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B. MINSHALL

2,462,531

MUSICAL VIBRATION TRANSLATING UNIT

Filed May 22, 1945

FIG. 1.

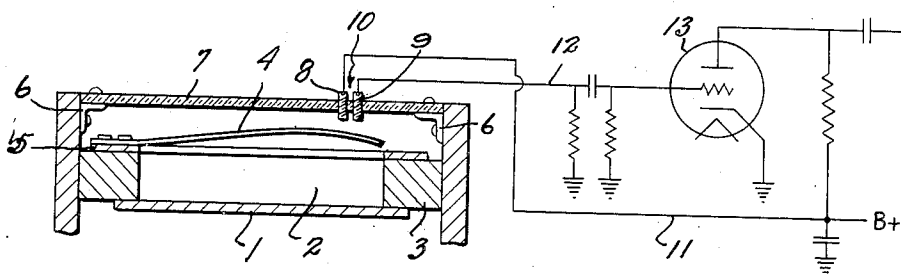


FIG. 2.

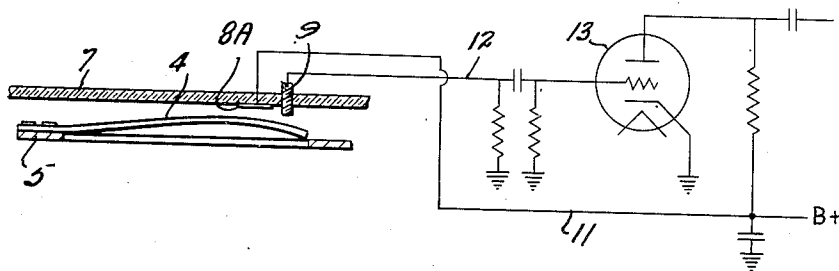


FIG. 3.

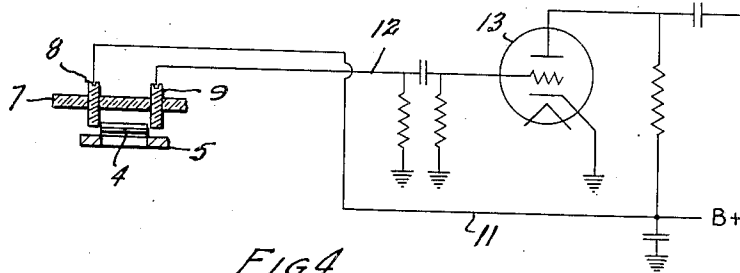
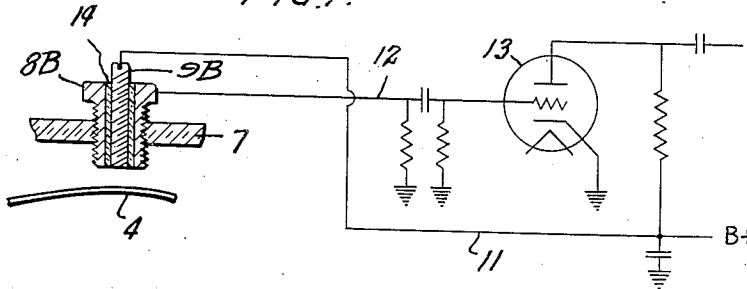


FIG. 4.



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## UNITED STATES PATENT OFFICE

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## MUSICAL VIBRATION TRANSLATING UNIT

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12 Claims. (Cl. 84—1.14)

1

This invention relates to a unit for translating the vibrations of reeds, such as are used in the ordinary reed organ as a source of tone, into electrical oscillations and more especially to an improved arrangement in which each vibratory reed is positioned to vibrate within the electrostatic field of an electrical capacity formed by stationary electrodes. The condenser formed by these electrodes is connected to an electrical circuit through which the electrical capacity is charged, but the vibratory reed is not conductively coupled to this charging means.

Hitherto, the musical vibrations of reeds have been translated into electrical oscillations by employing the reed as one plate of the condenser in the manner disclosed in Patent 2,015,014 to Fredreck A. Hoschke. In this arrangement the metallic reed is conventionally housed or mounted in a wooden cell and the reed, or a resilient metal strip attached to the base of the reed, is secured to a connection to the electrical circuit in order that it may form one plate of the condenser. This construction is impractical because of the necessity of removing the reed for tuning and servicing.

Moreover, the reed or the metal strip over a period of time becomes corroded, due to atmospheric action. This deterioration results in the creation of a varying resistance at the point of connection with the electrical circuit, thereby causing disturbances which are reproduced as noise through the amplifier. In addition, the wooden cell in which the reed is mounted has a tendency to absorb moisture, and such conditions will cause a leakage of the voltage carried by the reed, both to the ground and to the remaining plate of the condenser. If leakage occurs an unsatisfactory performance of the musical instrument will necessarily be the result. Furthermore, metal filings resulting from tuning the reed, may attach themselves to the stationary plate and to the reed and result in shorting the circuit to the energizing voltage, thereby causing the instrument to be wholly inoperative.

One of the objects of this invention is to overcome the above mentioned disadvantages of the prior art.

Another object of this invention is to provide a unit, for translating the vibrations of a tone reed into electrical oscillations, which will operate efficiently and assist in accurate reproduction under all operating conditions.

A further object of my invention is to provide a unit for translating the vibrations of a tone reed into electrical oscillations in which the reed

2

is positioned to vibrate within the electrostatic field of an electrical capacity formed by stationary electrodes.

With these and other objects in view which may be instant to my improvements, the invention consists in the parts and combinations hereinafter set forth in the claims, with the understanding that the necessary elements comprising the invention and the arrangement of these parts may be varied by those skilled in the art without departing from the spirit of the invention or the scope of the appended claims.

The invention embraces broadly the idea of providing a musical instrument employing reeds, of the type used in the ordinary reed organ as its source of tone, with a means for translating the vibrations of the reeds into electrical oscillations. Subsequently these oscillations are amplified and reproduced as sound waves. In this arrangement stationary electrodes mutually forming an electrical capacity are provided for each reed. These condensers are connected to a source of electrical potential for charging their capacities. In this invention, a reed made of any suitable material, such as a metallic or plastic reed may be employed. In musical instruments such as organs, the reeds are chromatically arranged in a musical scale.

The principal feature of the invention resides in positioning the reed to vibrate within the electrostatic field of the condenser so as to influence the capacity of the condenser without requiring the reed to be connected to the electric circuit or to the ground. Suitable means, such as pneumatic means, are provided to vibrate the reeds.

This construction eliminates the previously discussed disadvantages of the prior art and will provide efficient operation and accurate reproduction over substantial periods of time.

In order to make my invention more clearly understood, reference is made to the accompanying drawings which are for the purpose of illustrating preferred arrangements for carrying the invention into practical effect.

In the drawings:

Figure 1 discloses a longitudinal sectional view of a reed cell and an arrangement designed to form a vibration translation unit embodying the present invention.

Figure 2 discloses a modification, of the arrangement shown in Figure 1, in which a plate is used as one of the electrodes of the condenser.

Figure 3 is a cross sectional view of a cell in which the reed is positioned between spaced electrodes.

Figure 4 discloses a modification, of the arrangement shown in Figures 1 and 2, in which the electrodes forming the condenser consist of a sleeve and a screw concentrically mounted therein.

In the four forms of the invention shown in the drawings for purposes of illustration, a conventional reed cell 1 is disclosed in which a valve or pallet controls the passage of air under pressure through a duct 2 in the block 3 to a metallic reed 4. The reed is secured at one end to a frame 5 which in turn is attached to the duct block 3. Secured above the reed in spaced relationship thereto such as by brackets 6, is an insulating strip 7 in which are mounted a pair of spaced electrodes 8 and 9 forming a condenser 10.

These electrodes are shown connected to a conventional charging and amplifying circuit through which electrical oscillations may be transmitted and amplified. The electrical capacity of the condenser 10 is charged through the lead 11 which connects a source of electricity to the electrode 8. The remaining electrode 9 is connected by a wire 12 to the grid element of the input amplifier 13.

The reed 4 is positioned to vibrate within the electrostatic field of the condenser 10. This motion disturbs the field and therefore the capacity of the condenser and, as a result the vibrations are impressed upon the amplifying circuit in the form of electric oscillations which are then amplified and reproduced as sound waves. An axial adjustment of the electrodes with respect to the reed will directly effect the degree of this disturbance.

In the form of the invention shown in Figure 1, the free end of the reed 4 is positioned directly beneath the electrodes 8 and 9 forming the condenser 10. These electrodes are formed by a pair of screws, both of which are adjustable axially with respect to the reed 4. This simplified structure forms a very effective unit embodying the present invention.

In the modification shown in Figure 2, the electrode of the condenser 10, which is attached to the source of electricity, is a plate 8A which is preferably formed from a piece of foil which may be attached to the strip 7 by a suitable adhesive. This is a less expensive construction and is effective because the adjustment of the screw forming the electrode 9 is sufficient to effect the relationship between the condenser 10 and the reed 4.

In the modification of the invention shown in Figure 3, the electrodes 8 and 9 of the condenser 10 consist of a pair of screws such as are also shown in Figure 1. However, in this form of the invention these screws are spaced a sufficient distance apart to permit the reed 4 to vibrate between them. In this arrangement the motion of the reed causes a greater disturbance of the electrostatic field than is the case in the modifications in which the reed is positioned beneath the electrodes.

In the form of the invention shown in Figure 4, the reed 4 is positioned beneath the condenser 10 in the manner shown in Figures 1 and 2. However, in this modification, the condenser 10 consists of a sleeve 8B and a pin 9B, which is concentrically mounted therein and is insulated from the sleeve by a lining 14. The sleeve 8B is adjustably mounted in the insulating cover 7. This form of the condenser is more compact than

those previously discussed but may be easily and inexpensively made.

In all of the above described modifications of the invention, the reed is in close proximity to the exposed plates of the condenser 10 and, therefore, the vibration of the reed will disturb the capacity of the condenser causing the vibrations, in the form of electrical oscillations, to be impressed upon the amplifying circuit. This advantage is effected without connecting the reed to an electrical circuit or to the ground.

Furthermore, it will be appreciated that changes can be made in the form of the reed and the condenser structure and in the electrical circuit without departing from the spirit of the invention.

I claim:

1. A unit for a musical instrument for translating mechanical vibrations into electrical oscillations, comprising stationary electrodes mutually forming an electrical capacity, an electrical circuit including said capacity and including means for charging the capacity, a vibratory reed free of conductive connection with said circuit and positioned with respect to said electrodes to vibrate within the electrostatic field of said capacity, and means for vibrating said reed.

2. A unit for a musical instrument for translating mechanical vibrations into electrical oscillations comprising stationary electrodes mutually forming an electrical capacity, an electrical circuit including said capacity and including means for charging the capacity, a vibratory reed free of conductive connection with said circuit and positioned with respect to said electrodes to vibrate within the electrostatic field of said capacity, and pneumatic means for vibrating said reed.

3. A unit for a musical instrument for translating mechanical vibrations into electrical oscillations, comprising stationary electrodes mutually forming an electrical capacity, an electrical circuit including said capacity and including means for charging the capacity, a metallic vibratory reed free of conductive connection with said circuit and positioned with respect to said electrodes to vibrate within the electrostatic field of said capacity to set up electrical oscillations, pneumatic means for vibrating said reed, and said circuit also including means for amplifying the said electric oscillations.

4. A unit for a musical instrument for translating mechanical vibrations into electrical oscillations comprising a pair of stationary electrodes mutually forming an electrical capacity, an electrical circuit including said capacity and including means for charging the capacity, a metallic vibratory reed free of conductive connection with said circuit and positioned with respect to said electrodes to vibrate within the electrostatic field of said capacity to set up electrical oscillations, means for vibrating said reed, and said circuit also including means for amplifying the said electric oscillations.

5. A unit for a musical instrument for translating mechanical vibrations into electrical oscillations comprising a pair of stationary electrodes mutually forming an electrical capacity, an electrical circuit including said capacity and including means for charging the capacity, a metallic vibratory reed free of conductive connection with said circuit and positioned directly beneath the said electrodes to vibrate within the electrostatic field of said capacity to set

5

up electrical oscillations, means for vibrating said reed, and said circuit also including means for amplifying the said electric oscillations.

6. A unit for a musical instrument for translating mechanical vibrations into electrical oscillations comprising a pair of stationary electrodes mutually forming an electrical capacity, an electrical circuit including said capacity and including means for charging the capacity, a metallic vibratory reed free of conductive connection with said circuit and positioned between the said electrodes to vibrate within the electrostatic field of said capacity to set up electrical oscillations, means for vibrating said reed, and said circuit also including means for amplifying the said electric oscillations.

7. A unit for a musical instrument for translating mechanical vibrations into electrical oscillations comprising a reed cell, an insulating cover for said cell, a pair of electrodes extending through the cover, said electrodes forming an electric capacity, an electrical circuit including said capacity and including means to charge the capacity, a metallic reed free of conductive connection with said circuit and mounted within the cell for vibratory motion and positioned to vibrate within the electrostatic field of said capacity, and pneumatic means to vibrate the reed.

8. A unit for a musical instrument for translating mechanical vibrations into electrical oscillations comprising a reed cell, an insulating cover for said cell, a pair of electrodes extending through the cover, said electrodes forming an electric capacity, an electrical circuit including said capacity and including means to charge the capacity, a metallic reed free of conductive connection with said circuit and mounted within the cell for vibratory motion and positioned to vibrate within the electrostatic field of said capacity, to set up electrical oscillations, pneumatic means to vibrate the reed, and said circuit also including means for amplifying the said electrical oscillations.

9. A unit for a musical instrument for translating mechanical vibrations into electrical oscillations comprising a reed cell, an insulating cover for said cell, a pair of electrodes extending through the cover, said electrodes forming an electrical capacity, an electrical circuit including said capacity and including means to charge the capacity, a metallic reed free of conductive connection with said circuit and mounted within the cell for vibratory motion and positioned directly beneath the electrodes to vibrate within the electrostatic field of said capacity to set up electrical oscillations, pneumatic means to vibrate the reed, and said circuit also including means for amplifying the said electrical oscillations.

6

10. A unit for a musical instrument for translating mechanical vibrations into electrical oscillations comprising a reed cell, an insulating cover for said cell, a pair of electrodes extending through the cover, said electrodes forming an electrical capacity, an electrical circuit including said capacity and including means to charge the capacity, a metallic reed free of conductive connection with said circuit and mounted within the cell for vibratory motion and positioned directly between the electrodes to vibrate within the electrostatic field of said capacity to set up electrical oscillations, pneumatic means to vibrate the reed, and said circuit also including means for amplifying the said electrical oscillations.

11. A unit for a musical instrument for translating mechanical vibrations into electrical oscillations, comprising a reed cell, an insulating cover for said cell, a sleeve extending through said cover, a pin concentrically mounted in the sleeve, an insulating means separating the sleeve and pin to form an electrical capacity, an electrical circuit including said capacity and including means to charge the capacity, a metallic reed free of conductive connection with said circuit and mounted within the cell for vibratory motion and positioned directly beneath the electrodes to vibrate within the electrostatic field of said capacity to set up electrical oscillations, pneumatic means to vibrate the reed, and said circuit also including means for amplifying the said electrical oscillations.

12. In a musical instrument, a plurality of reeds chromatically arranged in a musical scale, a pair of stationary electrodes adjacent each reed, each set of electrodes mutually forming an electrical capacity, electrical circuit means including the capacities and including means for charging the capacities, said reeds being free of conductive connection with said circuit and positioned with respect to said electrodes to vibrate within the electrostatic fields of said capacities, and means for vibrating the said reeds.

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