J. NOLL.

APPARATUS FOR REPRODUCING SOUND.

APPLICATION FILED SEPT. 16, 1908.

919,293. Patented Apr. 20, 1909.

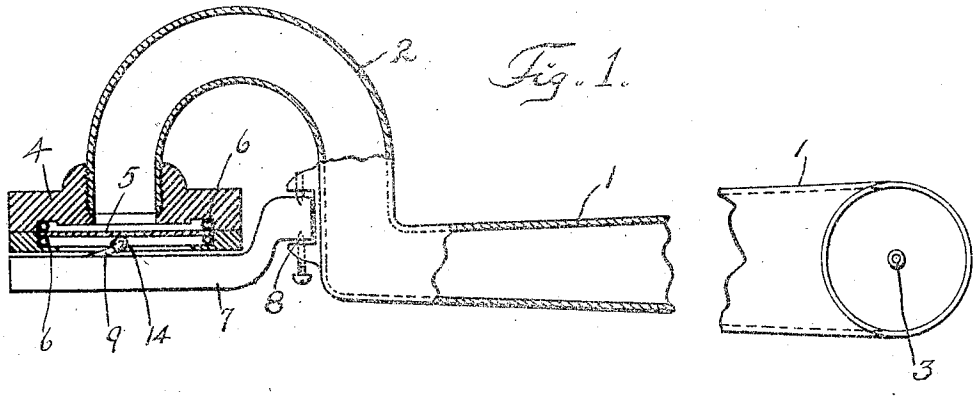


Fig. 1.

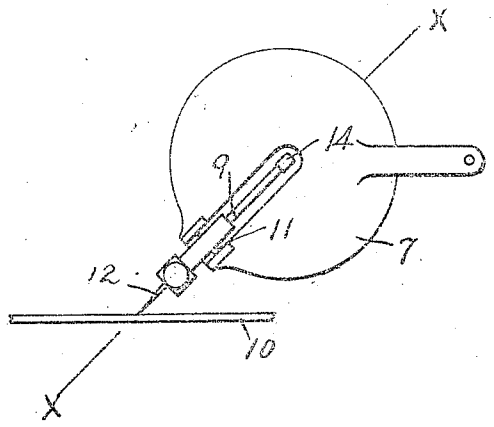


Fig. 2.

Fig. 3.

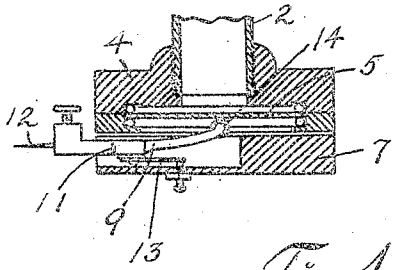
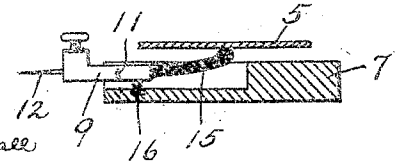


Fig. 4



WITNESSES:

David M. Edsall

Lillian Stone

INVENTOR

John Noll

BY

Townsend & Seeley

ATTORNEYS.

UNITED STATES PATENT OFFICE.

JOHN NOLL, OF BROOKLYN, NEW YORK, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO EMPIRE TALKING MACHINE COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

APPARATUS FOR REPRODUCING SOUND.

No. 919,893. Specification of Letters Patent. Patented April 20, 1909.

Application filed September 16, 1908. Serial No. 453,365.

To all whom it may concern:

Be it known that I, JOHN NOLL, a citizen of the United States, and a resident of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Apparatus for Reproducing Sounds, of which the following is a specification.

My invention relates to sound reproducers for talking machines, such as phonographs, gramophones and the like.

Briefly stated, the principal object of my invention is to attain a perfectly clear and true reproduction of the original from which the record was made, without having any of the scratch or rubbing sound, due to the movement of the stylus and the record, reach the sound box and to also insure that the diaphragm in the sound box will be acted upon by the stylus lever to the exact extent necessary to reproduce perfectly the desired sound as recorded on the record.

To these ends my invention consists first, in a sound reproducing apparatus consisting of a sound-box and its attendant stylus lever, wherein the stylus lever is mounted on a support independent of the sound-box and adapted to engage the diaphragm in the sound-box. By this construction, the weight of the sound box is prevented from resting on the stylus and also any direct connection between the stylus lever and the sound-box is avoided whereby the scratch due to the travel of the stylus on the record will not be transmitted to the sound box. Also as there is no fixed connection between the stylus and the sound-box, the sound box as a whole will not vibrate with the movements of the stylus lever.

My invention also consists in the employment of a non-sound conducting or sound insulating material between the stylus or the record and the diaphragm, in combination with the independently mounted stylus lever. The object of this construction is to absolutely insulate the sound-box from any scratching sounds due to the travel of the stylus needle on the record.

My invention consists also in the details of construction and combinations of parts hereinafter more particularly described and then specified in the claims.

In the apparatus heretofore employed such as commonly called gramophones, the sound box is mounted on a gravity arm, that is, an arm which swings vertically, and the stylus carrying lever is pivoted directly to the sound-box. This construction has various serious defects, among them being the metallic mounting of the stylus lever on the sound box whereby the scratch of the stylus needle is transmitted to the sound box. Another defect is that the entire weight of the sound box falls on the stylus needle which causes it to press into the record and cause the scratching sound and also unduly cuts the record. A further defect is, as the gravity arm carrying the sound box is also necessarily capable of swinging about a vertical axis to follow the record, the gravity arm and sound box vibrate or move bodily with the movements of the stylus lever which prevents the end of the stylus lever which bears against or is secured to the diaphragm from vibrating the diaphragm to the proper extent to obtain the full sound which is impressed on the record or to the extent that it would be vibrated were it held still and not subject to any movement other than the impulse impressed on it by the free end of the stylus lever, or the end of the stylus lever which is secured to it. In other words, the diaphragm is moved bodily at the same time that it is buckled by the end of the stylus lever, thus either decreasing or increasing the extent of its buckling due to the movement of the stylus lever which either accentuates or decreases the height of the sound wave and does not cause the exact sound to be emitted which is impressed on the record.

The above defects are remedied by constructing the apparatus according to my invention and as hereinafter described more in detail.

In the accompanying drawings, Figure 1 is a plan and partial section of a sound-reproducing arm constructed in accordance with my invention. Fig. 2 is a side elevation of the gravity arm viewed from the inside. Fig. 3 is a section taken on the line X X Fig. 2 and also includes a section through the sound-box. Fig. 4 illustrates a modification in the construction of the stylus lever.

In the preferred form of carrying out my invention as applied to talking machines, such as a phonograph or a gramophone, 1 indicates a hollow arm having a hollow goose-neck 2 rigidly secured thereto. The arm 1 is pivotally mounted to swing about a

vertical axis as is usual, said axis being indicated at 3, but is otherwise held rigid. Hereinafter this arm 1 and goose-neck 2 will be termed a rigid arm, by "rigid" being meant that it is not capable of an up and down movement as is usual for this arm to have in its employment in talking machines. A sound-box 4 secured to the open end of the goose-neck 2 is provided with the usual diaphragm 5 suitably held therein by means of rubber rings 6 as is usual in the art.

7 indicates a gravity arm preferably pivotally mounted on the rigid arm 1 as at 8, and adapted to move in a plane parallel with the diaphragm 5, the said gravity arm carrying the stylus lever 9 for transmitting the waves from the record 10 to the diaphragm 5. The stylus lever 9 is secured to the arm 7 and fulcrumed on a knife edge 11 as is usual in this art, one end being provided with the usual stylus 12 for following the record 10, the other or free end being held in contact with the diaphragm 5 by means of an adjustable spring 13 as more clearly shown in Fig. 3, the spring acting on the lever between the knife edge 11 and the end which bears against the diaphragm 5. The end of the lever 9 preferably merely presses against the diaphragm and is not secured thereto. Interposed between the lever 9 and the diaphragm is a piece of dead material or a substance which is a very poor conductor of sound or a sound insulator such as, for instance, a piece of rubber 14 secured to the end of the lever 9 and located between the end of the lever and the diaphragm. Obviously other ways of inserting a poor sound conductor between the stylus and the diaphragm might be employed, another form being illustrated in Fig. 4 in which the entire end of the lever which bears against the diaphragm is constructed of a poor sound conductor such as hard rubber as indicated at 15. Also in this figure a modification in the form of spring for pressing the lever against the diaphragm is shown, it being in the form of a spiral spring 16 located between the fulcrum and the end bearing against the diaphragm.

The gravity arm 7 is constructed with a sufficient quantity of metal to dissipate any sound of the stylus on the record transmitted to it, due to the metallic mounting of the stylus lever thereon and the scratch will therefore not reach the hollow arm 1 or at least not to any noticeable extent.

My invention is not limited to the ways of inserting the non-sound conducting material between the stylus and the diaphragm nor to any particular material, but broadly covers the employment of any poor sound conducting material between the stylus and the diaphragm. My invention is also not limited to the exact construction shown and described, it being capable of various modifications and uses to adapt it to different types of machines without departing from the spirit of my invention, the one shown merely serving to illustrate the invention.

What I claim as my invention is:—

1. In an apparatus for reproducing sound, the combination of a sound-box, a diaphragm mounted in said sound-box and a stylus lever mounted on an arm pivoted independent of said sound-box, said lever being adapted to engage said diaphragm.

2. In an apparatus for reproducing sound, the combination of a sound-box, a diaphragm mounted therein, a stylus lever mounted on an arm independent of said sound-box and means for keeping one end of said lever pressed against said diaphragm.

3. In an apparatus for reproducing sound, the combination of a diaphragm, an arm pivoted to move in a plane parallel with said diaphragm and a stylus lever pivoted on said arm and coöperating with said diaphragm.

4. In an apparatus for reproducing sound, the combination of a sound-conducting rigid arm, a sound-box secured to said rigid arm, a diaphragm in said sound-box, a pivotally mounted gravity arm and a stylus lever mounted on said gravity arm adapted to engage said diaphragm.

5. In an apparatus for reproducing sound, the combination of a sound-conducting rigid arm, a sound-box secured to said rigid arm, a diaphragm in said sound-box, a gravity arm pivotally mounted on said rigid arm and a stylus lever adapted to press against said diaphragm.

6. In an apparatus for reproducing sound, the combination of a hollow sound-conducting rigid arm, a sound-box secured to said rigid arm, a gravity arm free of said sound-box and a stylus arm mounted on said gravity arm.

7. In an apparatus for reproducing sound, the combination of a sound-box provided with a diaphragm, means for supporting said sound-box, an arm pivoted on said means and a stylus lever carried by said arm and coöperating with said diaphragm.

8. In an apparatus for reproducing sound, the combination of a hollow rigid arm, a sound-box secured to said rigid arm, a diaphragm in said sound-box, a gravity arm pivotally mounted on said rigid arm and free from said sound-box, a stylus lever mounted on said gravity arm, and means for keeping one end of said stylus lever pressed against said diaphragm.

9. In an apparatus for reproducing sound, the combination of a hollow rigid arm, a sound-box secured to said rigid arm, a diaphragm mounted in said sound-box, a pivotally mounted gravity arm free from said sound-box, a stylus lever carried by said gravity arm and adapted to engage said dia-

phragm at one end and a spring acting on said stylus lever between its fulcrum and the end in engagement with the diaphragm to press said end against said diaphragm.

10. In an apparatus for reproducing sound, the combination, of a sound-box including a diaphragm, means for supporting said sound-box, an arm pivoted to said means and carrying a stylus contacting with but sound insulated from said diaphragm.

11. In an apparatus for reproducing sound, the combination with a sound-box mounted on a sound conducting rigid arm and provided with a diaphragm, of a stylus lever mounted fr[illegible] from said sound-box for actuating said diaphragm and a non-sound conducting material between the stylus and the diaphragm.

12. In an apparatus for reproducing sound, the combination with a sound-box mounted on a sound conducting rigid arm and provided with a diaphragm, of a stylus lever mounted free from said sound-box for actuating said diaphragm and provided at one end with a stylus and a non-sound conducting material secured to the other end and located between the end of the lever and the diaphragm.

13. In an apparatus for reproducing sound, the combination of a sound-box including a diaphragm, means for supporting said sound-box, an arm pivoted to said means and carrying a stylus lever, said lever being provided with an arm of hard rubber.

14. In an apparatus for reproducing sound, the combination of a sound-box including a diaphragm, means for supporting said sound-box, an arm pivoted to said means and carrying a stylus lever, one arm of said lever being constructed entirely of sound insulating material.

Signed at New York in the county of New York and State of New York this 15th day of September A. D. 1908.

JOHN NOLL.

Witnesses:
LILLIAN BLOND,
C. F. TISCHNER, Jr.