

V. H. EMERSON.
SOUND RECORD.
APPLICATION FILED MAY 18, 1911.

Patented Aug. 18, 1914.
2 SHEETS—SHEET 1.

1,107,502.

Fig. 1

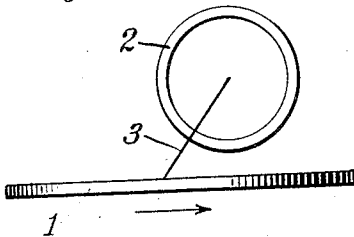


Fig. 2

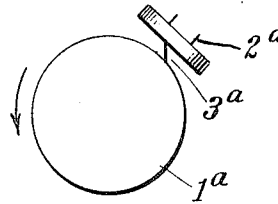


Fig. 3

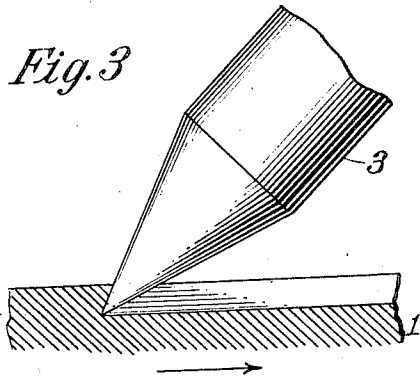


Fig. 4

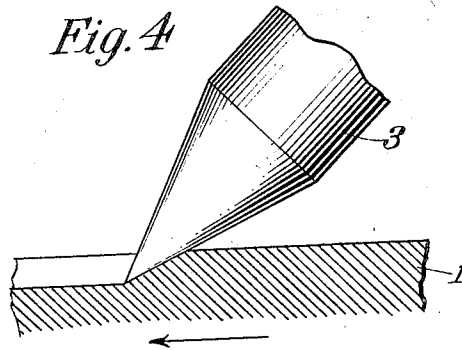


Fig. 5

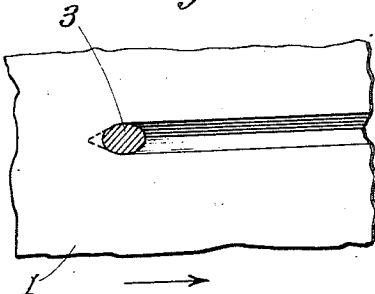


Fig. 6

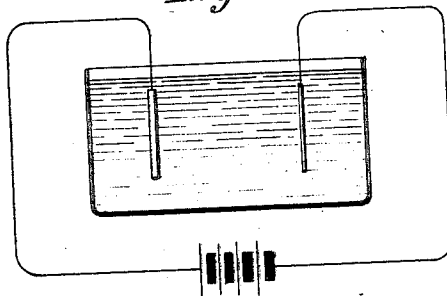
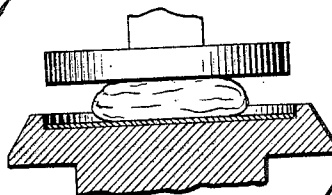


Fig. 7



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1,107,502.

Fig. 8

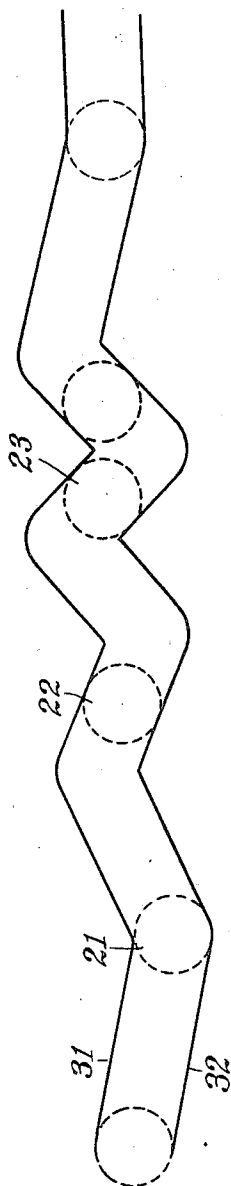
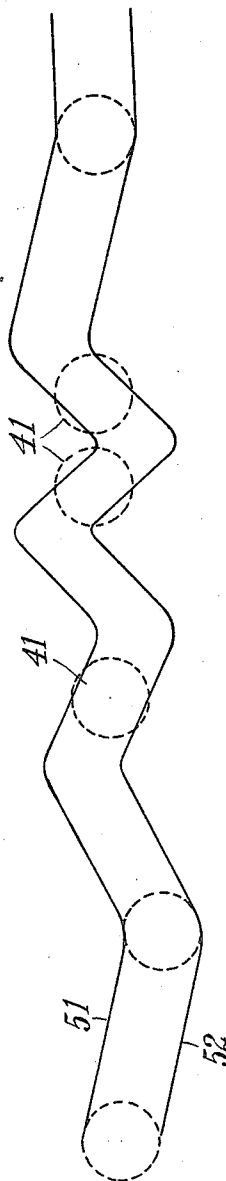


Fig. 9



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UNITED STATES PATENT OFFICE.

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SOUND-RECORD.

1,107,502.

Specification of Letters Patent.

Patented Aug. 18, 1914.

Application filed May 18, 1911. Serial No. 628,029.

To all whom it may concern:

Be it known that I, VICTOR H. EMERSON, a citizen of the United States of America, and a resident of New York city, New York, have invented a new and useful Improvement in Sound-Records, which invention is fully set forth in the following specification.

This invention relates to sound-records for talking-machines and the production thereof. It is particularly adapted for records in the form of a flat tablet or disk having the record-groove of practically-uniform depth arranged thereon in spiral form and characterized by lateral irregularities corresponding to sound-waves (commonly known as "zigzag disk records"); but the invention is likewise applicable to disk records having the spirally-arranged record-groove of varying depth (commonly known as the "up-and-down records"); and the invention is also applicable to record-grooves of either type upon tablets of cylindrical or other form.

This invention is based upon my novel manner or process of producing the "original sound-record," and the use of my novel "recording-stylus," which, however, are not here claimed.

The invention here claimed consists of my novel sound-records themselves (both "original records" and also commercial records obtained therefrom).

My invention consists further in the various details and features hereinafter set forth and claimed.

The invention will be best understood by reference to the annexed drawings which illustrate various portions thereof.

In these drawings,—Figures 1 and 2 are elevations, indicating conventionally the production of original sound-records by my invention. Fig. 3 is a side-view on an enlarged scale, showing my recording-stylus in the preferred method of using it. Fig. 4 is a modification of the same. Fig. 5 is a horizontal section through the stylus at the surface of the tablet in Fig. 3. Fig. 6 represents conventionally an electroplating bath, and Fig. 7 a press, as practical means for obtaining copies of the original. Fig. 8 is a plan, upon a greatly-exaggerated scale, illustrating conventionally a portion of my new

record groove; and Fig. 9 is a similar conventional plan of the record-groove of the prior art.

As my invention is intended primarily for zigzag disk records (though applicable to other forms and types) I will describe it in that connection.

Referring to Figs. 1, 3 and 5,—1 represents the flat record-tablet, which broadly speaking is of the wax-like composition commonly used in this art. 2 represents a sound-box, upon which the new stylus 3 is mounted in the ordinary manner. The tablet 1 is carried upon the usual turntable and revolves in the direction indicated by the arrow.

My new stylus has the operating portion or tip in the form of a cone, being rounded off uniformly on all sides, as indicated in Fig. 3. It is not essential that this recording-tip should be a precise mathematical cone. It is sufficient that in cross section it should be practically symmetrical, and without any cutting-edges, as indicated in Fig. 5, where it is practically elliptical, being a section through a cone by a plane at an angle to the axis of the cone. Figs. 1 and 3 indicate the preferred manner of using this stylus in making the record. The stylus is shown at an angle of about 45° (more or less) to the surface of the tablet. The effect of revolving the turntable and tablet 1 in the direction shown in Fig. 1 is the same as if the stylus 3 were shoved point foremost. In its passage through the material of the tablet, the stylus cleaves or plows its way, removing the material from the tablet in the form of a fine thread or shaving, or under favorable conditions as separate particles in powdery form (according to the consistency of the material). Apparently the extreme tip or acute point of the stylus 3 first cleaves its way, crushing the material out as a plow, while the successive wider portions of the stylus (above the extreme tip) serve to simultaneously crush and smooth or polish the side-walls of the record-groove. As the result of this operation, I have recorded selections which, when copied in more durable form and audibly reproduced, manifest remarkably superior quality. This method of producing the original record, wherein the

material is removed entirely from the tablet to produce the record-groove is distinguished from the "cutting-out" of U. S. Letters-Patent No. 896,059, granted Aug. 11, 1908; and my new process is distinguished on the other hand from the "displacing" operation described in U. S. Letters-Patent No. 941,010, granted Nov. 23, 1909, according to which latter patent the material is not removed from the tablet but merely shoved to either side of the "record-groove."

Instead of shoving the stylus 3 through the surface of the tablet as indicated in Figs. 1 and 3, it may be dragged through the tablet as indicated in Fig. 4; and instead of employing a flat tablet or disk 1, as indicated in Fig. 1, I may employ a cylindrical tablet 1^a, as indicated in Fig. 2; and instead of having the sound-box with its stylus arranged to vibrate laterally (in the plane of the surface of the tablet) as in Fig. 1, the parts may be arranged as in Fig. 2 so that the stylus 3^a will vibrate to and fro to produce the up-and-down type of record-groove. In employing my invention, the up-and-down type of record-groove may be applied to a disk tablet, or the zigzag type to a cylindrical tablet. This method of producing original records may be practised with any usual record-composition; but, better results can be obtained if the composition be especially adapted for the purpose. Among other compositions, I have employed with success a mixture of about two parts beeswax and two parts stearic acid with one part of carnauba wax; although these proportions may be varied greatly and different ingredients employed. In using that particular formula I have found that the same is liable to solidify with more or less crystallization, which is objectionable; and I have found that this objection may be overcome by pouring the melted mixture just referred to over a flat metal plate, to obtain a comparatively thin layer, which is suitable for the purpose. Of course, immediately before using a record-tablet for recording, the surface thereof is turned true by a shaving-knife in the usual manner practised in the production of disk sound-records.

The characteristics, which a suitable record-material should present, are that the material must be crisp, or crumbly, or "crushable," or chalky, or "short," or friable,—as distinguished from a yielding, spongy, tenacious, cohesive, sticky, and "pulpy," material. The function or operation of my new recording-stylus appears to be to crush or break-up the material, which operation is best carried on upon a material of the character above described as "friable,"—whereas in a material of the yielding and tenacious character, the particles re-

moved to produce the record-groove would adhere or cling to the tablet and thereby deface the sound-record; moreover, the material itself, by which I mean the body of the tablet, would tend to "spring back" and to that extent mar or deface or obliterate the impressions already produced by the stylus.

Having obtained an original sound-record as above indicated, by means of the stylus above described (when employed in the manner set forth), and in a material of the character described—such original sound-records can be employed for direct, audible reproduction. But preferably duplicates or copies will be made therefrom in any desired manner. For obtaining duplicates of the disk type, I would employ the electroplating process indicated in Fig. 6, followed by pressing the electroplates thereby obtained into suitable thermo-plastic material, as indicated in Fig. 7. This process is fully set forth in U. S. Letters-Patent No. 688,739, granted Dec. 10, 1901.

Various processes of duplicating have been employed for copying cylindrical records; and the particular method employed for the purpose with either form of record is not material so long, as duplicates or copies of my original record-groove are obtained.

With regard to the record-tablet and its quality, I have found that it is sometimes desirable to give the surface of the record-tablet a preliminary coating of graphite, finely-powdered graphite being carefully brushed over the surface to coat the same thoroughly. This serves as a lubricant, and permits the stylus to vibrate with less opposition so as to produce a record-groove that gives a more true indication of the original sound-waves. When this graphiting is employed, the recording-stylus seems to carry more or less of the graphite down with it, the graphite being found as a thin, faint coating upon the bottom and side-walls of the record-groove. However, when the material is otherwise of the proper consistency, I prefer not to use the graphiting step above referred to—in fact I find it not so desirable.

Referring now to the greatly exaggerated conventional views of Figs. 8 and 9: 21, 22, 23, etc. indicate different positions occupied by my recording-stylus in producing the record-groove whose side-walls are indicated by 31 and 32. It is obvious that if the groove be measured by a line extending at right angles from any particular portion of the side-wall of the record-groove, the distance across or the effective width of the groove is constant,—being the diameter of the recording-stylus. On the other hand, referring to Fig. 9, the successive positions of the flattened recording-stylus heretofore

employed, are indicated by 41, 41, etc.; and the side-walls of the record-groove produced thereby are indicated by 51 and 52. It is obvious that measured transversely by the parallel lines corresponding to the width of this old recording-stylus, this record-groove is of constant width; but measured by a line at right angles from any particular portion of the side-wall of the old record-groove, the same will be found to be of varying width,—being wider where the recording-stylus 41 was advancing straight ahead, and being narrower where the recording-stylus 41 was advancing in an oblique direction. Consequently the record-grooves of the records heretofore known are not of constant effective width. This is one distinctive feature of my sound-record; namely, that it has a record-groove “of constant effective width.” This is valuable in reproducing. With the prior records it is obvious that the reproducing-stylus must be no larger than the narrowest portion of the record-groove,—which means that the reproducing-stylus must be of smaller dimensions than the recording-stylus; and this means that the reproducing-stylus does not fit truly in the groove, and is liable to more or less rattle in reproducing. Or if a reproducing-stylus be employed of substantially the same dimensions as the recording-stylus, then in reproducing it has to tear its way through the narrower portions of the record-groove, which not only injures the walls or record-surface of those portions of the groove, but likewise wears or grinds the extreme tip of the needle. In my new record-groove, on the contrary, a reproducing-stylus of precisely the same size and shape as the recording-stylus may be employed, and it will follow freely and intimately throughout the entire length of the record-groove with less wear upon the needle itself and upon the walls of the groove, thereby prolonging the life of both.

It might be imagined that the keen cutting-edges indicated in the recording-stylus heretofore employed are more efficient in that they can produce the more minute indentations corresponding to the overtones, but this is not of any importance. Assuming for the moment that it is true, yet the reproducing-stylus, if it cannot enter the more minute indentations, would not be able to reproduce from them. But, as a matter of fact, my rounded and non-cutting recording-stylus produces just the same number of alternating concavities and convexities in the side-walls of the groove, and of just the same frequency, and of the same relative depths and shallownesses, as in case of the keen-edged cutting-out tool. And the audible reproductions are even more faithful, because the reproducing-stylus (being of the same shape and size as the recorders) can

enter wherever the recorder went; and, further, the side-walls of my new groove seem smoother than the “cut” walls of the prior art.

I have thus described my invention and an embodiment thereof, with considerable detail, but merely for the sake of clearness, since my invention is not limited to the precise details thus set forth. The spirit of my invention involves each of the following broad features:—the employment for recording purposes of a stylus which is practically symmetrical in cross-section and without any cutting-edges and without being flattened longitudinally of the record-groove; the employment of such stylus in crushing out and removing the material from the tablet which forms the record-groove as distinguished from “cutting out” of the material and as distinguished from merely displacing the material without removing it from the tablet; and the employment of said stylus in such a method with a material which I may designate as “friable.” And, in case of zigzag records, the production of a record-groove which shall have a constant effective width.

My invention consists further in producing commercial duplicates or copies, in hard and more durable material, of such record-groove of constant effective width; and in a commercial sound-record having that characteristic. Finally, the extreme tip of my new stylus produces a sharply-defined track in the extreme bottom of the grooves, which the tip of the reproducer follows with utmost fidelity; that is to say, the opposite walls of my new record-groove converge to a narrow line, so that the groove in cross-section may be defined as V-shaped.

Having thus described my invention, I claim

1. A sound-record of the zigzag type consisting of a tablet of friable material having a record-groove formed therein by crushing out and removing the material to produce a groove of constant effective width.
2. A sound-record consisting of a tablet of friable material having a record-groove of substantially uniform depth and of constant effective width and formed by crushing out and removing the material from said tablet.
3. A sound-record consisting of a tablet of friable material having a record-groove of substantially uniform depth and of constant effective width, the undulations of which are formed directly in accordance with the vibrations from a source of sound.
4. A sound-record consisting of a tablet of friable material having a record-groove formed therein by crushing out and removing the material.
5. A sound-record consisting of a tablet having a substantially V-shaped record-

groove of uniform depth and constant effective width, the undulations of which are formed directly in accordance with the vibrations from a source of sound, said record-groove being characterized by having its bottom consisting of a sharply defined zigzag line corresponding to sound-waves.

6. A sound-record consisting of a tablet having a substantially V-shaped record-groove of uniform depth and constant effective width, the undulations of which are formed directly in accordance with the vibrations from a source of sound.

7. A sound-record consisting of a tablet having a record-groove of constant effective width produced by crushing out and removing the material to produce lateral undulations by and in accordance with sound-waves.

8. A sound-record consisting of a tablet having a record-groove of constant effective width formed from a similar record-groove produced by crushing out and removing the material to produce lateral undulations by and in accordance with sound-waves.

9. A sound-record consisting of a tablet having a record-groove formed therein by crumbling the material and removing it

from the tablet by and in accordance with sound-waves.

10. A sound-record consisting of a tablet having a record-groove formed from an original record-groove produced by crumbling out the material of a suitable record-tablet and removing it therefrom by and in accordance with sound-waves.

11. A sound-record consisting of a tablet having a record-groove of substantially uniform depth and of constant effective width, the undulations of which are formed directly in accordance with the vibrations from a source of sound.

12. A sound-record consisting of a tablet having a zigzag record-groove of substantially uniform depth and of constant effective width, the undulations of which are formed directly in accordance with the vibrations from a source of sound.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

VICTOR H. EMERSON.

Witnesses:

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RALPH L. SCOTT.