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ELECTRIC PICKUP FOR VIBRATIONS

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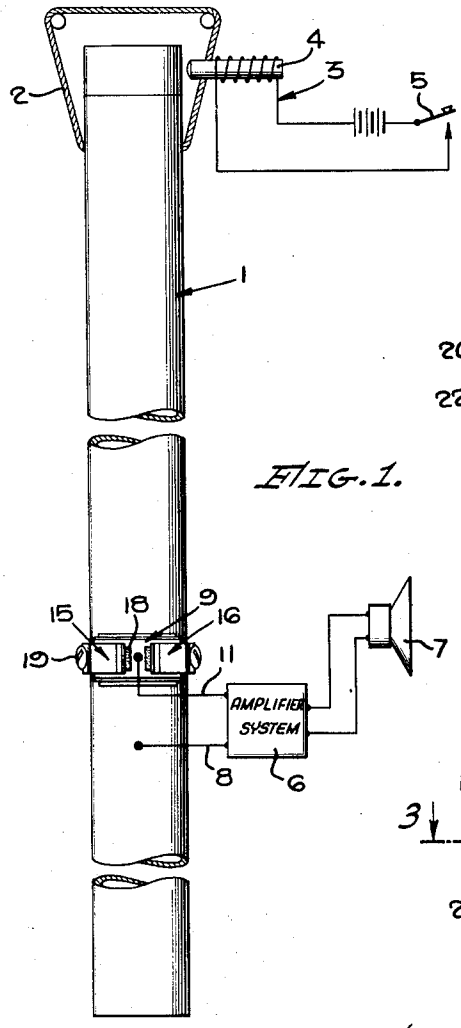
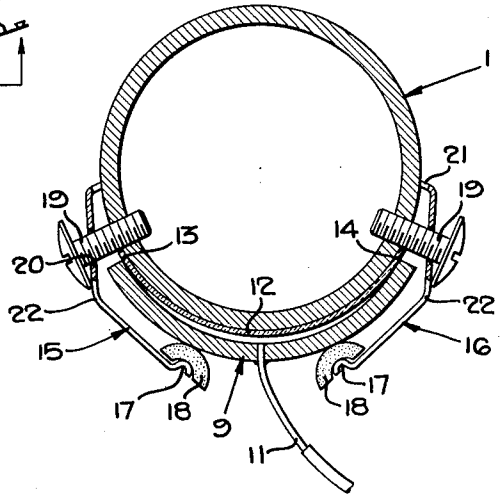


FIG. 1.

FIG. 3.



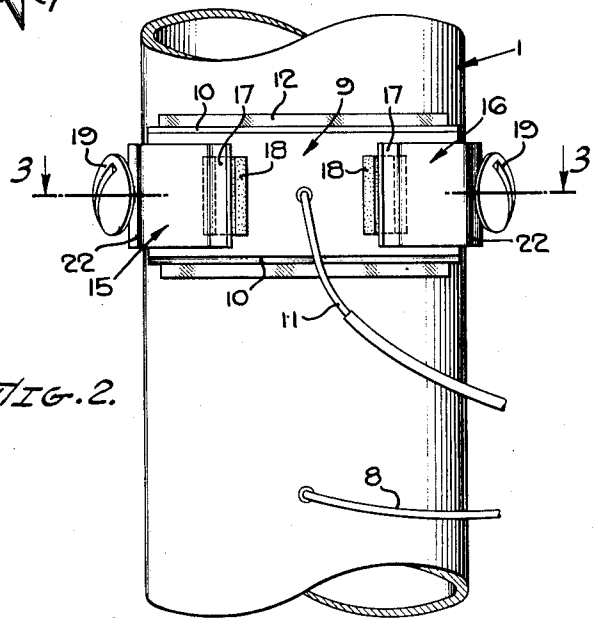


FIG. 2.

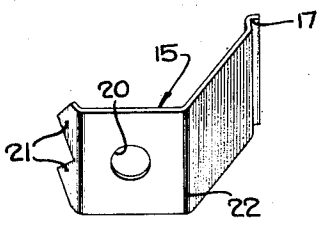


FIG. 4.

INVENTOR.
LOUIS A. MAAS

BY John Flam

ATTORNEY.

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ELECTRIC PICKUP FOR VIBRATIONS

Louis A. Maas, Glendale, Calif., assignor to Maas-Rowe Electromusic Corporation, Los Angeles, Calif., a corporation of California

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10 Claims. (Cl. 84—1.14)

1

This invention relates to the conversion of mechanical vibrations into electrical impulses, and especially by the aid of a capacitance which is varied in accordance with the vibrations. Such devices are useful, for example, to translate the vibrations of a vibrant bar or chime into electrical impulses that may be readily amplified and then converted into sound at a place remote from the vibrant bar or chime.

Pick-ups of this general character are especially useful for electrical musical instruments of the percussion type. However, such pick-ups have been somewhat complex, and required quite delicate adjustments.

It is one of the objects of this invention to improve pick-ups of this general character.

It is another object of this invention to simplify such pick-ups and to make it possible to adjust them expeditiously for optimum effects.

This invention possesses may other advantages, and has other objects which may be made more clearly apparent from a consideration of a form in which it may be embodied. This form is shown in the drawings accompanying and forming part of the present specification. It will now be described in detail, for the purpose of illustrating the general principles of the invention; but it is to be understood that such detailed description is not to be taken in a limiting sense, since the scope of the invention is best defined by the appended claims.

Referring to the drawings:

Figure 1 is an elevation of a vibrant bar utilizing the invention, the bar being shortened in order to reduce the size of the figure;

Fig. 2 is an enlarged fragmentary view of the bar, illustrating the invention;

Fig. 3 is an enlarged sectional view, taken along a plane corresponding to line 3—3 of Fig. 2; and

Fig. 4 is a pictorial view of one of the leaf springs used in connection with the invention.

In the present instance, a vibrant bar 1 is shown which may be in the form of a hollow tube freely suspended at its upper end, as by the aid of a flexible cord 2. In order to produce musical vibrations of the bar 1, use is made of a striker mechanism 3, including an electromagnetically operated striker 4 and a control switch 5.

The vibrations of the vibrant bar 1 are intended to be electrically amplified by an amplifier system 6 which ultimately passes energy to loud speaker 7 which converts electrical impulses into sound waves.

In order that the mechanical vibrations of the bar 1 be translated into electrical impulses fed

2

into the amplifier system 6, a capacitance is provided which is caused to vary in accordance with the mechanical vibrations. One plate of a capacitor for this purpose is formed by the bar 1, which is made of conducting material. An electrical connection 8 connects the bar 1 to the amplifier system 6.

The other plate of the condenser is formed by an arcuate plate 9, which is beveled, as indicated at 10, at its upper and lower edges. This plate 9 is connected, as by connection 11, to the amplifier system. Thus, the conductors 8 and 11 may be coupled in any desired manner to the input of the amplifier system 6.

As shown most clearly in Figs. 2 and 3, interposed between the bar 1 and the plate 9 is a layer of dielectric material 12. This may be thin, cellulose material, the thickness of which is exaggerated in Fig. 3. Furthermore, the arcuate plate 9 is so arranged that it has a limited area of contact with the dielectric material 12. This may be accomplished, for example, by making the plate 9 of slightly smaller radius than that of the tube 1, so that the side edges 13 and 14 form the only places of contact between the plate 9 and the dielectric material 12.

The arrangement is such that the mechanical vibrations of the bar 1 serve minutely to vibrate the plate 9 with relation to bar 1, thereby causing variations or oscillations in the capacitance of the condensed formed by the bar 1 and the plate 9. Thus, variations in capacitance correspond to the mechanical vibrations and, accordingly, affect the amplifier system 6.

In order that the plate 9 correspond in a desired manner to the vibrations, the location of the plate 9 along the length of the bar 1 is chosen so as to be properly affected by the complex vibrations set up in the bar 1 by the striker mechanism 3.

The plate 9 is resiliently urged toward seated position by the aid of a pair of leaf spring members 15 and 16. Each of these leaf spring members has a rounded end 17 engaging within a shallow groove formed in the arcuate resilient contacting or pad members 18. These pad members 18 may be made of rubber, or the like, and are in contact with the exterior surface of the plate 9. These rubber members 18 are purposely made quite thick so that erratic vibrations of plate 9 are reduced.

The leaf springs 15 are placed under stress, by the aid of the fastening means 19, such as a screw, which are threaded radially into the bar 1 and which pass through the clearance apertures 20

formed in the leaf springs 15. The ends of the leaf springs remote from the free ends 17 are bifurcated, as indicated at 21 in Fig. 4, to contact the exterior surface of the bar 1. By adjusting the screw 19, the force exerted by the corresponding leaf springs 15 and 16 may be varied to correspond to the desired degree of response of the structure. Furthermore, each of the leaf springs 15 and 16 may be bent, as indicated at 22, so that the leaf spring conforms generally to the contour of the tubular bar 1. The bifurcated ends 21 thus serve as a fulcrum about which the corresponding leaf spring 15 or 16 can be moved by operation of the screws 19.

The forces transmitted by the leaf spring 15 to the chime bar 1 through the screw 20 and the bifurcated end 21 of the leaf spring 15 are in a plane perpendicular to the line of vibration of the chime bar 1, and hence have no restricting or damping effect on the bar. Other methods of applying pressure on the plate 9 generally have all or a portion of these forces transmitted to the chime in a direction parallel to the line of vibration of the chime, and hence have a tendency to oppose the vibration, causing the chime to damp more rapidly.

Upon the occurrence of mechanical vibrations of the tube 1, a corresponding movement between bar 1 and plate 9 is effected. Although this movement is minute, it is yet sufficient to set up corresponding electrical impulses in the input circuit of the amplifier system 6.

The inventor claims:

1. In a pick-up structure: a vibrant electrically conducting member; a cooperating member forming a capacitance with the vibrant member; a dielectric layer between the members; said dielectric layer being in contact with both said members; one of said members having a limited area of contact with said dielectric layer; and a pair of spring arms each attached to one of the members and having a free end overlying the other member for urging said other member toward the one member, said arms extending in such a direction that the forces exerted thereby leave the resonant characteristics of the bar substantially unaffected.

2. In a pick-up structure: a vibrant electrically conducting member; a cooperating member forming a capacitance with the vibrant member; a dielectric layer between the members; said dielectric layer being in contact with both said members; and a pair of spring arms each attached to one of the members and having a free end overlying the other member for urging said other member toward the one member, said arms extending in such a direction that the forces exerted thereby leave the resonant characteristics of the bar substantially unaffected.

3. In a pick-up structure: a vibrant electrically conducting member; a cooperating member forming a capacitance with the vibrant member; a dielectric layer between the members; said dielectric layer being in contact with both said members; a pair of spring arms for urging the members together said arms extending in a peripheral direction about said vibrant member, thereby leaving the resonant characteristics of the bar substantially unaffected; and adjustable fastening means extending respectively through each arm and engaging one of the members.

4. In a pick-up structure: a vibrant electrically conducting member; a cooperating member forming a capacitance with the vibrant member; a dielectric layer between the members; said dielectric layer being in contact with both said members; a pair of spring arms for urging the members together said arms extending in a peripheral direction about said vibrant member, thereby leaving the resonant characteristics of the bar substantially unaffected; and adjustable fastening means extending respectively through each arm and engaging one of the members; one of said members having a limited area of contact with said dielectric layer.

5. In a pick-up structure: an elongated vibrant electrically conducting member; a cooperating member forming a capacitance wtih the vibrant member; a dielectric layer between the members; said dielectric layer being in contact with both said members; a pair of spring arms; each spring arm having one end in contact with one of the members and its other end overlying the other member for urging the members toward each other said arms extending substantially perpendicularly of the longitudinal axis of said vibrant member, thereby leaving the resonant characteristics of the bar substantially unaffected; and a screw for each arm, passing through an aperture in the arm and threaded into said one of the members.

6. In a pick-up structure: a vibrant electrically conducting member; a cooperating member forming a capacitance with the vibrant member; a dielectric layer between the members; said dielectric layer being in contact with both said members; spring arms having a free end urging the members together said arms extending in a peripheral direction about said vibrant member, thereby leaving the resonant characteristics of the bar substantially unaffected; and a resilient pad between the said end and one of the members.

7. In a pick-up structure: a vibrant electrically conducting member; a cooperating member forming a capacitance wtih the vibrant member; a dielectric layer between the members; said dielectric layer being in contact with both said members; one of said members having a limited area of contact with said dielectric layer; a pair of spring arms each attached to one of the members and having a free end overlying the other member for urging said other member toward the one member, said arms extending in a peripheral direction about said vibrant member, thereby leaving the resonant characteristics of the bar substantially unaffected; and a resilient pad between each of the free ends and said one member.

8. In a pick-up structure: an elongated vibrant bar made from electrically conducting material; a cooperating member forming a capacitance with the bar; a dielectric layer between the bar and the member and in contact with both of them; the member having a limited area of contact with said dielectric layer; and a pair of spring arms extending transversely to the bar and extending over the side edges of the member for urging the member toward the bar.

9. In a pick-up structure: an elongated vibrant bar made from electrically conducting material; a cooperating member forming a capacitance with the bar; a dielectric layer between the bar and the member and in contact with both of them; and means resiliently urging said bar and member together, the force exerted by said means being substantially perpendicular to the line of vibration of the bar.

10. In a pick-up structure: an elongated vibrant bar made from electrically conducting ma-

terial; a cooperating member forming a capacitance with the bar; a dielectric layer between the bar and the member and in contact with both of them; a pair of spring arms, each having a free end extending over the side edges of said member for urging the member toward the bar; said arms extending perpendicularly of the longitudinal axis of said bar, thereby leaving the resonant characteristics of the bar substantially unaffected; and securing means for said arms adjustably controlling the force urging said member toward the bar.

LOUIS A. MAAS.

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