June 19, 1923. 1,459,605

A. W. SCHREINER

PHONOGRAPH REPRODUCER

Original Filed March 2, 1921 2 Sheets-Sheet 1

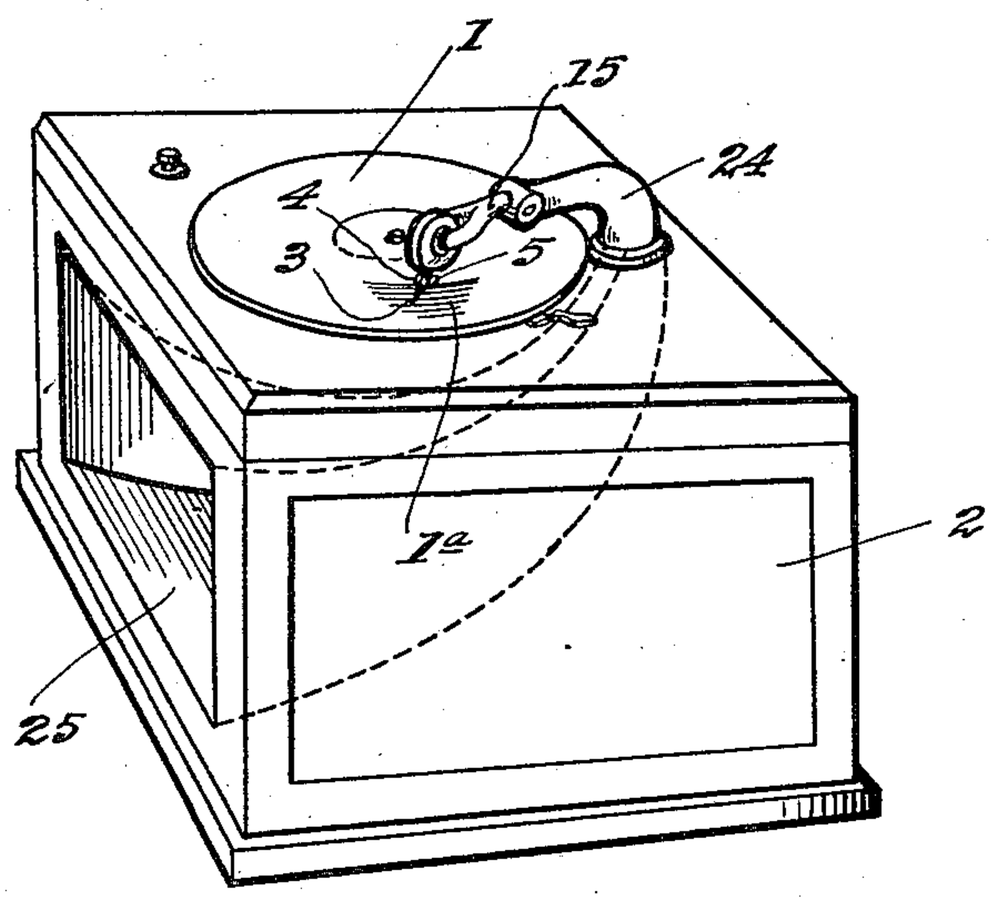

Fig. 1.

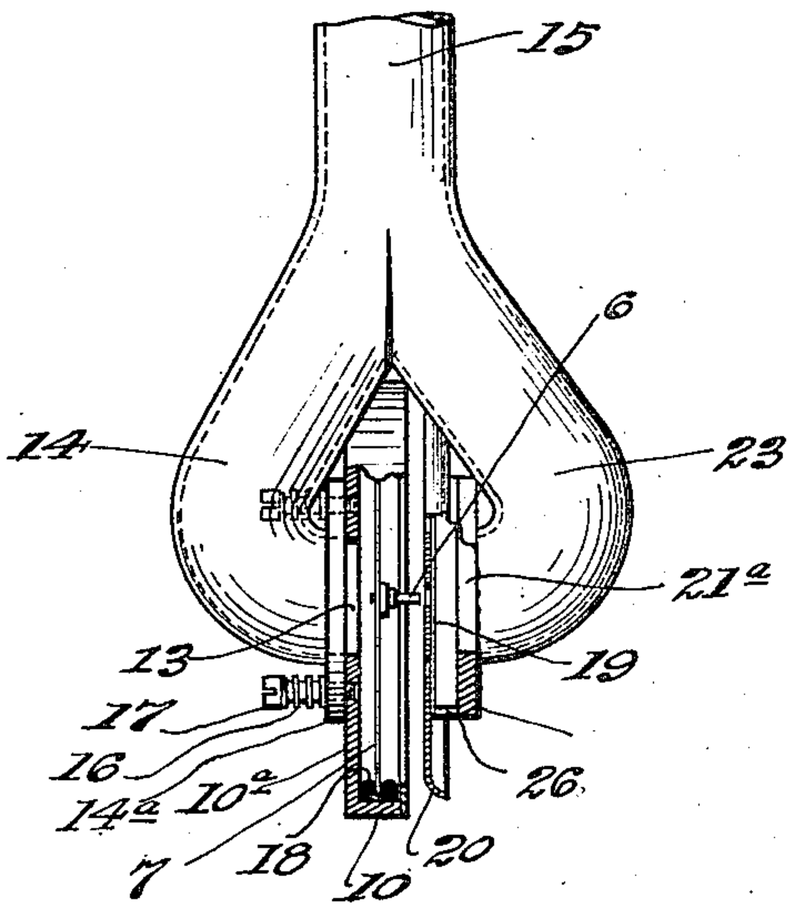

Fig. 2.

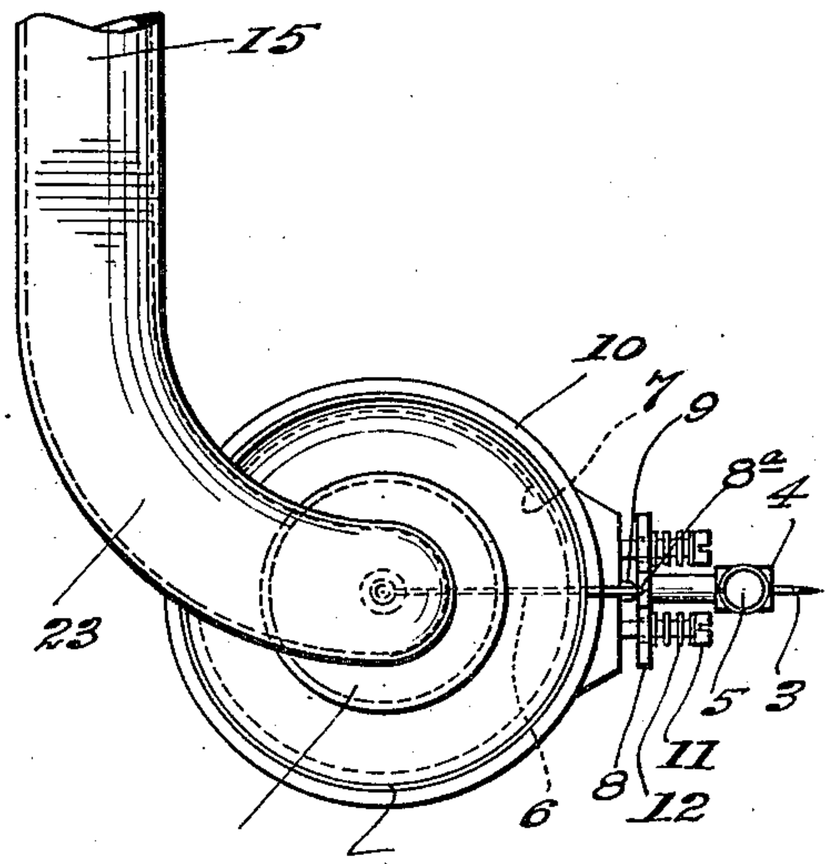

Fig. 3.

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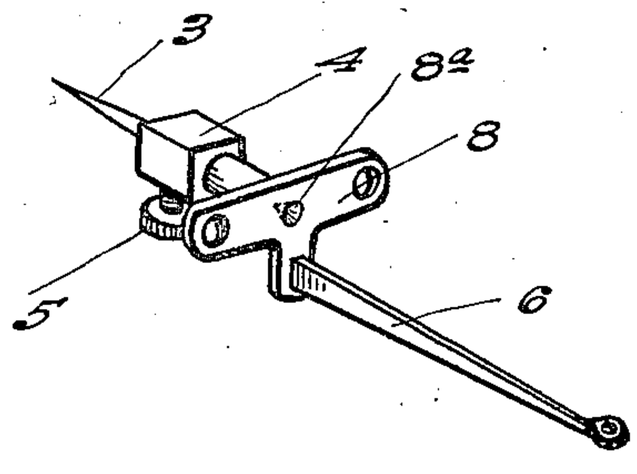

Fig. 4.

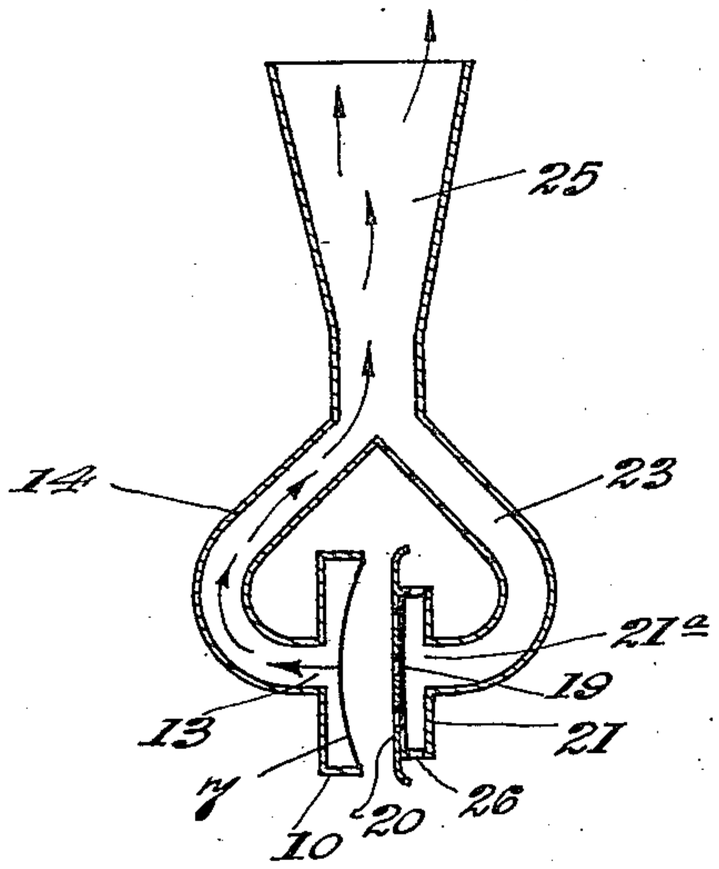

Fig. 5.

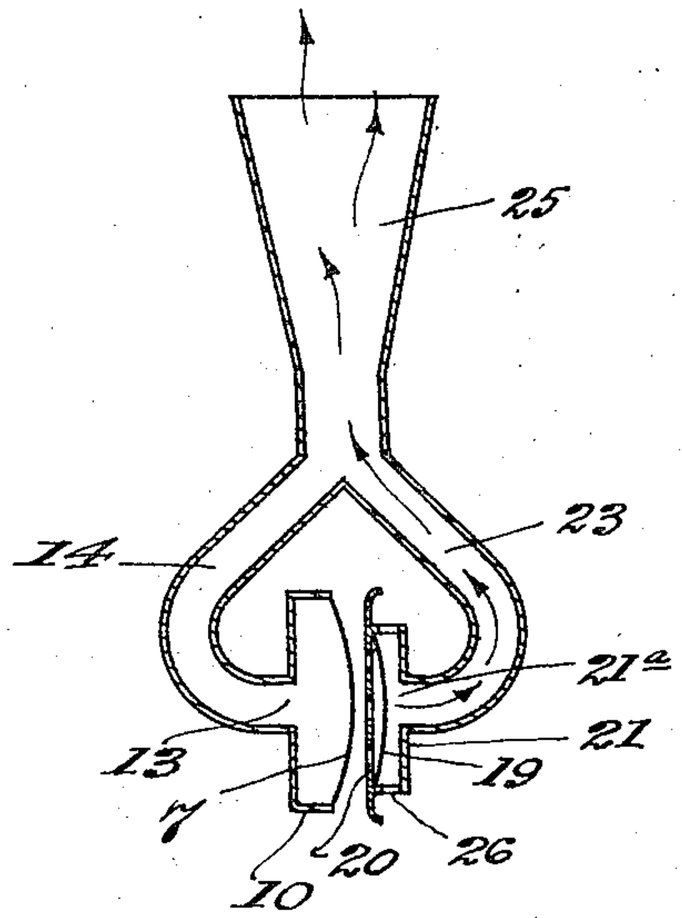

Fig. 6.

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Arthur W. Schreiner

Patented June 19, 1923. 1,459,605

UNITED STATES PATENT OFFICE.

ARTHUR W. SCHREINER, OF BROOKLYN, NEW YORK.

PHONOGRAPH REPRODUCER.

Application filed March 2, 1921, Serial No. 449,256. Renewed May 17, 1923.

To all whom it may concern:

Be it known that I, ARTHUR W. SCHREINER, a citizen of the United States of America, residing at Brooklyn, in the county of Kings and State of New York, have invented certain useful Improvements in Phonograph Reproducers, of which the following is a specification.

My invention relates to a phonograph reproducer primarily designed to improve the tone color and fullness of note so greatly desired in this class of instrument.

I have found that very remarkable improvements can be made in the clearness and volume of music played from ordinary phonograph records whether they be old or new, and regardless of whether they be orchestral, vocal, band, or simple instrumental pieces. Particular improvement can be noticed in the reproduction of notes from the piano.

In particular, I have discovered that the method of supporting the needle is of the utmost importance, and that it must be so supported to be movable in every direction so as to give every slight indentation on the record opportunity to operate the diaphragm.

Furthermore I have discovered that the volume of the reproduction may be greatly increased by using both sides of the diaphragm. To this end I have devised novel means of valving the air pulsations from the diaphragm so as to effect a continuous flow of waves forward through the phonograph horn or emitting tube. This also produces a most clear sound free from the usual stiffness and apparent incompleteness of note. I attribute this quality largely to the straight forward flow of the sound waves resulting from my valving arrangement and the use of both sides of the diaphragm. This feature as well as many other of the important points will be better understood by reference to the accompanying drawings, which form a part of this specification, and in which,

Fig. 1 is a perspective view showing my reproducer in use on a phonograph, which may be of any standard design or make.

Fig. 2 is a plan view of the reproducer partly shown in section.

Fig. 3 is a side elevation of Fig. 2.

Fig. 4 shows the detail construction of the needle support.

Figs. 5 and 6 are diagrammatic views showing the valving action of the reproducer.

Similar reference numerals refer to similar parts throughout the drawings.

A record 1 is revolved in the usual manner on any type of phonograph 2 causing the vibration of the needle 3, in contact with the impressions of the record 1^a. The needle is held in the socket clamp 4 by a thumb screw 5. A finger 6 forms a continuation of the clamp 4 and is attached at its extremity to the diaphragm 7 by means of a screw and an adhesive wax in the usual manner. Integrally formed with the finger 6 and the clamp 4 is a flange bar 8, and the center of this bar has a small depression 8^a to receive the support pin 9 which is rigidly set in the casing 10. In order to hold the needle 3 and the clamp 4, with its parts 6 and 8 in position against the pin 9, two screws 11 are fastened into the casing with their bodies passing freely through slip holes in the flange 8. Two helical compression springs 12 inserted between the flange 8 and the heads of the screws 11 press the flange against the pin 9 and thereby set the needle in a universal manner free to move in any direction. The common method of mounting the needle on knife edges permits movement in only one direction and prevents the needle from freely responding to any vibrations on the record except those in the one plane of needle motion. The casing 10 houses the diaphragm 7 and on one side 10^a is closed so as to direct the sound waves through a port 13 and thence into a tube 14 which connects to the common tube 15. The tube is joined to the casing by the flange 14^a, which is held in position under the tension of two springs 16 guided by screws 17. The diaphragm is set in the casing between rubber gaskets 18 and in the usual manner. In the ordinary construction the other side of the diaphragm is left open, but I have devised the auxiliary valving diaphragm 19, which is set in front of the principal diaphragm 7 and is vibrated by air pulsations from it. In order that this auxiliary diaphragm may transmit the sound waves thrown toward it by the principal diaphragm and yet not follow the principal diaphragm upon its return to the opposite side, a perforated wall 20 is disposed between the principal and auxiliary diaphragms and acts as a check to the auxiliary diaphragm, permitting the

movement in only one direction. The auxiliary diaphragm is mounted in a casing 21 which houses its outer side. A central port 21ª in the rear wall of the casing leads to the tube 23 which in turn carries the sound into the common tube 15. The tube 15 leads into the tone-arm 24, which may be of any standard design. The sound waves then pass into the horn 25 and are distributed. In order to emit a small amount of the sound produced by the diaphragm direct from the reproducer, the plate 20 is flared at its edge and also an annular set of ports 26 are cut in the casing 21 around the auxiliary diaphragm 19. I find that this sound emission direct from the reproducer gives a most desirable effect in the reduction of harshness and scratch. Likewise the support of the reproducer casing 10, by springs 16 and 17 to flange 14ª is important in the reduction of harshness and needle scratch.

The operation may be shown to advantage by reference to the diagrammatic Figures 5 and 6. The record is put in motion and the impressions thereon vibrate the needle, which is so mounted on a universal pivot pin that it responds to every slight wave in a lateral record and transmits this vibration through the arm 6 to the principal diaphragm 7. This diaphragm is free to move in a forward and reverse direction. In Fig. 5 it is shown deflected in its forward direction, whereupon a pulsation is sent through the tube 14 and into the discharge horn. The movement of the diaphragm 7 forward as shown in Fig. 5, causes a rarefaction in the space between the diaphragm 7 and 19 and a condensation within the tube 14. Plate 20 prevents the diaphragm 19 being pushed in the same direction by the atmospheric air in tube 23. The ports 26 short circuit the unequal pressure condition in tube 23, permitting an intake or exhaust as required to meet varying compressions in tube 14 and the discharge horn. Movement of the diaphragm 7 in the reverse direction causes an air compression in the space between diaphragm 7 and diaphragm 19, which pressure is exerted through the perforated wall 20 against the diaphragm 19. The movement of diaphragm 19 in this reverse direction causes a compression in tube 23 which partly passes up to the common tube 15 and thence to the emitting horn. A small part of the compression passes out through the annular ports 26 and is set free at the reproducer. The value of this is to reduce the audible harshness and scratch so apparent at the needle when the reproducer is exposed. The scratch is not so audible when the louder notes are liberated through the ports 26 and the sound effect produced at the top of the phonograph is greatly improved. This feature is very valuable in the types of simple, uncovered phonographs. The movements of the diaphragms are small in amplitude but in the last analysis do no more than create condensations and rarefactions in the leading tubes, and if more than this air or gas vibration is set up, the diaphragms are not functioning properly and the energy is being wasted.

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

1. In a phonograph reproducer, a mechanically actuated diaphragm, a conducting tube disposed on one side of and housing that side of the said diaphragm, a supplementary conducting tube positioned opposite the said diaphragm, a perforated plate in the end of the said tube and a valving diaphragm free to move away from the said plate responsive to the outward movements of the principal diaphragm, substantially as described.

2. In a phonograph reproducer, a mechanically actuated diaphragm, a conducting tube disposed on one side of and housing that side of the said diaphragm, a supplementary conducting tube positioned opposite the diaphragm, a perforated plate in the end of the said tube and a valving diaphragm free to move away from the said plate responsive to the outward movements of the principal diaphragm, and ports in the conducting tube at the inner side of the auxiliary diaphragm, substantially as described.

In testimony whereof I affix my signature.

ARTHUR W. SCHREINER.

Witness:

JOHN J. D. TAYLOR.