saddle unit 36. An inclined groove 37 is cut into each saddle unit 36 from one side thereof and extends a little over half way across as may be more clearly seen in FIGS. 3 and 4. The upper surface of each saddle unit 36 is cutaway as at 38 to form, with the groove 37, an edge 39 over which a string passes and which serves as bridge proper. The edge is preferably of saw-tooth form to provide for lateral adjustment of the position of the string over the edge and this is conveniently achieved by providing each saddle unit with a saw-toothed upper surface 40. The front of each saddle unit is stepped as at 41 and is drilled and adapted to receive a pair of adjustment screws 42, to provide for adjustment of the position of the saddle unit in a direction towards and away from the mounting plate 30. The adjustment screw 35, in conjunction with a compression spring 43 disposed between the anchorage 32 and the rear of the saddle unit 36 provides for adjustment of the position of the saddle unit in a direction parallel to the mounting plate 30 towards and away from the anchorage 32.

A contact pick-up unit indicated generally at 50 is resiliently attached to the mounting plate adjacent the forward ends of the bridge saddle units 36. The device 50 comprises a magnetic core structure 51, formed by two outer pole pieces 52, 53 connected together by screws 54, 55 and sandwiching between them a central pole piece 56 and permanent magnet assemblies 57, 58. Each of the assemblies 57, 58 comprises a pair of bar-section permanent magnets arranged end to end with like poles abutting one another in each pair, and like poles of the two pairs arranged similarly, for example with the north poles of all four at the centre and the south poles of all four at the ends. A coil 59 is located around the central pole piece 56. In the air gap between the pole pieces 52, 56 and 53, there is disposed a piece 60 of resilient material such as foamed plastic and part of the air gap is bridged by four armatures such as 61, the piece 60 being stuck to the pole pieces and to the armatures by a suitable adhesive. The magnetic core assembly is attached to the mounting plate 30 by

four screws 62, on each of which is located a compression spring 63. Attached to the centre of each of the armatures 61 is a rod-like member 63 of nonmagnetic material which extends through a grommet or bush 64 of rubber or like material in an opening in the mounting plate 30. The outer end of the rod-like member 63 has a shoulder 65 and a reduced diameter portion 66. A sleeve 67 of a thermoplastic material, such as polyvinyl chloride is disposed on the reduced diameter portion 66 which, together with the sleeve, is received in an aperture in a strip member 68 which rests on the shoulder 65 and extends generally along the plate 30 in a direction followed by a string. The end of each plate 68 remote from the bridge saddle unit 36, is resiliently connected to the plate 30 by means of a screw 69 and a compression spring 70. Slidably mounted on each strip 68 is a contact member 71 including a contact piece 72 of a suitable material, such as felt or a foamed plastic, for engagement by a string such as 73, as may be seen in FIGS. 3, 4 and 5.

In operation, when a string such as 73, suitably tuned, is set into vibration either by plucking or bowing, the contact piece 72, besides exerting a damping effect on the string, causes some vibration of the string to be transmitted through the strip 68 and rod member 63 to armature 61 and thereby cause an electric signal to be induced in the coil 59. Such signal may, after passing through controls in the control panel 24, be applied to one or more amplifier and loudspeaker systems for the production of audible sound. Some variation in the quality of the audible sound so produced can be effected by sliding the contact member 71 along the strip 68.

Since the signal derived from coil 59 does not depend upon the string 73 being wholly or partly of magnetic material, the contact pick-up device 50 may be applied to a conventional stringed instrument such as cello or double bass. It is, therefore, not essential for the fingerboard on the neck 21 of a guitar to be provided with frets 90 but a fingerboard having a plain outer surface 91 as illustrated in FIG. 7, may be provided. If the instrument is intended for bowing, then the cross-sectional shape of the finger board need not be flat as illustrated in FIG. 8, but may be curved as illustrated at 92 in FIG. 9. Should it be felt desirable to provide a fingerboard having a plain or smooth outer surface, but provided with markings to assist in fingering, the fingerboard may be provided with superimposed markings or with inset transverse strips such as 93 of a contrasting colour set into a main fingerboard panel 94.

If, however, the contact pick-up unit 50 is employed or is intended to be employed in an instrument provided with strings, some or all of which are wholly or partly of magnetic material, the plate 30 may be extended to include an electromagnetic pick-up 80 in which electric signals are induced in a coil as a result of variations in magnetic flux passing through such coil upon vibration of one or more string. Such signals may be passed through the control panel 24 and either combined selectively with signals from the coil 59 and applied to a common amplifier and loudspeaker system or may be applied to a separate amplifier and loudspeaker system. The electromagnetic pick-up device 80 may be disposed in part on each side of the plate 30 and be adjustably mounted relatively thereto for movement towards and away from the strings by screws 81 of springs 82.

We claim:

1. A contact pick-up unit for a stringed musical instrument having a body, a neck and fingerboard, a bridge on the body and means on the body and neck for stretching at least one string in spaced relationship to the fingerboard and in engagement with the bridge, comprising a magnetic core structure, at least one permanent magnet in said core structure, said magnetic core structure defining at least one air gap, an armature resiliently mounted in said air gap, a damping contact member for engage-

5

ment with a string of a musical instrument at a location between the bridge and the fingerboard separately from and independently of its engagement with the bridge and connected to said armature, and a coil surrounding part of said core structure for having induced therein electrical signals derived from vibration of a string engaging said contact member.

2. A contact pickup unit for a stringed musical instrument having a body, a bridge on the body, a neck and fingerboard and means on the body and neck for stretching at least one string in spaced relationship to the fingerboard and in engagement with the bridge, comprising an air gapped magnetic core structure, at least one permanent magnet in said core structure, an armature resiliently mounted in said air gap, a coil surrounding part of said core structure and a damping contact member connected to said armature for engaging a string between the bridge and the fingerboard separately from and independently of its engagement with the bridge.

3. A contact unit for a multi-stringed musical instrument having a body, a bridge on the body, a neck and fingerboard and means on the body and neck for stretching a plurality of strings in spaced relationship to the fingerboard and in engagement with the bridge, comprising a magnetic core structure, at least one permanent magnet in said core structure, said core structure including at least one air gap, a plurality of armatures in said air gap, a plurality of damping contact members separate from and independent of the bridge and equal in number to the number of strings in the musical instrument for each engaging one of said strings at a location between the bridge and the fingerboard separately and independently of the bridge and each connected to an individual one of said armatures, and at least one coil surrounding part of said structure for having induced in it signals corresponding to vibrations in any one or all of said armatures.

4. A contact pick-up unit for a multi-stringed musical instrument having a body, a bridge on the body, a neck and fingerboard and means on the body and neck for stretching a plurality of strings in spaced relationship to the fingerboard and in engagement with the bridge, comprising an air-gapped magnetic core structure, at least one permanent magnet in said core structure, a plurality of armatures in said air gap, a plurality of damping contact members separate from and independent of the bridge and each connected to an individual one of said armatures and each for engagement with a string of the musical instrument at a location between the bridge and the fingerboard separately and independently of its engagement with the bridge, and at least two coils each disposed around a different part of said core structure, each having induced in it electrical signals derived from the vibration of one or of all of a group of strings.

5. A pick-up unit for a stringed musical instrument having a body, a bridge on the body, a neck and fingerboard and means on the body and neck for stretching at least one string in spaced relationship to the fingerboard and in engagement with the bridge, comprising in combination a mounting plate adapted to be received on the body, a contact pick-up unit carried on said mounting plate and an electromagnetic pick-up carried on said mounting plate, said contact pick-up unit comprising an air-gapped magnetic core structure, at least one permanent magnet on said core structure, at least one armature resiliently mounted in said air gap, at least one coil surrounding part of said core structure and a damping contact member separate from and independent of the bridge and connected to said armature for engagement with a string of the musical instrument at a location between the bridge and the fingerboard independently of its engagement with the bridge.

6. A contact pick-up unit for a multi-stringed musical instrument having a body, a bridge on the body, a neck and fingerboard and means on the body and neck for

6

stretching a plurality of strings in spaced relationship to the fingerboard and in engagement with the bridge, comprising an air-gapped magnetic core structure, a permanent magnet in said core structure, a plurality of armatures in said air gap, a coil surrounding part of said core structure, a plurality of strip-like members separate from and independent of the bridge and each connected to an individual one of said armatures and each adapted to extend substantially parallel to and spaced from a string of the musical instrument at a location between the bridge and the fingerboard, and a plurality of damping contact members slidably disposed one on each strip-like member for engagement with a string independently of the engagement of that string with the bridge.

7. A contact pick-up unit for a stringed musical instrument having a body, a bridge on the body, a neck and fingerboard and means on the body and neck for stretching at least one string in spaced relationship to the fingerboard and in engagement with the bridge, the unit being adapted for incorporation on and in the body adjacent the bridge and on the fingerboard side thereof, comprising a mounting plate, an air-gapped magnetic core structure carried at one side of said mounting plate, at least one permanent magnet in said core structure, an armature resiliently mounted in the air gap of said core structure, a coil surrounding part of said core structure, a rod-like member connected to said armature and projecting through said mounting plate to the other side thereof, a strip-like member connected intermediate its ends to said rod-like member and resiliently mounted on said other side of said mounting plate at that one of its ends which, when in situ in a stringed musical instrument, is remote from the bridge, said strip-like member then extending substantially parallel to the line of the string, and a damping contact member slidably disposed on said strip-like member for engaging a string at a location between the bridge and the fingerboard, the strip-like member and contact member being separate from and independent of the bridge.

8. A pick-up unit for a multi-string stringed musical instrument having a body, a bridge on the body, a neck and fingerboard and means on the body and neck for stretching a plurality of strings in spaced relationship to the fingerboard and in engagement with the bridge, the unit being adapted to be disposed on the body between the bridge and the fingerboard, comprising a mounting plate, a magnetic core structure resiliently connected to said mounting plate at one side thereof, said magnetic core structure including an air gap, at least one permanent magnet in said core structure, a plurality of armatures resiliently mounted in the air gap, at least one coil surrounding part of said magnetic core structure, the number of armatures being equal to the number of strings in the instrument, a plurality of strip-like members equal in number to the number of armatures each resiliently attached to the mounting plate and spaced from the other side thereof to extend substantially parallel to the direction of a string, a plurality of rod-like members each connecting an armature with a strip-like member, said mounting plate being apertured to permit passage of said rod-like members, each rod-like member connecting with a strip-like member intermediate the ends of the strip-like member, and a plurality of damping contact members each slidably mounted on a strip-like member for engagement with a string at a location between the bridge and the fingerboard, the strip-like members and the contact members being separate from and independent of the bridge.

9. A combined string anchorage bridge and pick-up unit for a stringed musical instrument having a body and a neck, fingerboard and machine head comprising a mounting plate adapted to be received on the body, a string anchorage attached to one side of said mounting plate, a bridge unit adjustably positionable to said one side of said mounting plate adjacent said string anchor-

age, the anchorage and bridge unit being adapted respectively to secure one end of and engage part of a string stretching over the fingerboard to the machine head, a strip-like member extending substantially parallel to but spaced from said one surface of said mounting plate, means for resiliently connecting to the mounting plate that end of the strip-like member remote from the bridge unit, a magnetic core structure resiliently connected to the mounting plate and disposed at the other side thereof, at least one permanent magnet in said core structure, said core structure defining at least one air gap, an armature resiliently mounted in said air gap, a rod-like member extending through said mounting plate and connecting said armature with a point on said strip-like member intermediate the ends of the strip-like member and a damping contact member slidably mounted on said strip-like member for engaging the string at a location between the bridge unit and the fingerboard, the strip-like member and the contact member being separate from and independent of the bridge unit.

10. A combined bridge and pick-up unit for a multi-string stringed musical instrument having a body, a neck, fingerboard and machine head, comprising a mounting plate adapted to be received on the body, a string anchorage adapted to secure one end of each string, a plurality of bridge units equal in number to the number of strings and disposed at one side of said mounting plate and each adapted to engage part of a string stretching from the anchorage over the fingerboard to the machine head, a plurality of strip-like members equal in number to the number of strings, means for connecting that end of each of the strip-like members remote from the bridge units to the mounting plate at said one side thereof, a magnetic core structure, means connecting said core structure to said mounting plate with said core structure at and spaced from the other side thereof, said core structure defining an air gap, at least one permanent magnet in said core structure, at least one coil surrounding part of said core structure, a plurality of armatures equal in number to the number of strings, means for mounting each armature resiliently in the air gap, a plurality of rod-like members each connecting one of said armatures with one of said strip-like members at a point of the strip-like member intermediate its mid-point and its end nearer the bridge units, a plurality of damping contact members each slidably mounted on one of said strip-like members for engagement with a string at a location between its bridge unit and the fingerboard, said strip-like members and said contact members being separate from and independent of the bridge units.

11. A combined bridge and pick-up unit for a multi-string stringed musical instrument according to claim 10, including an electromagnetic pick-up unit, means for mounting said electromagnetic pick-up unit to said mount-

ing plate at a region thereof beyond said strip-like members.

12. A combined bridge and pick-up unit for a multi-string stringed musical instrument according to claim 10, including means mounting said string anchorage on said mounting plate adjacent said bridge units.

13. A combined bridge and pick-up unit for a multi-string stringed musical instrument according to claim 12, in which said string anchorage comprises an angle section member, one arm of which engages said surface of said mounting plate and the other arm of which extends substantially normally thereto, and in which each bridge member comprises a block having an edge serving as bridge proper and is provided with an inclined slot communicating with said edge for receiving part of a string between said edge and said string anchorage, first adjustment screw means connecting the block with said normally extending arm of the string anchorage for adjustably positioning the block in a direction towards and away from the string anchorage, and second screw adjustment means received in tapped holes in said block and engaging said one surface of said mounting plate for adjustably positioning the block in a direction towards and away from the mounting plate.

14. A combined bridge and pick-up unit for a multi-string stringed musical instrument according to claim 13, which said edge has a plurality of spaced grooves along the edge to form a saw-toothed profile.

15. A combined bridge and pick-up unit for a multi-string stringed musical instrument according to claim 10 in which each rod-like member has at its strip-like member engaging end a shoulder and a reduced diameter end portion, and in which each strip-like member is bored to receive said reduced diameter portion, yet rests on said shoulder.

16. A combined bridge and pick-up unit for a multi-string stringed musical instrument according to claim 15 in which a sleeve of thermoplastic material is disposed around said reduced diameter portion and then said bore.

17. A combined bridge and pick-up unit for a multi-string stringed musical instrument according to claim 10 in which each of said rod-like members is a non-magnetic material.

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