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PHONOGRAPH RECORD AND METHOD OF PRODUCING THE SAME.

No Drawing.

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This invention relates to pressed sound-records, formed either as discs or otherwise, whose record-grooves are either laterally-undulatory or vertically-undulatory, and their usual depth is not more than, say, approximately three one-thousandths of an inch, although the depth may be somewhat more or less, as desired. Broadly stated, the invention comprises the new thermoplastic record-material hereinafter set forth, which may be, and preferably is, used as the surface-coating of a suitable core (which latter need not be, and preferably is not, of thermoplastic material); also the new record-tablets or records having an outer coating of said record-material. The invention comprises further a new record-tablet or record, having between the core and said new surface-coating, an intermediate coating, having a higher point of plasticity than the surface-film; and also a tablet or record having, adhering to the outer surface of said new surface-coating, a thin coating of similar composition to said intermediate coating. The invention consists further of the thin and flexible and rollable record-tablet hereinafter described. The invention consists further of the new process of producing such tablets and records; and also of the various features and steps hereinafter set forth in the appended claims.

The invention will be best understood by reference to the ensuing detailed description of a preferred embodiment thereof, applied to discs; but it must be understood that the invention is not limited to the described features with regard to ingredients, steps, and so forth, as hereinafter disclosed.

The core consists preferably of a compacted body or disc of fibrous material, such as pasteboard, cardboard, laminated paper, or even a thin sheet of paper, fabric, or the like. The core may in any desired manner be rendered waterproof or at least sufficiently repellent to the solvents used, as by treating it with a suitable waterproofing preparation, preferably of the type which is applied in the form of a water-base solution. Whatever type of waterproofing has already been or may be applied, the treated core is allowed or caused to dry out thoroughly, as in a vacuum or in an oven, or by resorting to both expedients, until substantially all the moisture (water or solvent) has evaporated, leaving a thoroughly-dry moisture and sol-

vent-repelling core, hereinafter referred to comprehensively as the treated core.

For the intermediate coating (when used), a substantially pure cellulose-ester, such as nitro-cellulose or cellulose-acetate, or a mixture of such esters, is dissolved in a suitable solvent, such as acetone, ethyl-acetate, methyl-acetone, or some mixture of such or similar solvents; the solution is preferably applied to both faces and also the edge of the treated core in any desired manner, as with a brush or roller, or by dipping or spraying; and the applied solution is then allowed or caused (as above indicated) to dry out until the solvent has substantially evaporated. This intermediate coating is not designed to receive the impressions of the pressing-matrix; and may therefore be quite thin, say, approximately only one or two one-thousandths of an inch thick. This coating serves to unite the subsequently-applied surface-coating and the treated core, besides serving certain other advantageous purposes hereinafter set forth.

For the surface-coating, a cellulose-ester, or a mixture of cellulose-esters, containing (or formed from one or more substances containing) camphor-gum or camphor-gum substitute (or some other suitable gum or resin or a mixture thereof, with or without camphor-gum), is dissolved in a suitable solvent (as indicated above); or a pure cellulose-ester may be thus dissolved, and a suitable proportion of gum-content added to the solution. Then a suitable quantity of finely-comminuted rotten-stone, pumice, or other abrasive, is thoroughly mixed into the solution. Preferably this gum-containing ester is thinned with a greater proportion of solvent than is the aforesaid cellulose ester which constitutes the intermediate coating. Accordingly when such less-diluted solution of cellulose-ester is applied (to form the intermediate coating), its solvent is less prone to enter the minute interstices of the core; and, when the intermediate coating has dried out, it retards entry of the (thinner) solution of gum-containing ester applied to form the outer coating. Said gum-containing solution is applied to one or both faces of the prepared core in any desired manner, as already indicated; and the applied solution is then allowed or caused (as above) to dry out until the solvent has substantially evaporated. Appli-

cant has not yet verified the fact, but has reason to believe that the solvent of the surface-coating acts to some extent upon the outer particles of the intermediate coating to which it is applied, resulting in a gradual blending of the adjacent particles of the two coatings and a substantially perfect juncture of the two coatings themselves. Inasmuch as the matrix-ridges are to be impressed into, and retained by, this surface-coating, the latter may be as much as approximately some three to ten one-thousandths of an inch in thickness, or even thicker or thinner, if desired. To attain the desired thickness, there may be successive applications of this last-named mixture.

The resultant article, comprising the treated core, the intermediate coating with its relatively-higher point of plasticity and the surface-coating with its relatively-lower plastic point, constitutes the completed record-tablet, and is now ready to have record-grooves pressed into either or both of its faces. The temperature resorted to in the pressing-operation should of course be amply sufficient to render the surface-coating sufficiently plastic; but preferably is insufficient to render the intermediate coating plastic. This is what is meant by the ensuing statements that the plastic point of the intermediate coating is higher than, and that of the surface-coating is lower than, the heat employed in the pressing-operation.

As stated, a pure and essentially gum-free cellulose-ester is practically non-thermoplastic. It is the presence of the gum-content which imparts plasticity to the cellulose-ester, the greater the gum-content the lower the plasticity point. If the gum-content be too great, however, an unsatisfactory record-surface is liable to be produced in the first instance; and even a fairly satisfactory record-surface will rapidly deteriorate where too much gum is present. For example, it has been found that ordinary celluloid contains too great a gum-content to constitute a satisfactory material for forming the thermoplastic outer coating. Therefore, where the present specification and claims state that the solution for forming said outer coating should contain a suitable amount of gum-content, such statement is to be understood as meaning an appreciably smaller proportion of gum-content than present heretofore in ordinary celluloid for record purposes.

Said intermediate coating serves, as stated, to prevent undue loss of the mixture applied to form the surface-coating. Further, the dry intermediate coating, especially when essentially free from gum-content, does not become plastic within the range of temperatures employed in the well-known pressing-operation, and therefore in this art is practically non-thermoplastic.

Said intermediate coating serves, during the pressing-operation, as a more or less rigid backing for the surface-coating; indeed, where the floor-face of the die or either face of the matrix or of the record-tablet is not a true plane, or where there may be any deviation from true parallelism of said faces, the fibrous core is believed to act more or less as a cushion, while the intermediate coating (or coatings, if there be one on each face of the core) serves as a more rigid backing for the then-plastic surface-coating. At any rate, better impressions are obtained throughout the entire area of the record-zone, where such intermediate coating is present. The intermediate coating further serves to impart additional stability to the tablet as a whole.

If desired, the core may consist of a thin sheet of paper or fabric, and the coatings, particularly the surface-coating, may be somewhat thinner (for receiving shallower grooves) than above indicated; indeed, the surface-coating (and the intermediate coating) may be applied upon only one face of the core. In such case, the records pressed from such tablets are very flexible and pliable, and may even be rolled up for mailing in a tube. The composition of said coating is sufficiently tough yet pliable, and adhere so faithfully, that there is little or no tendency to cracking when rolled; and yet, when unrolled, the disc may resume approximately its normal plane.

If desired, the aforesaid intermediate coating may be dispensed with, and the aforesaid mixture for the surface-coating may be applied directly upon either or both faces of the treated core.

Again, if desired, a thin film of pure cellulose-ester (with little or no gum-content) may be applied upon the outer face of said surface-coating; and in this case the completed tablet is subjected, in the pressing-operation, to a temperature not sufficient to render said film fully plastic, the grooves being impressed into the now-plastic gum-containing coating covered by said film, and the film being somewhat stretched to constitute an indented surfacing which adheres securely to the impressed grooves.

When dry, the aforesaid coatings, whether without gum-content, or containing gum and abrasive, are transparent. Therefore such printed matter as titles, illustrations, advertisements, etc., may be imparted to either or both faces of the core, before said coatings are applied and the record-grooves impressed; and such printed matter will be clearly visible through the coating or coatings. But, if desired, some coloring-matter may be added to either or both of the solutions.

The broad invention has thus been described in all its details, but only for the

sake of clearness. Departures may be made from the described features set forth as to materials and steps of procedure, modifications may be resorted to, and parts of the invention used to the exclusion of other parts, without in any case departing from the spirit of the invention, which is defined by the appended claims.

The invention having thus been fully described, what is claimed is:

1. The herein-described method of producing sound-records, which consists of printing upon a core of fibrous material such as cardboard, treating said printed core with a water-soluble waterproofing, drying it out, applying to said dry treated core a solution of pure transparent and essentially gum-free cellulose-ester, drying out the same to constitute a transparent and practically non-thermoplastic intermediate coating, applying to said dry coated core a mixture of an abrasive in a solution of transparent cellulose-ester containing a suitable amount of gum-content, drying out the same to constitute a transparent surface-coating that will become sufficiently plastic under the heat and pressure of the usual pressing-operation, then under heat impressing the ridges of a record-matrix into said surface-coating, and cooling the same to constitute a pressed record with its aforesaid printing still visible.

2. The herein-described method of producing sound-records, which consists of treating a core of fibrous material such as cardboard with a water-soluble waterproofing, drying it out, applying to said dry treated core a solution of pure and essentially gum-free cellulose-ester, drying out the same to constitute an intermediate and practically non-thermoplastic coating, applying to said dry coated core a mixture of an abrasive in a solution of cellulose-ester containing a suitable amount of gum-content, drying the same out to constitute a surface-coating that will become sufficiently plastic under the heat and pressure of the usual pressing-operation, then under heat impressing the ridges of a record-matrix into said surface-coating, and cooling the same to constitute a pressed record.

3. The herein-described method of producing sound-records, which consists of printing upon a core of fibrous material such as cardboard, treating said printed core with a water-soluble waterproofing, drying it out, applying to said dry core a mixture of an abrasive in a solution of cellulose-ester containing a suitable amount of gum-content, drying out the same to constitute a transparent surface-coating that will become sufficiently plastic under the heat and pressure of the usual pressing-operation, then under heat impressing the ridges of a record-matrix into said surface-coating, and

cooling the same to constitute a pressed record with its aforesaid printing still visible.

4. The herein-described method of producing sound-records, which consists of treating a core of fibrous material such as cardboard with a water-soluble waterproofing, drying it out, applying to said dry core a mixture of an abrasive in a solution of cellulose-ester, containing a suitable amount of gum-content, drying out the same to constitute a surface-coating that will become sufficiently plastic under the heat and pressure of the usual pressing-operation, then under heat impressing the ridges of a record-matrix into said surface-coating, and cooling the same to constitute a pressed record.

5. The herein-described method of producing sound-records, which consists of printing upon a core of fibrous material such as cardboard, waterproofing and drying out the same, applying to said dry treated core a solution of pure and essentially gum-free transparent cellulose-ester, drying out the same to constitute a transparent and practically non-thermoplastic intermediate coating, applying to said dry coated core a mixture of an abrasive in a solution of transparent cellulose-ester containing a suitable amount of gum-content, drying out the same to constitute a transparent surface-coating that will become sufficiently plastic under the heat and pressure of the usual pressing-operation, then under heat impressing the ridges of a record-matrix into said surface-coating, and cooling the same to constitute a pressed sound-record with the aforesaid printing still visible.

6. The herein-described method of producing sound-records, which consists of printing upon a core of fibrous material such as cardboard, waterproofing and drying out said printed core, applying to said dry core a mixture of an abrasive in a solution of transparent cellulose-ester containing a suitable amount of gum-content, drying out the same to constitute a transparent surface-coating that will become sufficiently plastic under the heat and pressure of the usual pressing-operation, then under heat impressing the ridges of a record-matrix into said surface-coating, and cooling the same to constitute a pressed sound-record with the aforesaid printing still visible.

7. The herein-described method of producing sound-records, which consists of waterproofing and drying out a score of fibrous material such as cardboard, applying to said dry treated core a solution of pure and essentially gum-free cellulose-ester, drying out the same to constitute an intermediate and practically non-thermoplastic coating, applying to said dry coated core a mixture of an abrasive in a solution of cellulose-ester containing a sufficient amount of gum-content, drying out the same to consti-

tute a transparent surface-coating that will become sufficiently plastic under the heat and pressure of the usual pressing-operation, and under heat impressing the ridges of a record-matrix into said surface-coating, and cooling the same to constitute a pressed record.

8. The herein-described method of producing sound-records, which consists of waterproofing and drying out a core of fibrous material such as cardboard, applying to said dry core a mixture of an abrasive in a solution of cellulose-ester containing a sufficient amount of gum-content, drying out the same to constitute a surface-coating that will become sufficiently plastic under the heat and pressure of the usual pressing-operation, then under heat impressing the ridges of a record-matrix into said surface-coating, and cooling the same to constitute a pressed record.

9. The herein-described method of producing sound-records, which comprises applying upon the printed surface of a suitable core a transparent and practically non-thermoplastic intermediate coating, thereafter applying upon said coating a transparent surface-coating that will become sufficiently plastic under the heat and pressure of the usual pressing-operation, and finally impressing record-grooves into said outer coating.

10. The herein-described method of producing sound-records, which comprises applying upon the surface of a suitable core an intermediate and essentially gum-free coating, thereafter applying upon said coating a surface-coating that will become sufficiently plastic under the heat and pressure of the usual pressing-operation, and finally impressing record-grooves into said outer coating.

11. The herein-described method of producing record-tablets, which consists of printing upon a core of fibrous material such as cardboard, treating said printed core with a water-soluble waterproofing, drying it out, applying to said dry treated core a solution of pure transparent and essentially gum-free cellulose-ester, drying out the same to constitute a transparent and practically non-thermoplastic intermediate coating of relatively-high melting-point applying to said dry coated core a mixture of an abrasive in a solution of transparent cellulose-ester containing a suitable amount of gum-content, and drying out the same to constitute a transparent surface-coating that will become sufficiently plastic under the heat and pressure of the usual pressing-operation.

12. The herein-described method of producing record-tablets, which consists of treating a core of fibrous material such as cardboard with a water-soluble waterproofing, drying it out, applying to said dry treated

core a solution of pure and essentially gum-free cellulose-ester, drying out the same to constitute an intermediate and practically non-thermoplastic coating, applying to said dry coated core a mixture of an abrasive in a solution of cellulose-ester containing a suitable amount of gum-content, and drying the same out to constitute a surface-coating that will become sufficiently plastic under the heat and pressure of the usual pressing-operation.

13. The herein-described method of producing record-tablets, which consists of printing upon a core of fibrous material such as cardboard, treating said printed core with a water-soluble waterproofing, drying it out, applying to said dry core a mixture of an abrasive in a solution of cellulose-ester containing a suitable amount of gum-content, and drying out the same to constitute a transparent surface-coating that will become sufficiently plastic under the heat and pressure of the usual pressing-operation.

14. The herein-described method of producing record-tablets, which consists of treating a core of fibrous material such as cardboard with a water-soluble waterproofing, drying it out, applying to said dry core a mixture of an abrasive in a solution of cellulose-ester containing a suitable amount of gum-content, and drying out the same to constitute a surface-coating that will become sufficiently plastic under the heat and pressure of the usual pressing-operation.

15. The herein-described method of producing record-tablets, which consists of printing upon a core of fibrous material such as cardboard, waterproofing and drying out the same, applying to said dry treated core a solution of pure transparent and essentially gum-free cellulose-ester, drying out the same to constitute a transparent and practically non-thermoplastic intermediate coating, applying to said dry coated core a mixture of an abrasive in a solution of transparent cellulose-ester containing a suitable amount of gum-content, and drying out the same to constitute a transparent surface-coating that will become sufficiently plastic under the heat and pressure of the usual pressing-operation.

16. The herein-described method of producing record-tablets, which consists of printing upon a core of fibrous material such as cardboard, waterproofing and drying out said printed core, applying to said dry core a mixture of an abrasive in a solution of transparent and essentially gum-free cellulose-ester containing a suitable amount of gum-content and drying out the same to constitute a transparent surface-coating that will become sufficiently plastic under the heat and pressure of the usual pressing-operation.

17. The herein-described method of pro-

5 ducing record-tablets, which consists of wa-
 terproofing and drying out a core of fibrous
 material such as cardboard, applying to said
 dry treated core a solution of pure and es-
 10 sentially gum-free cellulose-ester; drying out
 the same to constitute an intermediate and
 practically non-thermoplastic coating apply-
 ing to said dry coated core a mixture of an
 abrasive in a solution of cellulose-ester con-
 15 taining a suitable amount of gum-content,
 and drying out the same to constitute a
 transparent surface-coating having a suffi-
 ciently-low melting-point to be rendered
 plastic under the heat and pressure of the
 usual pressing-operation.

18. The herein-described method of pro-
 ducing record-tablets, which consists of wa-
 terproofing and drying out a core of fibrous
 material such as cardboard, applying to said
 20 dry core a mixture of an abrasive in a solu-
 tion of cellulose-ester containing a suitable
 amount of gum-content and drying out the
 same to constitute a surface-coating having
 a sufficiently-low melting-point to be ren-
 25 dered plastic under the heat and pressure
 of the usual pressing-operation.

19. The herein-described method of pro-
 ducing record-tablets, which comprises ap-
 plying upon the printed surface of a suitable
 core a transparent and practically non-
 30 thermoplastic intermediate coating, and then
 applying upon said coating a transparent
 surface-coating having a sufficiently-low
 melting-point to be rendered plastic under
 35 the heat and pressure of the usual pressing-
 operation.

20. The herein-described method of pro-
 ducing record-tablets, which comprises ap-
 plying upon the surface of a suitable core
 an intermediate and practically non-thermo-
 40 plastic coating, and then applying upon said
 coating a surface-coating having a suffi-
 ciently-low melting-point to be rendered
 plastic under the heat and pressure of the
 45 usual pressing-operation.

21. The herein-described sound-record,
 comprising a moisture-repellant core of
 fibrous material which has printing upon its
 surface, a transparent intermediate coating
 50 of essentially gum-free cellulose-ester ad-
 hering thereto, and a transparent surface-
 coating of cellulose-ester adhering thereto
 and containing abrasive and also a suitable
 amount of gum-content to render said coat-
 55 ing sufficiently plastic under the heat and
 pressure of the pressing-operation, said sur-
 face coating having record-grooves located
 within the depth thereof, and said printing
 being visible through said coatings.

22. The herein-described sound-record,
 comprising a moisture-repellant core of
 fibrous material which has printing upon its
 surface, and a transparent surface-coating of
 essentially gum-free cellulose-ester secured
 65 thereto and containing abrasive and also a

suitable amount of gum-content to render
 said coating sufficiently plastic under the
 heat and pressure of the usual pressing-op-
 eration, said coating having record-grooves
 located within the depth thereof and with
 70 said printing being visible through said coat-
 ing.

23. The herein-described sound-record,
 comprising a moisture-repellant core of
 fibrous material, an intermediate coating of
 75 essentially gum-free cellulose-ester adhering
 thereto, and a surface-coating of cellulose-
 ester adhering thereto and containing abra-
 sive and also a suitable amount of gum-con-
 tent to render said coating sufficiently plastic
 80 under the heat and pressure of the usual
 pressing-operation, said outer coating having
 record-grooves located in the depth thereof.

24. A resilient and rollable record-tablet
 comprising a suitable core, a resilient and
 85 non-thermoplastic intermediate coating, and
 a resilient and thermoplastic surface-coating
 suitable to receive and retain record-grooves.

25. The herein-described sound-record,
 comprising a suitable core which has print-
 90 ing on its surface, a transparent and practi-
 cally non-thermoplastic intermediate coat-
 ing, a transparent surface-coating of thermo-
 plastic material having record-grooves lo-
 cated within the depth thereof, said printing
 95 being visible through said coatings.

26. The herein-described sound-record,
 which comprises a suitable core, an inter-
 mediate coating of relatively-high melting-
 point, a surface-coating of relatively-low
 100 melting-point, and record-grooves located
 entirely within the depth of said surface-
 coating.

27. The herein-described record-tablet,
 comprising a moisture-repellant core of
 105 fibrous material which has printing upon its
 surface, a transparent intermediate coating
 of essentially gum-free cellulose-ester ad-
 hering thereto, and a transparent surface-coat-
 ing of cellulose-ester adhering thereto and
 110 containing abrasive and also a suitable
 amount of gum-content to render it suf-
 ficiently plastic under the heat and pressure
 of the pressing-operation.

28. The herein-described record-tablet,
 115 comprising a moisture-repellant core of
 fibrous material which has printing upon its
 surface, and a transparent surface-coating
 of cellulose-ester secured thereto and contain-
 ing abrasive and also sufficient gum to render
 120 said coating plastic under the heat and pres-
 sure of the usual pressing-operation, said
 printing being visible through said coating.

29. The herein-described record-tablet,
 125 comprising a moisture-repellant core of
 fibrous material, an intermediate coating of
 essentially gum-free cellulose-ester ad-
 hering thereto, and a surface-coating of cellu-
 lose-ester adhering thereto and containing
 130 abrasive and also a suitable amount of gum-

content to render said surface coating sufficiently plastic under the heat and pressure of the pressing-operation.

5 30. A record-tablet comprising a resilient and non-thermoplastic under-coating and a resilient and thermoplastic outer coating which is suitable to receive and retain record-grooves.

10 31. The herein-described record-tablet, comprising a suitable core which has printing on its surface, a transparent intermediate and practically non-thermoplastic coating of relatively-high melting-point, and a transparent and sufficiently thermoplastic surface-coating of relatively-low melting point.

15 32. The herein-described record-tablet, comprising a suitable core, an intermediate coating containing an essentially gum-free cellulose-ester, and a surface-coating containing cellulose-ester having a proportion of gum-content appreciably lower than that of ordinary celluloid.

20 33. A thin flexible record-disc consisting of a core having a coating of practically pure

and gum-free cellulose-ester and another coating of cellulose-ester containing gum and abrasive, the last-named coating being suitable to receive and retain record-grooves, and said disc being sufficiently pliable and resilient to be rolled up and to retain its shape when unrolled.

30 34. A record-tablet having a transparent under coating of practically pure and gum-free cellulose-ester, a transparent outer coating of cellulose-ester containing gum and abrasive, and a transparent outside film of the first-named ester, said outer coating and film being suitable to receive and retain record-grooves.

35 35. A record-tablet having an under coating of practically pure and gum-free cellulose-ester, an outer coating of cellulose-ester containing gum and abrasive, and an outside film of the first-named ester, said outer coating and film being suitable to receive and retain record-grooves.

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