G. K. CHENEY.

PROCESS OF RECORDING SOUND.

APPLICATION FILED DEC. 12, 1902.

941,010. Patented Nov. 23, 1909.

Fig. 1.

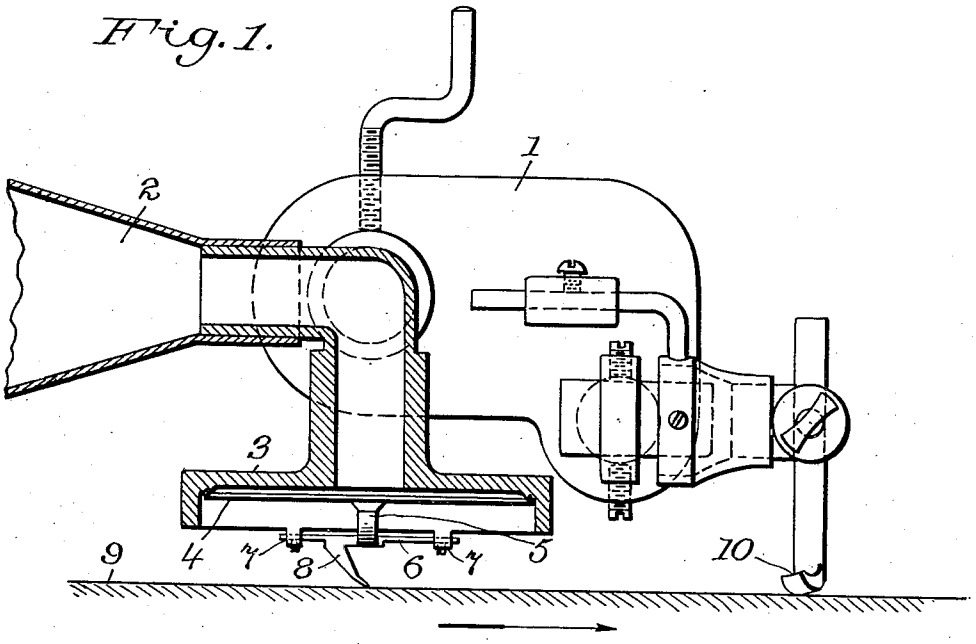

Fig. 2.

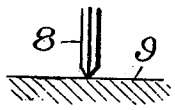

Fig. 3.

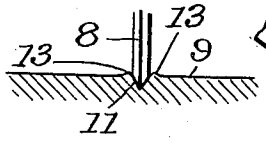

Fig. 4.

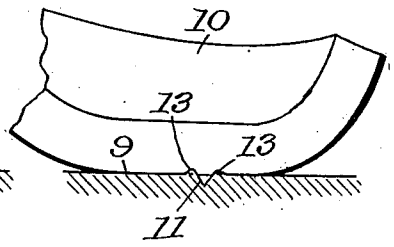

Fig. 5.

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UNITED STATES PATENT OFFICE.

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PROCESS OF RECORDING SOUND.

941,010. Specification of Letters Patent. Patented Nov. 23, 1909.

Application filed December 12, 1902. Serial No. 134,914.

To all whom it may concern:

Be it known that I, GEORGE K. CHENEY, a citizen of the United States of America, and a resident of the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Processes of Recording Sound, of which the following is a specification.

The main object of this invention is to provide an improved process for producing a true sound record from which may be obtained a faithful reproduction of sound.

Heretofore, it has been common in the art to make a sinuous line, representing sound waves, on photographic material or in a film upon the surface of a metal plate, and then by chemical action to form a corresponding line in a tablet; and the method has also been practiced of cutting or engraving such a line in a tablet of suitable nature. All of these methods are considered by me to be objectionable, however, to a more or less extent, in that it has been suggested that the final record grooves are liable to have rough places and irregularities which may result from the methods of their formation.

In the chemical process of forming records, the action of the reagent is uneven on account of local differences in the structure of the record blank, upon which it acts, and therefore the surfaces of the grooves formed thereby are not true and are cellular or pitted, which results in an unpleasant scratching sound during the reproduction of the record.

In the engraving method, the record blank is usually formed of a more or less waxy and tenacious material, which, when not made homogeneous is liable to cause the engraving tool, which removes, in the form of chips or shavings, a portion of the record blank to form the record groove to leave the record groove with surfaces more or less uneven, because the harder particles of the tablet material may be torn or dragged from their positions instead of being cut cleanly through by the edges of the tool.

The aim of my invention is to dispense with any chemical action and any cutting, scraping or gouging action of the recording tool itself, substituting therefor a pressing or ironing action of the tool.

One form of apparatus for carrying out my improved method is illustrated in the accompanying sheet of drawings in which:

Figure 1 is a side elevation partially in section of the recording apparatus shown in its relation to the recording tablet; Fig. 2 an enlarged front view of the recording tool point; Fig. 3 a similar enlarged view showing the recording tool in operative position, and the shape of the groove formed thereby in the record tablet; Fig. 4 an enlarged front view of the paring knife in action removing the raised edges of the groove; and Fig. 5 is an enlarged cross section showing the completed groove.

Referring to the drawings in which the same references are used throughout the various views to designate the same part, the supporting frame 1 carries a horn 2 and a sound box 3. The sound box is provided with the usual diaphragm 4, to the center of which is attached the inner end 5, of a bell crank arm, which is mounted on the torsional shaft 6. The ends of the torsional shaft are rigidly set in sockets 7, 7 fixed on the sound box casing.

The recording point 8 is carried by the torsional shaft 6 and is caused to vibrate laterally by the vertical vibration of the diaphragm acting through the bell crank arm 5, carried thereby. The extremity of the recording point 8 is inclined rearwardly in the direction of the motion of the record tablet as shown in Fig. 1, and is wedge shaped in cross section as shown in Figs. 2 and 3.

The surface 9 of the record tablet is formed of some suitable displaceable material. This may be a composition of soap-like or wax-like construction, or it may be of soft metal such as lead or other material the molecules of which are capable of being moved one upon another and partially displaced by such pressure as the recording tool is able to give without too greatly straining the parts of the mechanism.

Upon the frame 1, and behind the recording tool 8, is adjustably mounted a paring knife 10, whose cutting edge just clears the surface of the tablet 9, when the surface is in its original flat condition.

Figs. 3 and 4 represent at 11, the record groove in process of formation; and Fig. 5 represents at 12, the completed sound record groove.

For forming records, the parts are so adjusted that the point of the recording tool 8 sinks into the record tablet as represented in Fig. 3, and the paring knife 10 barely touches the plane surface of said record tablet, as indicated in Fig. 4. Motion being given to the record tablet in the direction of the arrow, and sound waves being projected into the horn 2, the usual vibrations of the recording tool are produced and as the tablet 8 advances, a sinuous line of even depth is formed in the tablet. On account of the backward rake or inclination of the recording tool 8, shown in Fig. 1, the tool does not cut or gouge or scrape out the material of the tablet 9 as the same passes by it, but presses the material downwardly and toward each side, ironing out a groove 11 having raised burs or ridges, 13, 13, on the sides. The paring knife 10, following after in proper adjustment, pares off the burs or ridges 13, 13, leaving a flat upper surface to the record as shown in Fig. 5.

The master record so made may be used for direct reproduction if the material employed is sufficiently hard, or duplicates of the master record may be made in any well known manner.

Another advantage of the ironing action of the recording tool, which forms a record groove with smooth walls, the surfaces of which are formed of material denser and harder than the rest of the tablet, inasmuch as it has been packed and ironed down by the tool, and which are free from any cellular or pitted formation such as may be produced by a gouging, or tearing, or scraping action of a cutting or a more indenting tool.

Wherever in the specification or claims I use the expressions "pressing", "impressing", "ironing", or the like, relative to the action of my tool on the moving tablet, I mean thereby to define the function of the tool in forming a groove in the manner above described, that is, without cutting, or tearing, or gouging or scraping out of particles of the record material.

It is evident, of course, that various changes might be made in the details of the process above described without departing from the spirit or scope of my invention. For instance, the paring down of the bur or ridges might be done as a separate operation; other forms of recording tool might be employed so long as the necessary backward inclination is retained to give the scoring and ironing action described and avoid any cutting or paring; the second step of the process, the paring down of the ridges 13, 13, might be omitted and a fairly accurate reproduction still be obtained, but these and similar modifications, however, would still leave the process within the boundaries of my invention.

Having thus described my invention, I claim as new and desire to protect by Letters Patent of the United States:

1. The method of recording sound waves, which comprises vibrating a stylus by means of sound waves, impressing a sinuous groove in a record blank of displaceable material, by forcing by means of said stylus a depression therein having smoothed or ironed surfaces.

2. The method of recording sound waves, which comprises vibrating a stylus by means of sound waves, impressing a sinuous groove in a record blank of displaceable material, by forcing by means of said stylus said material upwardly and laterally under pressure which smooths or irons the surfaces of said groove.

3. The method of recording sound waves, which comprises vibrating the stylus by means of sound waves, impressing a sinuous groove in a record blank of displaceable material, by gradually increasing the depth of said groove by means of said stylus through downward and lateral pressure.

4. The method of recording sound waves, which comprises vibrating a stylus by means of sound waves, impressing a sinuous groove in a record blank of displaceable material by means of said stylus, the angle of the walls of said groove being acute, whereby the material of the tablet is displaced laterally and upwardly.

5. The method of recording sound waves, which comprises vibrating a stylus by means of sound waves, impressing an acute V-shaped sinuous groove in a tablet of displaceable material by means of said stylus, by displacing said material laterally and upwardly, and removing the material displaced above the normal surface of the tablet.

6. The method of recording sound waves, which comprises the following steps: (1) forming a sinuous groove in a record blank of displaceable material, by displacing said material transversely and upwardly by means of a stylus vibrated by sound waves, and (2) paring away the material displaced above the normal surface of the tablet.

7. The method of recording sound waves, which comprises the following steps: (1) impressing a sinuous groove in a tablet of displaceable material, by displacing said material transversely and upwardly on each side of said groove by means of a stylus vibrated by sound waves, and (2) cutting away the material displaced so that the same is level with the normal surface of the tablet.

8. The method of recording sound waves which comprises vibrating a tool in accordance with sound vibrations and forming by means of said tool a groove having an ironed surface, in a record blank of displaceable material.

9. The method of recording sound waves

which comprises forming a groove, having an ironed surface corresponding to sound waves, in a record blank of displaceable material.

10. The method of recording sound waves which comprises forming a groove, having a smooth or ironed surface corresponding to sound waves in a record blank of displaceable material, and cutting away displaced material at the edge of said groove.

11. The method of recording sound waves which comprises forming a sinuous depression corresponding to sound waves in a record blank of displaceable material, and then cutting away displaced material at the edge of said depression.

12. The method of recording sound waves which comprises forming a sinuous depression having a compressed surface corresponding to sound waves, in a record blank of displaceable material.

13. The method of recording sound waves which comprises forming a sinuous depression having a compressed surface corresponding to sound waves in a record blank of displaceable material, and cutting away displaced material at the edge of said depression.

14. The method of recording sound waves which comprises forming a groove corresponding to sound waves in a record blank and then removing a portion of the surface of said blank adjacent to said groove.

15. The method of recording sound waves which comprises forming a groove corresponding to sound waves in a record blank and then cutting away a portion of the surface of said blank adjacent to said groove.

16. The method of recording sound waves which comprises forming a groove corresponding to sound waves in a record blank and then shearing away a portion of the surface of said blank adjacent to said groove.

Signed at New York, N. Y. this 25th day of November 1902.

GEORGE K. CHENEY.

Witnesses:
W. H. PUMPHREY,
M. G. CRAWFORD.