T. A. EDISON.

PHONOGRAPH REPRODUCER.

APPLICATION FILED OCT. 29, 1909.

1,099,348. Patented June 9, 1914.

Fig. 1

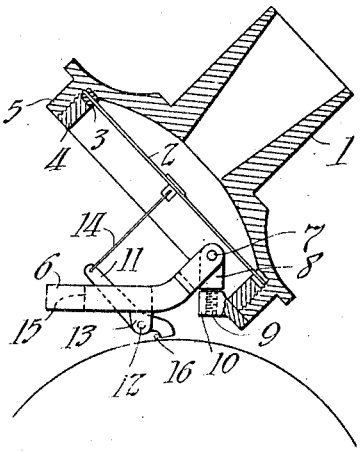


Fig. 3

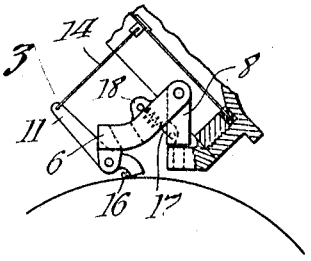
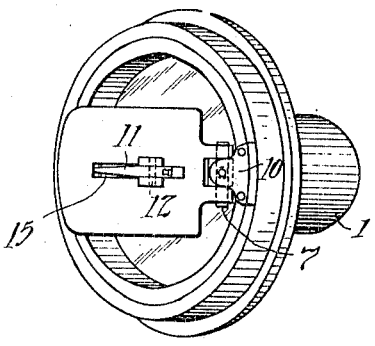


Fig. 2



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UNITED STATES PATENT OFFICE.

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PHONOGRAPH-REPRODUCER.

1,099,348. Specification of Letters Patent. Patented June 9, 1914.

Application filed October 29, 1909. Serial No. 525,333.

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, and a resident of Llewellyn Park, West Orange, Essex county, New Jersey, have invented certain new and useful Improvements in Phonograph-Reproducers, of which the following is a description.

My invention relates to phonograph reproducers and has for its objects the provision of means whereby an improved volume and quality of reproduction may be obtained with the use of a floating weight of the same or less weight than that used at present, the weight being so mounted and constructed that the fulcrum of the stylus lever may be placed nearer to the stylus than would otherwise be possible without greatly increasing the weight imposed upon the stylus to hold it down to its work and consequently wearing the record to a degree which would be prohibitive in the case of records made of the usual compositions. By thus rendering possible an increased leverage for the stylus a greater amplification is obtained.

In my experiments, using a phonograph reproducer having the stylus lever pivoted in the usual manner from a floating weight pivoted in the manner well known in the art, I attempted to increase the loudness of the reproduction by moving the pivotal point of the stylus lever nearer to the stylus, whereby the amount of amplification of the sound vibrations should be increased, and consequently, the loudness of the reproduction. On increasing the ratio of the leverage of the stylus lever beyond a certain point, however, I found that the reproduction did not increase in volume because of the increased work imposed upon the stylus and the consequent tendency to lift the floating weight. To overcome this difficulty, I have designed the construction embodying the subject matter of this application, in which the reaction of the pivot of the stylus lever due to the lifting of the stylus by the undulations of the record groove is exerted chiefly in a plane occupied by both the stylus lever pivot and the floating weight pivot, so that this thrust or reaction, being exerted against the immovable floating weight pivot, has but little tendency to lift the weight. The construction is such, however, that eccentricities in the record will lift the floating weight in order that the diaphragm shall not be affected by these irregularities.

Other objects of my invention comprise the details of construction and combinations of parts more fully hereinafter described and claimed, and which tend to promote the above mentioned general object.

In order that my invention may be more clearly understood, attention is hereby directed to the accompanying drawings, illustrating a preferred form thereof, in which Figure 1 is a central vertical section through a reproducer equipped with my invention, certain parts being shown in side elevation. Fig. 2 is a bottom plan view thereof; and Fig. 3 is a partial sectional and elevational view similar to Fig. 1 illustrating a modification of my invention.

Referring to the drawings, the usual sound box 1 is provided with diaphragm 2 which is clamped between gaskets 3, the whole being held in place by a ring 4 which is threaded within flange 5 of sound box 1 in the usual manner. The floating weight 6 is pivoted at 7 to a member 8 which occupies a substantially vertical position, and has formed integral therewith a portion 9 of reduced diameter, which is screw threaded within a member 10 having a correspondingly threaded opening, and which member 10 is secured in any suitable manner to the bottom of flange 5 of the sound box body 1. By this construction, floating weight 6 is free to oscillate in a vertical plane about its pivot 7, and also in a horizontal plane about its vertical pivot 9. The member 8 is directed upwardly from its base, so that horizontal pivot 7 is near the diaphragm and well inside of flange 5 of the sound box 1. The floating weight, instead of occupying a plane substantially parallel to the diaphragm, as in the usual construction, extends downwardly from its pivot at a considerable angle to the diaphragm. Preferably, the portion of the floating weight nearest to the pivot is so mounted that it extends practically at right angles to the diaphragm.

Stylus lever 11 is pivoted at 12 to lugs 13 depending from the floating weight 6, or the stylus lever may be pivotally connected to

the floating weight in any other desirable manner. The tail of lever 11 is connected to the center of diaphragm 2 by the usual link 14. In the construction shown in the drawings, stylus lever 11 is positioned substantially parallel to diaphragm 2, and accordingly, its arm between pivot 12 and link 14 extends through a passageway 15 in floating weight 6.

Preferably, as shown, pivot 12 of the stylus lever lies in approximately the same plane substantially at right angles to stylus lever 11 and diaphragm 2 as pivot 7 of floating weight 6. Also, preferably, floating weight 6 is bent at a point nearly above stylus 16 carried by stylus lever 11, or at such a point that pivot 12 of the stylus lever supported by lugs below the bent portion of the weight lies approximately in the median plane of weight 6 through pivot 7, so that the tail of the floating weight, or the part thereof extending substantially from this point to the outer end of the weight, extends in a plane which is substantially parallel to the tangent to the record through the stylus. The essential point is that the reaction on pivot 12 of the stylus lever due to the sound undulations of the record groove, shall be exerted in the direction of pivot 7 of the floating weight 6, or a large component of this reaction shall be so exerted. At the same time, floating weight 6 must perform its well known functions as a floating weight when the stylus passes over eccentricities in the record. These objects are all attained in the construction shown in the drawings. Here, stylus lever 11 is practically parallel with the diaphragm, and link 14 and the upper portion of floating weight 6 are substantially at right angles to diaphragm 2. The reaction of pivot 12 in the operation of stylus 16 is substantially all directed toward pivot 7. A plane passing through the axis of the record and through stylus 16 of pivot 12, however, intersects the plane including pivots 7 and 12 at a considerable angle. Accordingly, it will be seen that as a result of stylus 16 passing over eccentricities or other inequalities in the record of considerable magnitude as compared to the hills and valleys of the sound record, floating weight 6 will be lifted and the diaphragm 2 not affected by these irregularities. As a result of this construction, the fulcrum of the stylus lever can be brought as close to the end of the lever bearing the stylus as is desired, and the amplification correspondingly increased, it being only necessary that wherever the fulcrum is placed, the floating weight be so positioned and shaped that the thrust of the lever pivot is directed substantially in the line of the weight pivot. Incidentally, I have found in practice that good results may be obtained with the use of a floating weight mounted as shown in the drawings, considerably lighter than the weights necessary under the former practice, whereby the wear on the record and stylus is lessened.

Another beneficial result which, it is to be noted, accrues from the positioning of stylus lever 11 at a considerable angle to the tangent to the record through the stylus, is that friction between the stylus and the record being exerted tangentially tends to turn the stylus lever about its pivot, and aids in producing a louder reproduction. In the case of a stylus lever mounted in the usual manner, in a plane substantially parallel to the tangent to the record, the friction as the stylus ascends a hill in the record merely pulls on the lever pivot, and creates practically no turning effect on the lever. In my present invention it does exert a turning effect on the lever, and this is one of the factors enabling me to increase the leverage of the stylus in this construction. It is also to be noted that the construction illustrated constitutes a parallel-motion or pantograph, the link 14 and the portion of the floating weight between the two pivots always being substantially parallel.

In the modification shown in Fig. 3, a spiral spring 17 is interposed between a lug 18 on floating weight 6 and member 8 to assist in holding stylus 16 down to its work. When this spring is used, it is, of course, obvious that the mass of floating weight 6 need not be so great as in the former case. In the claims, the term "floating weight" is used to denote a member having the well known functions of a floating weight and actuated by either gravity or a spring, or both.

Having now described my invention, what I claim and desire to protect by Letters Patent is as follows:

1. In a device of the class described, the combination with a vibratory member, of a floating weight pivoted near said vibratory member for movement about a horizontal axis, an amplifying stylus lever pivoted to said weight, and a link connecting said lever and said vibratory member, said lever and said member being normally approximately parallel, and said link being substantially parallel to a line containing the centers of the pivots of said weight and lever, substantially as described.

2. In a phonograph reproducer, the combination of a diaphragm, a floating weight pivoted adjacent to said diaphragm, a stylus lever pivoted to said weight, a stylus carried by said lever, and a connection from said lever to said diaphragm, said weight having a portion extending directly from its pivotal point toward said stylus lever pivot at a sharp angle to the tangent to the record at the point of contact of said stylus, and having a second portion extending in a plane more nearly parallel to said tangent, said

lever being pivoted substantially at the intersection of said portions of said weight, substantially as described.

3. In a phonograph reproducer, the combination with a sound box body and a diaphragm therein, of a floating weight pivoted to said body, a stylus lever pivoted to said weight and extending therethrough, and connections between said lever and diaphragm, said weight extending directly from its pivot toward that of said lever in a direction approximately at right angles to said diaphragm and having an extension beyond the pivot of said lever, substantially as described.

4. In a device of the class described, in combination, a stylus lever, a stylus carried thereby, a vibratory member substantially parallel to said lever, a connection between said member and said lever, and means pivoted near said vibratory member for movement about a horizontal axis and pivotally supporting said lever at a point between said stylus and said connection, the pivots of said lever and said supporting means being located in a plane substantially parallel to said connection, substantially as described.

This specification signed and witnessed this 28th day of October 1909.

THOS. A. EDISON.

Witnesses:
DYER SMITH,
H. H. DYKE.