July 8, 1924. 1,500,698

A. WIEHL

PHONOGRAPH RECORD AND PROCESS OF MAKING THE SAME

Filed April 10, 1920 2 Sheets-Sheet 1

Fig. I.

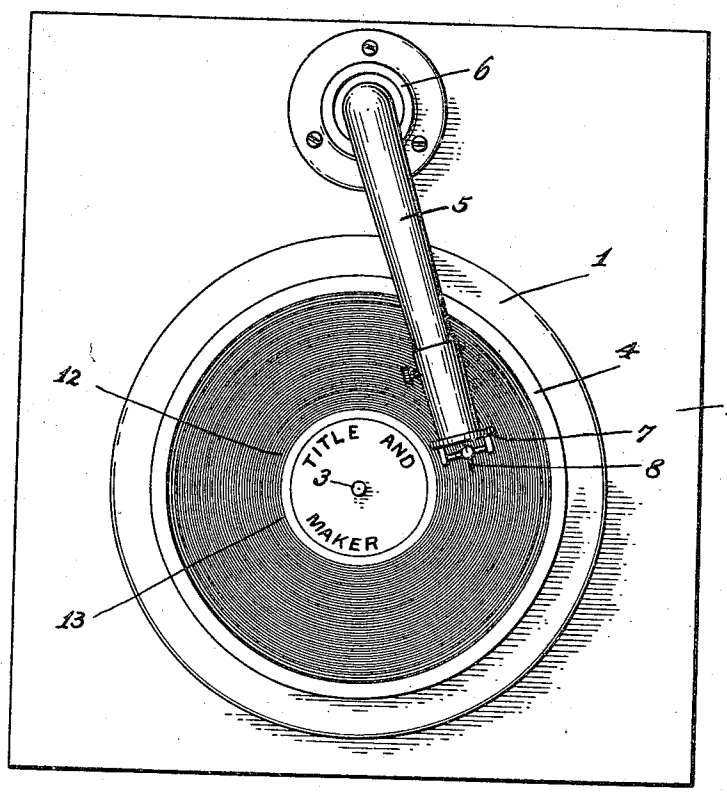


Fig. II.

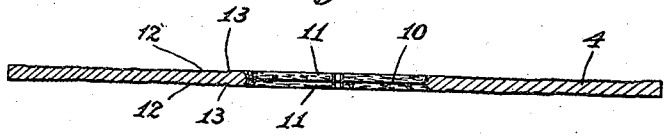
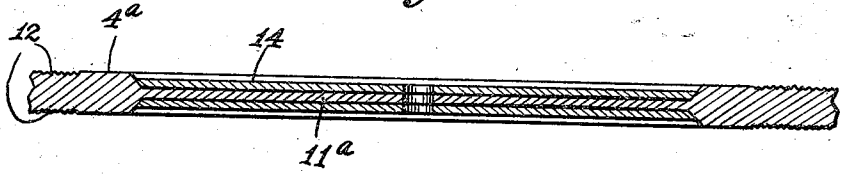


Fig. III.



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PHONOGRAPH RECORD AND PROCESS OF MAKING THE SAME

Filed April 10, 1920 2 Sheets-Sheet 2

Fig. IV.

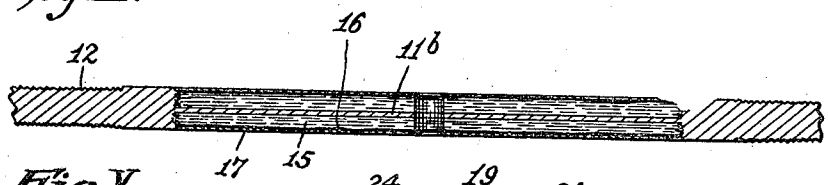


Fig. V.

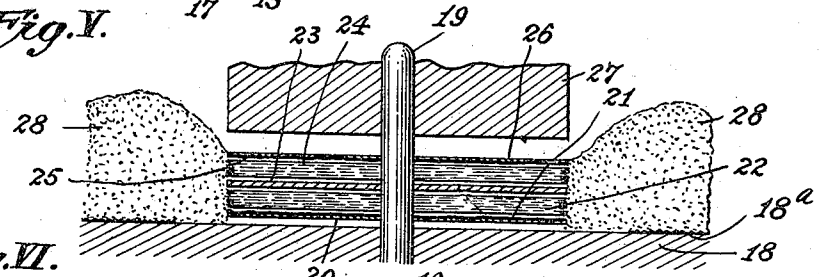


Fig. VI.

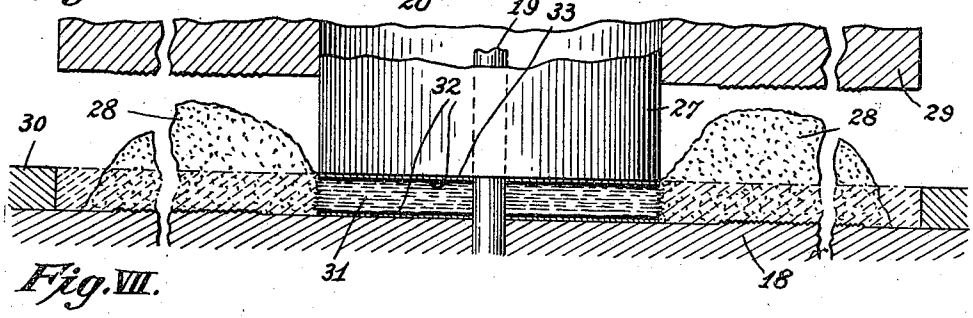


Fig. VII.

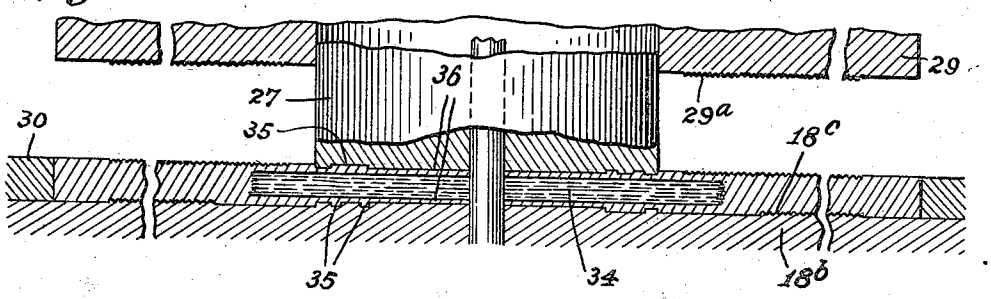
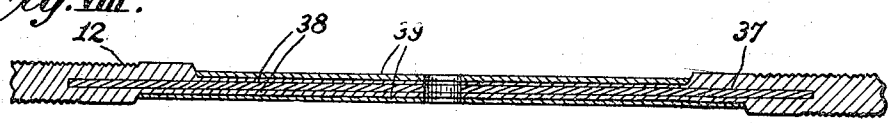


Fig. VIII.



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Patented July 8, 1924. 1,500,698

UNITED STATES PATENT OFFICE.

ALFRED WIEHL, OF BROOKLYN, NEW YORK.

PHONOGRAPH RECORD AND PROCESS OF MAKING THE SAME.

Application filed April 10, 1920. Serial No. 372,770.

To all whom it may concern:

Be it known that I, ALFRED WIEHL, a citizen of the United States, residing in the city of Brooklyn, county of Kings, State of New York, have invented certain new and useful Improvements in Phonograph Records and Processes of Making the Same, of which the following is a specification, reference being had to the accompanying drawings, illustrative of one particular embodiment of my invention.

This invention relates to articles known as records used in phonographs or sound-reproducing apparatus and process of making the same, and has for its object the reduction of cost in the making of the records, likewise the weight may be reduced in certain forms of construction, and in the process of manufacture economies may be effected, and various other advantages gained which will appear from the more detailed specification hereinafter set forth. In the production, economies may be effected and advantages attained, while the finished product is available for use without modification of parts of the phonograph apparatus; and with all, durability and strength is among the other results attained by the practice of my invention.

In my application for Patent S. No. 325,329, filed Sept. 22, 1919, certain forms of construction of record were shown, disclosing the basic invention herein set forth, but my inventions were not sufficiently shown or described in detail to set forth a basis for all of the claims made in this application.

The construction, method of manufacture and advantages of my invention will be understood from the detailed description hereinafter set forth, with reference to specific embodiments, which are shown in the accompanying drawings in which:

Fig. I is a plan view of a phonograph box with record and arm in operating position.

Fig. II is a transverse diametrical section of a record.

Fig. III is a transverse diametrical section, on an enlarged scale, of the central portion of a record.

Fig. IV is a transverse diametrical section, on the enlarged scale, of a modified form of the central portion of the other record.

Fig. V is a transverse section of the central portion of a record in the making.

Fig. VI is a transverse section, part broken, of a record in the making, with the central portion of modified construction.

Fig. VII is a transverse section, part broken, of a record in the making, with the central portion of modified construction.

Fig. VIII is a transverse diametrical section, on the enlarged scale, of a record with modified central construction.

In Fig. I the phonograph table 1 is mounted in the usual way, on the box 2, with a central projecting centering-pin 3 locating the record 4, which rests on the table 1, while the over-hanging arm 5, mounted on the base 6, secured to the box 2, carries the diaphragm 7 and the mechanism supporting the needle or stylus 8 in proper relation to the record 4.

The record 4, shown in Fig. II, has its thickness slightly exaggerated in scale, but embodies in the central portion a disc or diaphragm 10 of much less thickness than the outer annular portion of the record, the difference in thickness being made up by the embodiment of suitable light and cheap material, as indicated at 11, the upper and lower surfaces of which central portion are adapted to receive an imprint or label indicating the title and the maker of the record. The edges of the central portion consolidate with the adjacent portion of the outer annular section of the record at a circle slightly less in diameter than the termination of the convolutions or record grooves 12, so that the grooves engaging and guiding the needle terminate before the needle reaches the central specially constructed portion, and, furthermore, to limit the movement of the needle I may terminate the grooves by a circular inner groove 13 at which the spiral record groove terminates.

In Fig. III the record 4^a, of a suitable thickness for stiffness and adapted to receive the record grooves 12—12 on both surfaces, is cut away, or its material is omitted throughout the large central portion and is supplanted by the diaphragm 11^a of stiff material. This diaphragm is consolidated at its periphery during the process of manufacture, with the outer annular portion of the record, and the difference in thickness, leaving a large circular depression over the diaphragm 11^a and between its surface and the plane of the surface of the record portion of the plate, has set into it a label 14, of thin material adapted to take the imprint

of title and maker or other marking desired, without raising the surface of the central portion beyond a predetermined extent, and preferably of material of lesser weight than the main body portion of the record, in order that the net result of the changed central structure will reduce the total weight of the record. This insert material on the central diaphragm 11^a may be on both sides and of fibrous material, and so consolidated with the surface of the diaphragm as to toughen the central structure and permit the use of a very thin, light and inexpensive diaphragm. The magnified scale of thickness relative to diameter in the illustrations, serves to more clearly indicate what would in reality be a diaphragm of 10 to 15 thousandths of an inch with light, fibrous material of 2 to 3 hundredths inch, sealed on the surface of the diaphragm, with its periphery consolidated with the heavier portion of the record proper.

In Fig. IV the modified form of central construction embodies the diaphragm 11^b, which is prepared thin and stiff preliminary to the formation of the record proper, and is put in place on top of light fibrous material such as paper pulp or special quality of similar material, the outer surface of which is coated with a suitable adhesive 16 to consolidate it with an outer thin sized paper disc 17 which receives the marking of title, maker or otherwise as desired. The thin disc 11^b and the fibrous material 15 meet at their periphery the material of the disc proper, and in the formation of the record consolidate with the disc proper forming a fixed central portion in which the diaphragm only is of material as expensive as the body of the record, the remaining portion making up the central section being of relatively cheap material and preferably lighter in weight than the balance of the record having the sound or record grooves 12. The adhesive 16, after the compression of the built-up central portion, becomes a stiff irregular diaphragm consolidated with the fibrous portion 15, but backs the surface paper or coating material to give a suitable surface for the purpose described.

In Fig. V there is shown, spaced, elements to make up the central section of the record, which are shown in restricted diameter for purposes of illustration, in the following manner:

A matrix 18 carrying the record grooves 18^a, has the central assembling pin 19, onto which there is first placed a disc 20, and on this a coating of adhesive 21, then suitable fibrous material in a fixed disc form 22, then a finished or semi-finished stiff material diaphragm 23, then a suitable disc of light fibrous material 24, and thereon an adhesive 25, and a top disc preferably thin paper 26. A central plunger 27, approximating the diameter of the built-up centre section adapted to move on the central pin 19 and effect consolidating pressure on the built-up central section, is shown in preliminary position; and around the periphery of the central section is indicated the plastic material 28 destined to form the main portion of the record proper, of material best adapted to the purposes of the record or sound grooves, and which comes in contact with the outer periphery of the built-up centre and during the formation consolidates intimately with the edges of the different layers of the central built-up portion.

In Fig. VI the lower matrix 18 has superposed the top matrix 29 with a central opening adapting it to fit close around the plunger 27. The plunger 27 here shown, has compressed a central built-up portion of slightly different structure than that shown in Fig. V, but the bottom matrix 18 shows superposed the plastic compound 28 destined to form the impressed portion of the record, and in dotted lines is shown the finished record after the upper matrix 29 has been pressed down, with suitable heat and pressure to form the finished article. The plastic material, as indicated, is provided in accurately predetermined quantity to form annular body portion of the record exclusive of the built-up centre, and with a circumferential ring 30, or other suitable means, limiting the outward movement of the plastic material, that material is assured upon the application of pressure with the upper matrix 29 of intimate contact and consolidation with the central built-up disc portion and all the material forming the outer edge of the central section. As here shown the central section comprises fibrous or non-flowing material 31, preferably much lighter than the plastic record material and less expensive, and on each surface of this central disc a suitable adhesive 32 is spread, and on top of the adhesive a label or suitable thin paper or light, smooth material 33, adapted when the pressure is applied under suitable temperature conditions to effect a finished consolidated central section in which the adhesive becomes substantially a stiff diaphragm closely associated with its adjacent material.

In Fig. VII the lower matrix 18^b has the sound grooves 18^c, while the upper matrix 29 has the sound grooves 29^a extending to a lesser diameter than those on the lower matrix. The plunger 27 forms the central guide of the upper matrix, but in this case suitable light, cheap material 34 extends over a diameter greater than the minimum diameter of the groove section 29^a, and plastic material in semi-finished condition is spread over the top and the bottom of the material 34. The central portion of the lower matrix and the bottom of the plunger

27, are etched or otherwise formed to a negative to effect embossing of lettering or configuration on the upper and lower sides of the central section of the record as indicated at 35. This embossing is accommodated by the thin layer or diaphragm of material of far lesser extent in thickness than the outer annular portion of the record proper, but being backed by the material 34, and under pressure of the plunger cooperating with the lower matrix forms a consolidation with the surface of the material 34, and between the two recording matrices forms a complete consolidation, with flow of the material, with the edges and the surfaces of the central light, cheap material 34.

In Fig. VIII a similar difference in diameter of the convolutions on the upper and lower sides of the record is illustrated. In the formation of the central portion, a diaphragm 37 may be of paper or suitable stiff, but light and cheap material, on the upper and lower surface, after which adhesive or plastic material 38—38 is spread in even layers, and coated with a suitable thin disc 39, preferably of paper, adapted for the usual marking. The diaphragm 37 gives the necessary stiffness in consolidation with the superposed layers with a diminution in weight and a marked reduction in cost of the central portion, and as shown the extension of the disc 37 radially outward beyond the convolutions 12, aids to displace a larger quantity of the more expensive and heavier material, and still provides for the surface coating close to the periphery of the diaphragm 37 of a material well-adapted to properly receive the accurate sound grooves.

This form provides for a record with different diameter central sections, so that the greatest economy, by the elimination of expensive material from the centre, can be accomplished with a short record "piece" on one side of the record and a longer piece on the other side of the record. Similar economy may be accomplished in the construction shown in Fig. VII.

It will thus be seen that the practice of my invention results in a phonograph record 4, on both surfaces of which convolutions or sound grooves 12 are impressed in material most perfectly adapted to receive the grooves and support them for best conditions of reproduction, while providing the embodiment of a different structure for a large area about the centre, so that the central circular section may be made of material much cheaper than the outer annular portion, while still serving to hold the record in its operative position on the table of a phonograph and permit the centering or placing with equal or greater facility than in the case of records heretofore used. It likewise affords the opportunity of reducing the weight of the central section; and to provide a central section adapted for marking of the record, and for the desired rigidity, and a simple and secure consolidation of the central section with the annular record groove portion.

The process of making the records with my invention is such as to insure the proper relation of the central section with the outer annular portion of the record of the finished structure. Also the method of placing the central section preliminary to the forming of the outer disc, eliminates a large proportion of area of the upper matrix, so that the area of carefully prepared sound-groove matrix surface is reduced and the cost of producing the matrix proportionately reduced. This economy in making of the matrix for the sound convolutions may be carried out with the lower matrix as well, or with both, so that the economies may be substantial in the preparation and final use of the matrices,—still insuring the vital portion of the record containing the accurate sound grooves, in form and character perfectly suited in accordance with best practice for reproduction, strength and durability.

As shown in Figs. II and III, the central section formed of a disc, which in the final record is stiff and consolidated at its periphery with the adjacent material of the main body portion of a record, is, in general, in accord with two forms shown in my application Serial Number 325,329. In Fig. V is shown how such disc or diaphragm is positioned in the process of making of the record and consolidated with the surrounding material. In Fig. IV the consolidation is shown with the additional provision whereby a medial disc of fibrous material or non-flowing material is flanked by intervening cheap material, such as loose paper pulp, or as otherwise desired, with a suitable amount of binder, which is surfaced with sufficient adhesive on top of which thin paper labels placed on either side and finally all subjected to pressure, cause a finished product in which the adhesive embodied becomes a permanent, stiff diaphragm or diaphragms, forming the necessary protection and durability for all the requirements of the central section.

As shown in Fig. VI the adhesive applied to a medial body portion, may be of sufficient amount to form a stiffer diaphragm on either side adjacent the surface, obviating the necessity of a central separate diaphragm.

In Fig. VII a thin disc of the same material similar to that of the main portion of the record, forms a thin diaphragm, eliminating throughout the central portion a large amount of the expensive material which is supplanted by cheap internal structure throughout that area underlying the

central portion over which the groove records are not superposed,—except that the final convolutions may run slightly over the limit of the middle cheap section, preferably only on one side, to allow for any slight discrepancy in the radial extent of the records when manufacturing and in cases where a minimum number of sizes of central modified sections are desired for embodiment in all the different sizes of records.

Furthermore, in Fig. VIII the expensive material in the main portion of the record may be displaced medially by the stiff diaphragm 37, extending radially from the center into the main body portion, but having the main body portion cut away at a reasonable limit of distance inside of the last record groove. As cut away in this form of construction, or material omitted, the resultant central diaphragm is coated with a thin layer of the same material as the record or a suitable adhesive 38, so as to consolidate a label 39 on either side.

It will be noted that, in general, the drawings magnify relatively all dimensions of thickness, which is done to make more clear the details of construction which in actual practice deal with thin sheets or diaphragms of a few thousandths, or at the most a few hundredths of an inch, and require the greatest nicety of proportion and arrangement even though a finished diaphragm may in reality be a surfacing of adhesive which, after the process of manufacture is complete, constitutes a stiffening disc in conjunction with the adjacent materials and surfaces.

With reference to Fig. VIII, the feature of embossing the name of the piece is provided by the particular construction, serving the purpose of economy and lightness,—but having the additional important element of serving to distinguish the record, that is, reading the name of the record in the dark, and, therefore, providing for reading the name of the record by the blind. Besides the name, other configuration or lettering may be otherwise or similarly impressed or embossed.

Where discs or diaphragms suitably stiff are prepared before the record proper is pressed into shape, their periphery need not be regular, and the embodiment of paper or pulp or fabric with irregular edges serves to consolidate with the expensive material of the record proper which flows into the interstices formed by the edge of the built-up central portion, and all forms around the periphery of any stiff portion or stiff individual diaphragm, effecting a secure consolidation of the central section with the balance of the record.

The central hole is likewise provided for by the various forms of structure of my invention, as to security and durability, and should transparent material be used for consolidating a central section with the balance of the record it affords additional advantage of partial or substantial transparency to facilitate the centering.

While my invention may be modified as to various details of construction and material, such might involve a difference in the saving of cost or of weight, as to degree, while in some embodiments stiffer or different surface requirements of the central section may warrant a relative loss as to the advantages of weight or cost,—many modifications may be made in these and other respects without departing from my invention.

What I claim and desire to secure by Letters Patent is:

1. A phonograph record comprising the usual disc adapted to accommodate on both of the opposite parallel sides reproduction convolutions extending from the outer portion to a point approaching the centre, a central section consisting of a plurality of layers of different materials so as to make said central section specifically lighter than said outer portion, the parts of said central section being integrally consolidated with said outer portion.

2. A phonograph record comprising a rigid reversible similar faced annular disc portion with homogeneous material from surface to surface, a central section with a plurality of layers of relatively light material having a central hole and being consolidated at its periphery with the body portion of the annular homogeneous disc substantially at a diameter corresponding to the innermost convolution of sound record impressions on the annular portion.

3. The process of forming phonograph records, comprising the pre-making of a central circular section with a plurality of layers of relatively light cheap material, locating the same in predetermined position centrally with respect to complementary sound-groove matrices, the supplying of plastic material exterior to the partially or wholly pre-made central section, and forming the impressed outer annular section with convolutions on both sides simultaneously with the consolidation of the latter with the central section.

4. In a two-sided phonograph disc a central circular section comprising a diaphragm depressed from both sides below the abutting convolution surfaces of the disc, and superposed separately attached discs on said central diaphragm below the planes of the convolution surfaces.

5. The process of forming phonograph discs consisting of locating a small circular disc of tough fibrous material thinner than the thickness of the proposed convolution bearing portion, locating said disc of fibrous material with its periphery project-

ing into the field of the convolution bearing portion, inserting the plastic material annularly, and applying pressure on the matrices to form the sound record portion of the disc simultaneously with an inward radial pressure on the central disc to consolidate the edges thereof permanently with the record bearing annular portion while retaining the central disc under independent pressure.

6. A process of making phonograph records which consists in building up a central circular portion in a plurality of layers, placing plastic material annularly about the central portion, and compressing the whole mass so as to impress the sound records on the annular portion and simultaneously consolidate the annular portion and the central portion.

7. A process for forming phonograph records, which consists in building up a central circular part with a plurality of layers, placing plastic material annularly about said central part so as to overlap the outer edge of said central part, and compressing the whole mass so as to impress the sound records on the annular portion and consolidate the annular portion and the central part.

8. A process for making phonograph records, which consists in building up a central circular part with a plurality of layers, disposing plastic material about said central part, and compressing the mass so as to impress sound records on the outer portion and emboss letters or designs on said central part, and consolidate the central and the outer parts.

9. A phonograph record comprising a central circular portion with a plurality of layers, and an outer annular portion overlapping the edge of said central portion, said central and annular portions being integrally consolidated.

10. A phonograph record comprising a central circular portion and an outer annular portion containing sound records on both sides, said central portion having a layer of the same material as said outer portion and continuous therewith, but thinner than said outer portion, and having other layers of lighter materials, said various layers being consolidated, together.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses, this 8th day of April, 1920.

ALFRED WIEHL.

Witnesses:
H. MUCHMORE,
HERMAN F. CUNTZ.