June 2, 1942. L. A. MAAS 2,284,911

MUSICAL INSTRUMENT

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Fig. 1.

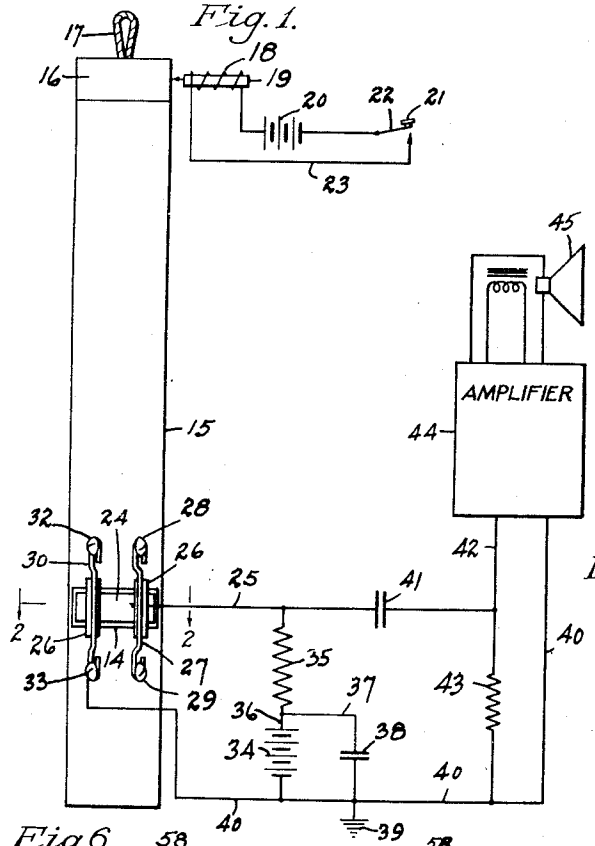


Fig. 2.

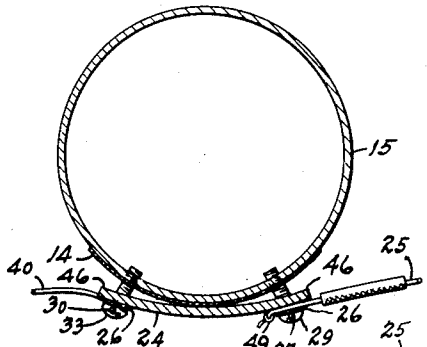


Fig. 3.

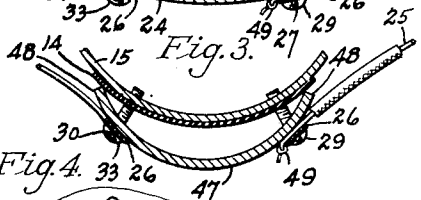


Fig. 4.

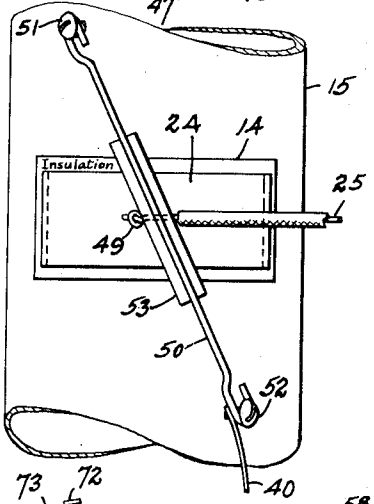


Fig. 6.

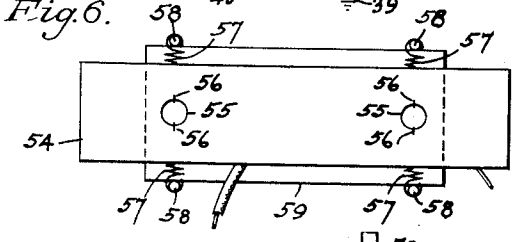


Fig. 5.

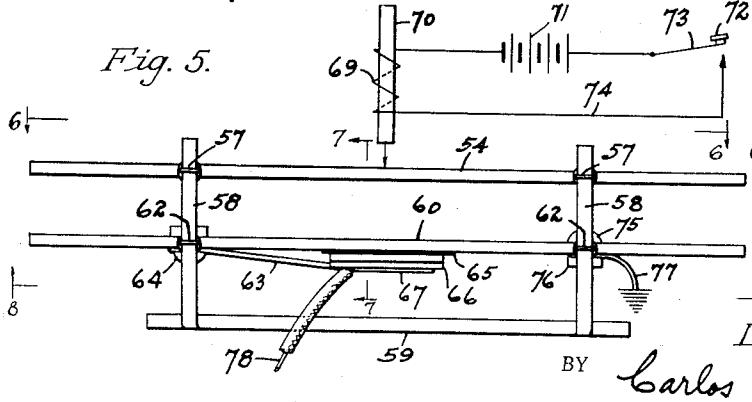
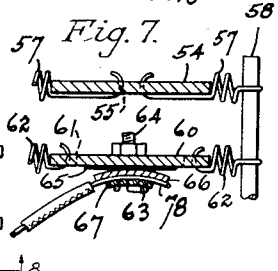


Fig. 7.



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Fig. 8.

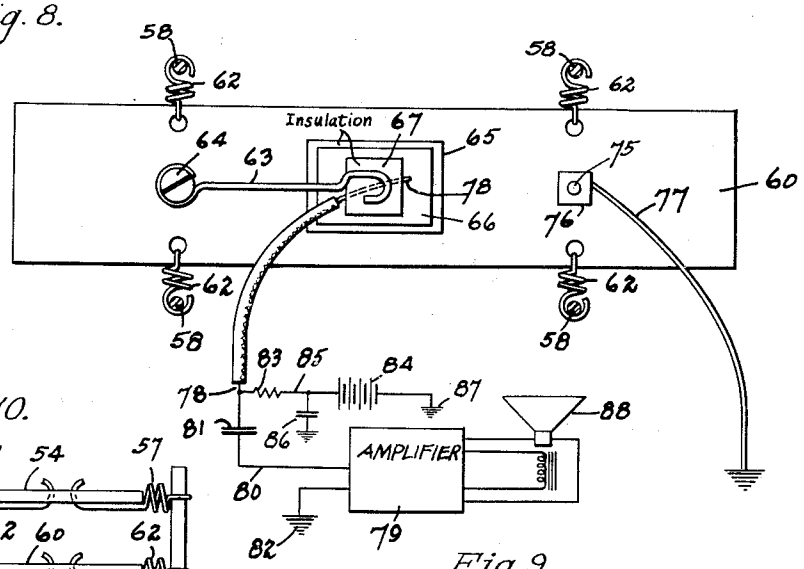


Fig. 10.

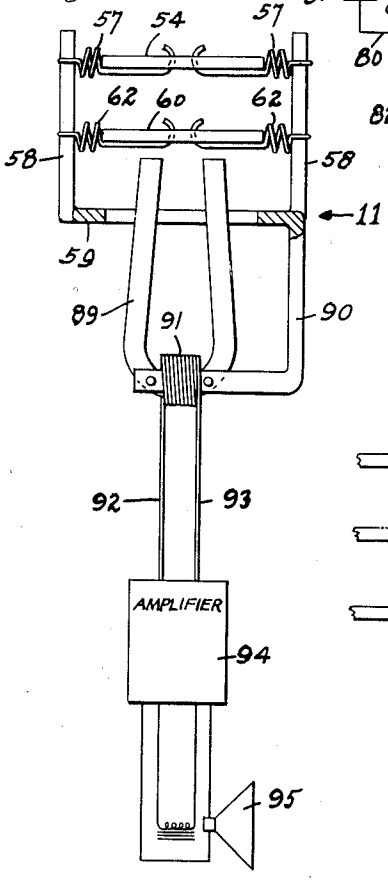


Fig. 9.

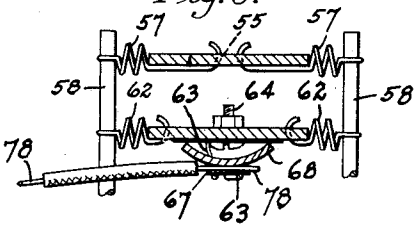
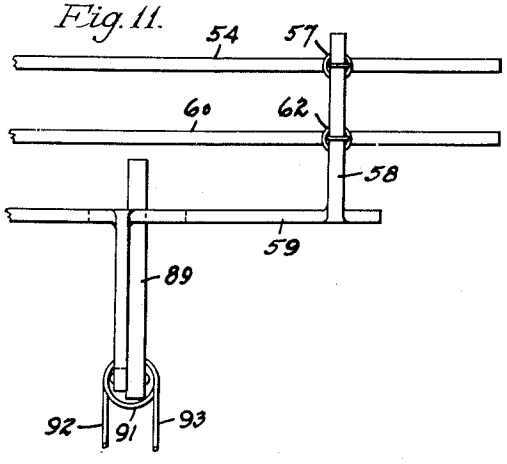


Fig. 11.



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UNITED STATES PATENT OFFICE

2,284,911

MUSICAL INSTRUMENT

Louis A. Maas, Glendale, Calif.

Application April 12, 1940, Serial No. 329,260

5 Claims. (Cl. 177—7)

My invention relates to a musical instrument and more particularly to means for electrically amplifying musical vibrations of a vibrating member; e. g., converting the vibrations of chimes into corresponding electrical impulses and amplifying such impulses.

The musical instrument comprises hammers that deliver blows against chimes, and an important object of the invention is to provide means in such a musical instrument to substantially eliminate audible effect by the instrument, of the percussion blows of the hammer.

Another object is to provide a pick-up device that will avoid materially dampening the vibrations of the chime.

A further object is to provide resilient, vibrating, polarized bodies of different shapes than the chimes by which such bodies are vibrated, and from which bodies electrical impulses are obtained corresponding to the vibrations of such bodies.

A still further object is to be able to vary at will, within a prescribed range, the capacity between the chime and the polarized body, to obtain the desired amount of signal energy from each chime.

The invention also comprises novel details of construction and novel combinations and arrangements of parts, which will more fully appear in the course of the following description. However, the drawings merely show and the following description merely describes an embodiment of the present invention, which is given by way of illustration or example only.

In the drawings, like reference characters designate similar parts in the several views.

Figure 1 is an elevation of a tubular chime and a diagrammatic view of a striking means circuit and an amplifying circuit embodying the present invention.

Figure 2 is an enlarged section taken on the line 2—2 of Figure 1.

Figure 3 is a broken view of a section similar to Figure 2, but showing a modified construction.

Figure 4 is an enlarged, broken face view of another modified construction.

Figure 5 is a side elevation of a bar chime modification of the present invention.

Figure 6 is a plan view, looking in the direction of the arrows 6—6 of Figure 5.

Figure 7 is a broken, transverse sectional view, taken on the line 7—7 of Figure 5.

Figure 8 is an underneath sectional view taken on the line 8—8 of Figure 5.

Figure 9 is a broken, transverse section, taken on the line 7—7 of Figure 5, but showing a modified construction.

Figure 10 is an end view of a magnetic pick-up device, with an amplifying circuit shown in diagrammatic form.

Figure 11 is a broken, side elevation looking in the direction of the arrow 11 of Figure 10.

Referring more in detail to the drawings, the reference number 15 generally designates a tubular chime which may be provided with a non-metallic or other striking head 16 and suspended by a cord 17, all as more particularly shown and described in United States Letters Patent No. 1,813,171, issued July 7, 1931, on an invention by Joseph W. Klein.

A percussion device for the chime comprises a solenoid 18 whose core 19 strikes the chime when the solenoid is energized by a source 20 of electrical energy. A manual key 21 operates a switch 22 that controls the circuit 23 for the solenoid.

Mounted on the body of the chime 15 is a polarizing plate 24, with a dielectric 14, such as of varnished linen, disposed between the plate and the chime. An end of a wire 25 is held against the plate 24 by another dielectric strip 26, which in turn is held in place by a spring wire 27. Screws 28 and 29 on the chime 15 hold the spring wire 27 resiliently against the dielectric 24 and thereby yieldingly hold the end of the wire 25 and the plate 24 in place with respect to the chime.

A similar spring wire 30 resiliently maintains the opposite end of the plate 24 in place. A dielectric 26 is arranged between the wire 30 and the plate 24. Screws 32 and 33 maintain the wire 30 in its resilient clamping position with respect to the plate 24.

By unscrewing the screws 28, 29, 32 and 33, the plate 24 is permitted to vibrate at greater amplitude and thus produces a correspondingly stronger impulse in the wire 25. By tightening these screws, the amplitude of the vibrations of the plate 24 is reduced, thus producing a correspondingly weaker electrical impulse in the wire 25.

A condenser microphone circuit includes the wire 25 in which a polarizing voltage is obtained from an electrical source 34, which source is connected with the wire 25 through a resistance 35. Wire 36 that connects the source 34 with the resistance 35 is tapped by a wire 37 that contains a condenser 38 and is grounded at 39.

Both the ground 39 and the negative side of the

source 34 are connected by a wire 40 to the chime 15 by means of the screw 33. A blocking condenser 41 is arranged in the wire 25 between the connection with the resistance 35 and a wire 42. A resistance 43 bridges the wires 42 and 40.

The wires 40 and 42 are connected with an amplifier suggested at 44. A detailed description of the amplifier is deemed unnecessary to those skilled in the art. A conventional dynamic speaker, connected with the amplifier, is indicated at 45.

The plate 24 is preferably of a different sectional shape than the contour of the tubular chime 15. If the plate 24 is curved (which is not essential), it is preferably in an arc of greater or smaller radius than the radius of the tubular chime. Figure 2 shows the plate 24 curved and of a greater radius than the tubular chime 15, thus providing loose edges 46 that vibrate when the plate 24 is set in vibration by the vibration of the chime.

Figure 3 shows a plate 47 that is curved and is of a smaller radius than the tubular chime 15, whereby the edges 48 of the plate 47 contact the dielectric 14 and the center portion of the plate 47 is bowed outwardly from the chime. The end of the wire 25 may be knotted, as shown at 49, to prevent it being drawn outwardly from between the dielectric 26 and the plate 24 or 47.

In the form shown in Figure 4, a single diagonally arranged spring wire 50 is fastened to the chime 15 by screws 51 and 52. A diagonally arranged dielectric 53 is disposed between the resilient wire 50 and the plate 24.

Figure 5 shows a modified construction of a chime, to wit, two floating bar chimes 54 and 60 of the same pitch. Nodal points of the bar chime 54 have apertures 55 in which are hooked the ends 56 of coil spring 57. It is believed clear without further illustration that the bar chimes may be supported on leather, rubber or felt pads, or supported by string at nodal points of the chimes. The opposite ends of the springs 57 are looped about posts 58. A base 59 supports the posts 58. The tubular chimes also have nodal points and vibrating portions.

The adjacent bar chime 60 has apertures 61 in which are hooked springs 62, which in turn are looped about posts 58. A spring wire 63 is fastened at one end by a bolt 64 on a nodal line of the bar chime 60. The opposite end of the spring wire 63 yieldingly holds the end of a wire 78 against a dielectric 65 between a curved plate 66 and the chime 60. A dielectric 67 is arranged between the wire 63 and the plate 66. The plate may be oppositely curved, as shown at 68 in Figure 9.

A bolt 75 and nut 76 fasten a grounded wire 77 to a nodal point on the bar chime 60.

Percussion mechanism for the initial bar chime 54 comprises a solenoid 69 having a core 70 that strikes the bar 54 when the solenoid is actuated by electrical current from a source 71. A key 72 controls a switch 73 for the circuit 74 of the solenoid.

An amplifier 79 is connnected with the wire 78 by means of a wire 80 that contains a blocking condenser 81. The amplifier 79 is grounded at 82. A resistance 83 is connected with the wire 78 and to a source 84 of electrical current by means of a wire 85. A grounded by-pass condenser 86 taps the wire 85 between the resistance 83 and the source 84. The said source is grounded at 87. A conventional dynamic speaker 88 is connected with the amplifier 79. The pick-up devices hereinbefore described are electrostatic pick-ups. However, a magnetic pick-up may also be used, where the chime is of magnetic material. For a magnetic pick-up a horseshoe magnet 89 is disposed with its poles in close proximity to the bar chime 60. A bracket 90 supports magnet 89 in substantially rigid relationship to the frame 58. A coil 91 around the magnet has its opposite ends connected by wires 92 and 93 to an amplifier 94. A conventional dynamic speaker 95 is connected to the amplifier 94.

In the operation of each electrostatic pick-up form of the invention shown and described, a resilient, vibrating member carries a polarized plate which in turn is resilient and vibrated by the vibrating, carrying member. In one form of the invention, a magnetic pick-up is employed. With either the electrostatic pick-up or the magnetic pick-up, the sound of the percussion blow may be eliminated by employing two associated chimes of the same pitch, striking one of the chimes, inducing vibrations in the second chime by close association of the two chimes, and picking up the vibrations of the second chime. The vibrating chime and the vibrating plate are electrodes in the circuit.

The polarized plate is preferably of a different radius than the tubular chime, if such a chime is used, and the plate is preferably curved if the chime is a flat, bar chime. This difference in radius or shape provides a wider variance between the vibration of the chime and of the plate carried by the chime.

The clamp for maintaining the plate in position on the chime is preferably one that does not extend around the chime and thereby restrict vibration thereof.

It is to be understood that the present drawings show only a single unit of a musical instrument. A plurality of such units, having chimes of different pitch (pitched to the ordinary musical scale) are arranged together with a keyboard composed of a plurality of keys 21 or 72.

By an operator manipulating such keys, the chimes 15 or 54 are struck. The vibration of the chime 15 induces vibration of the plate 24, 47, 66 or 68, whose vibrations are picked up by the wire 25, amplified and discharged as sounds by the loud speaker 45. Vibrations of the chime 54 induce the chime 60 to vibrate. The plate 66 or the magnet 89 pick up the vibrations of the bar chime 60, subsequent to which the means described amplify same and reproduce them at the loud speaker 88 or 95.

While I have illustrated and described what I now regard as the preferred embodiment of my invention, the construction is, of course, subject to modifications without departing from the spirit and scope of my invention. I, therefore, do not wish to restrict myself to the particular form of construction illustrated and described, but desire to avail myself of all modifications which may fall within the scope of the appended claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. A chime, comprising a chime member forming one part of a condenser, a plate insulated from said chime member, and insulated spring members supporting said plate on the chime member, the said plate having a different contour from the chime.

2. A chime comprising a percussively vibrated chime member, and a second vibratory member supported on, and in vibrating relation to, said

first member and insulated therefrom, said members presenting adjacent surfaces of non-conforming contour, and each member thus forming one plate of a condenser.

3. A chime, comprising a chime member forming one plate of a condenser, and a separate plate member yieldingly supported in connection with, and insulated from, the chime member and forming the other plate of the condenser, said members presenting adjacent surfaces arranged with respect to one another to provide a varying space therebetween.

4. The invention as set forth in claim 3, wherein one of the vibrating members is curved in a degree forming a variation in its contour with respect to the contour of the other member.

5. The invention as set forth in claim 3, with means insulated from one of said members for adjustably, yieldingly connecting the members.

LOUIS A. MAAS.