Patented Jan. 14, 1936 2,028,126

UNITED STATES PATENT OFFICE

2,028,126

PHONOGRAPH RECORD

Richard F. Warren, Stratford, Conn., assignor to Carbide and Carbon Chemicals Corporation, a corporation of New York

No Drawing. Application July 7, 1930, Serial No. 466,038

6 Claims. (Cl. 106—22)

This invention relates to new and useful improvements in phonograph records.

An object of the invention is to provide a phonograph record which is light in weight; a record which may be repressed to have it carry a groove representing a different recording from that which it originally bore or which may be repressed to have it carry the same groove in the event of it having been rejected; or which may be treated to provide it with a smooth surface by treating it with heat and pressure whereby to remove a groove in order that a groove may later be engraved in the smooth surface by means of a heated stylus or the like.

A further object is to provide a record having an improved surface, that is, one wherein less scratch or less surface noise results from the tracking of the stylus in the record groove; a record which is hard in the sense that it will reproduce all audible frequencies and yet be flexible as a record, and which will withstand moisture.

Additional objects are to provide a record that may be pressed in a multiple press, and which may be pressed under a reduced pressure as compared with pressures at present used, and which is of such structure that it may be cut from sheets as the record groove is pressed.

Another object is to provide a record including an improved surface coating adapted to receive the sound record groove, and which contains as the sole resinous constituent of the surface coating, a vinyl resin, such as polymerized vinyl esters of the lower fatty acids, vinyl halides, styrol, and mixtures thereof.

Other objects and advantages will become apparent from a consideration of the following description wherein the invention is fully disclosed. However, it is to be understood that the invention is not limited to the details disclosed but comprehends all such changes as fall within the scope of the appended claims.

I have found that polymerized vinyl acetate or vinyl chloride, or mixtures of the two, with or without plasticizers, when used in the manufacture of phonograph records result in a record having a superior playing surface, in that it is hard and durable, and is particularly advantageous by reason of its freedom from surface noise.

Throughout this specification the invention will be described as applied to a sheet of paper or the like, but it will be understood that it is also applicable to other types of records, for example, it may be used in solid stock records, or as a coating for sheets used in the manufacture of laminated records.

In the manufacture of a record in accordance with this invention, a sheet of fibrous material, whether in the form and size of a record, or larger (for example, in the form of a roller strip) is first impregnated with a primary solution of resinous material. For the purpose of this impregnation, the following procedure may be used:

A fibrous material, such as paper or the like, which is to form the core of the record is impregnated or coated by passing it through, or otherwise applying a solution of resinous material on its surface to provide a support or base for the second coating to be hereinafter described. This primary coating may be formed of any material or mixture of materials which will give the fibrous core a smooth and hard moisture-resistant surface, but which will not render the sheet so hard and solid that it cannot later be compressed or flexed.

In my experiments I have found that a suitable primary coating may be applied by the use of a solution of phenolic resin, such as phenol-formaldehyde or phenol-furfuraldehyde resins; cresol-aldehyde resins; casein; cellulosic derivatives, such as cellulose acetate or cellulose nitrate; and vinyl resins, such as polymerized vinyl acetate, vinyl chloride, styrol or mixtures thereof. Other resinous materials than those named and combinations of the foregoing materials may also be used for the primary coating. In general, I prefer to employ a heat-reactive artificial resin for the purpose of providing the record core with a moisture-resistant surface.

For the phenolic and cresolic resins named above, alcohol may be used as a solvent. In the use of casein, caustic soda or aqueous ammonia and other well known alkaline solvents may be employed. When cellulose esters, or the vinyl resins are used, acetone, diacetone alcohol, ethylene dichloride, and mixtures of these, or mixtures of these solvents with diluents such as toluene and benzol may be used as the solvents.

It will of course be understood that the primary coating may be applied to the sheet other than by dipping. For example the primary coating may be sprayed onto the sheet or it may be applied with a brush or the like. Also, it is not absolutely necessary that the sheet be thoroughly impregnated. However, it is desirable that the surface of the sheet at least be impregnated so that the fibers thereof are coated, and the sheet made relatively moisture-resistant. Should the sheet not be moisture proof the fibres thereof on becoming wet will swell and may break the surface of the record.

After being treated with the first or primary coating and dried, the sheet is given a second coating. The second coating consists essentially of the resinous material in which the record grooves are to be formed. In this connection it is to be noted that should the second coating be thin the sound groove will extend into the first or primary coating.

The playing groove receiving surface contains as the sole resinous constituent a vinyl resin, such as polymerized vinyl acetate, vinyl chloride, styrol, or mixtures of these, with or without plasticizers or filling materials. Fillers which may be used in the playing surface may be those which have been used in record manufacture, and may include one or more of the following: Rottenstone, clay, slate, barytes, red iron oxide, fuller's earth, or umber. Coloring materials, such as lamp black, may be used if desired, and it is to be noted that red iron oxide, rottenstone, or umber may be used alone or in combination, and it is desirable to use one of the latter with the other materials mentioned.

The second coating composition may be made by adding the vinyl resin together with plasticizers and fillers, if desired, to a solvent and grinding the whole in a ball mill to obtain thorough dispersion. The solvent used, as has been indicated above, preferably is sufficiently volatile in nature to be completely eliminated after the record is pressed. After the mixing operation, the mixture may be screened or filtered and is then ready for use.

The core which has been impregnated with the primary coating is then coated with the vinyl resin composition by any suitable means such as dipping or spraying, or the like. It is advantageous to incorporate a small amount of carnauba wax or lead salt master wax in the second coating solution in order that the record will have no tendency to stick when pressed.

When the second coating containing the vinyl resin is dry, the sheet may be stamped or pressed into record blanks and molded within two matrices to form the finished record.

The following specific example will illustrate the invention:

A sheet of fibrous material such as pulp board was used as the record core. This sheet was first coated or impregnated with a solution having the following composition:

	Parts by weight
Cresol-furfuraldehyde resin	9
Denatured ethyl alcohol	30

The second coating was formed as follows:

Vinyl resin (mixture of polymerized vinyl acetate and vinyl chloride)	6 parts by weight
Rottenstone	2 " " "
Lamp black	1 " " "
Iron oxide	2 " " "
China clay	2 " " "
Ethylene dichloride	24 " " "
Wax, per gallon of solution	½ ounce

By the process of this example, a record having a somewhat yielding core is provided. These records are relatively thin and may be rolled without injury, and in the pressing operation by which the sound grooves are formed a die of the flat type as distinguished from one of the crowned type should be used. If a record in accordance with this invention is to be provided with a hard core, a landing pad of rubber, lead, or similar cushioning material should be used in the press.

The record forming operation is expedited if the coated sheets are preheated before they are pressed. The preheating should, of course, be carried out at a temperature below that at which the resinous coating will tend to flow off of the core. An advantage of the records of this invention is found in the thermo-plasticity of the playing surface, and unsatisfactory records or worn records may be repressed. It is also possible to make record blanks in accordance with this invention provided with a blank groove in which a sound track may be formed by means of a heated stylus or the like.

Further the records may be pressed in a multiple press, and when long sheets are used the records may be stamped or cut from the sheets as a part of the pressing operation, and the records may at the same time be pierced. Additionally, the records may be pressed under a reduced pressure as compared to that ordinarily used, and have a very low coefficient of expansion.

Should cotton flock be used in the records as a filler, it may first be impregnated with polymerized vinyl acetate or vinyl chloride dissolved in ethylene dichloride, and thereafter dried in a centrifuge. Of course it will be understood that cotton flock is more applicable to a solid stock record, or to the back stock of a laminated record comprising sheets connected by a core and having the record groove receiving compound on their outer surfaces.

In forming records in accordance with this invention, a roll of paper may be mounted in such a way that it can be unwound and drawn through a tank containing the primary coating solution as described above. Rollers or rods, or the like, may be used to keep the paper submerged in the solution. The coated sheet may be drawn from the tank through a drier and thereafter rewound or passed directly to a second coating device where the second surface coating solution is applied. A satisfactory device for applying the second coating is one in which the coating is applied simultaneously to both sides of the paper by means of brushes or the like.

On leaving the second coating machine, the paper may again be passed through a drier and it is then ready to be stamped into the form of records and pressed to provide sound record thereon.

Alternatively, record disks may be cut from the sheet after it has received the primary coating and these blanks then supplied with the second or surface coating material.

It will be understood that modifications of the invention are possible and are included within the invention as defined by the appended claims.

Having thus described the invention, what is claimed is:—

1. A laminated sound record comprising a fibrous core at least the surface of which is impregnated with a hardened artificial resin to render the core moisture resistant, and which is provided with a playing groove receiving surface containing as the sole resinous constituent a vinyl resin of the group consisting of polymerized vinyl esters of the lower fatty acids, vinyl halides, styrol and mixtures thereof, said record being characterized by durability and a minimum of surface noise.

2. A laminated sound record comprising a fibrous core at least the surface of which is impregnated with a hardened heat-reactive resin, and which is provided with playing groove re-

ceiving surfaces integral with said core containing as the sole resinous constituent a vinyl resin of the group consisting of polymerized vinyl, esters of the lower fatty acids, vinyl halides, styrol and mixtures thereof, said record being characterized by durability and a minimum of surface noise.

3. A laminated sound record comprising a fibrous core having at least its surfaces impregnated with a hardened heat-reactive artificial resin, and which is provided with playing groove receiving surfaces integral with said core containing as the sole resinous constituent a vinyl resin of the group consisting of polymerized vinyl esters of the lower fatty acids, vinyl halides, styrol and mixtures thereof, said record being characterized by durability and a minimum of surface noise.

4. A laminated sound record comprising a fibrous core having at least its surfaces impregnated with a hardened heat-reactive artificial resin to render the core moisture resistant without rendering it inflexible and incompressible, said record having a playing groove receiving surface integral with said core containing as the sole resinous constituent a vinyl resin of the group consisting of polymerized vinyl esters of the lower fatty acids, vinyl halides, styrol and mixtures thereof, and said record being characterized by durability and a minimum of surface noise.

5. A laminated sound record comprising a fibrous core at least the surface of which is impregnated with a hardened artificial resin to render the core moisture resistant, and which is provided with a playing groove receiving surface containing as the sole resinous constituent a polymerized vinyl halide, said record being characterized by durability and a minimum of surface noise.

6. A laminated sound record comprising a fibrous core at least the surface of which is impregnated with a hardened artificial resin to render the core moisture resistant, and which is provided with a playing groove receiving surface containing as the sole resinous constituent polymerized vinyl acetate, said record being characterized by durability and a minimum of surface noise.

RICHARD F. WARREN.