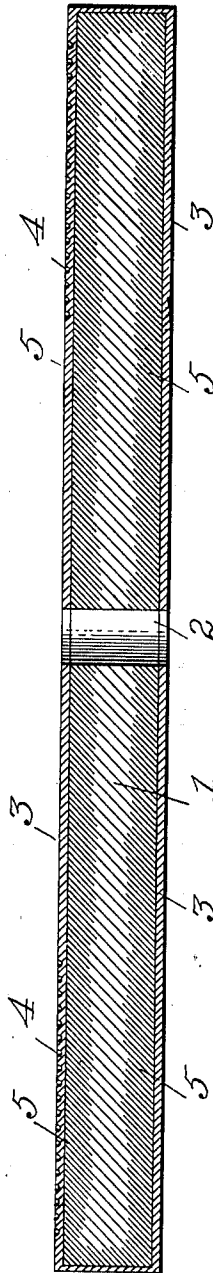


J. SANDERS.
SOUND RECORD TABLET.
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956,904.

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Witnesses:

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UNITED STATES PATENT OFFICE.

JOSEPH SANDERS, OF WASHINGTON, DISTRICT OF COLUMBIA.

SOUND-RECORD TABLET.

956,904.

Specification of Letters Patent.

Patented May 3, 1910.

Application filed April 20, 1904. Serial No. 204,024.

To all whom it may concern:

Be it known that I, JOSEPH SANDERS, a citizen of the United States, and resident of Washington, in the District of Columbia, have invented certain new and useful Improvements in Sound-Record Tablets, of which the following is a specification.

My invention has reference to improvements in sound record tablets, particularly flat sound record tablets, such as are employed in the commercial gramophone, although the invention is also applicable for use in phonographs and graphophones.

The gramophone tablet which is used commercially, consists of a flat disk of hard rubber or of an imitation of hard rubber, having a sound record impressed on one or both surfaces in the shape of a spiral groove of even depth, the groove itself being laterally undulating, and these lateral undulations or sinuosities correspond to the recorded sound waves, which are reproduced from the tablet by causing the sinuosities to react upon a style and diaphragm, as is well known to those skilled in the art.

In a phonograph or graphophone record the groove is not of uniform depth, but of varying depth, and the variations of depth in that case correspond to the recorded sound waves, which are then reproduced from the tablet by causing these vertical undulations to react upon a style and diaphragm in the manner well known to those skilled in the art.

The material of the flat gramophone record tablets is now almost universally a composition of matter in which shellac is combined with infusorial earth or with baryta, or other like substances. The shellac serves as a binder for the powdery body of baryta or infusorial earth, and the mixture forms a mass, which, like hard rubber, is softened by heat, but is very hard when cold. The sound record is impressed upon such tablets by a metallic matrix on which the undulations corresponding to sound waves appear in raised lines. A lump or mass of the record material, heated until it is quite soft or in a doughy condition, is placed upon the matrix and is pressed out into a disk, in intimate contact with the matrix, by the application of considerable force and this tablet of record material is kept in contact with the matrix until cool and hard. In order to serve its purpose the record material must be of such character that it be-

comes soft and plastic when heated, so that it will then receive the impress of a matrix, and when cold it must be so hard that it will then not receive an impression from a matrix, will not elastically yield to and will not perceptibly wear under the action of a gramophone reproducing style; only to such materials do I apply the term gramophone "record material." In this process it is necessary that a considerable thickness or mass of the tablet material be used in order that the body of it form a yielding cushion for the impressed surface at the time when the pressure is exerted upon it by the matrix. The impression obtained, that is to say, the spiral groove, is, under all circumstances, very shallow, rarely exceeding a depth of $\frac{3}{16}$ of an inch, so that it would seem to be sufficient to heat and soften the tablet only at its upper surface and leave the remainder quite hard. Experience, however, has shown that such practice will not yield a good impression and that it is necessary that the record material be yielding to a considerable depth and preferably throughout its whole mass in order that good impressions from the matrix be obtained. This is one of the reasons why the record tablets are made of considerable thickness. Another reason for this practice is that the resinous tablet is rather brittle, so that when dropped upon a hard table or upon a hard floor it will crack and break if made as thin as it might otherwise be made. The material employed, however, particularly the shellac, is quite expensive, and for this reason strength is frequently sacrificed to cheapness.

It is the object of my invention to produce a record tablet that contains only a minimum of resinous or similar record material, but which nevertheless yields under the pressure of the matrix to a considerable depth, and which is also very much stronger than the record tablets made altogether of the resinous compounds usually employed.

In the accompanying drawing I show a cross section of a record tablet made in accordance with my invention.

In this drawing 1 represents a disk of card board, or other stiff, tough, fibrous material. This is made of the size usually given to gramophone tablets; it has a hole 2 at the center for mounting on a turn-table when sound reproduction is desired. This disk is coated with a thin layer 3 of the

resinous record material, adapted to receive, when heated, the impression of a sound record matrix; such impression is indicated at 4. Since it is desirable to use no more of this material than is necessary, I preferably apply to the card board or other fibrous base, first a sizing 5 of rosin which will sink into the surface of the card board for a distance, or may permeate the card board throughout, or any other kind of sizing that softens under heat, that well adheres to or sinks to a certain distance into the card board and to which the superimposed layer of record material also well adheres, may be used. This sizing, by closing the pores of the surface of the card board, prevents the absorption by the body of the card board of the superimposed layer of record material, and when the sizing permeates the card board it acts as a binder for the fibers causing the tablet to retain its shape after pressing and making it more solid and compact, for, without the binding action of the sizing of the card board fibers would tend to return to their original shape when the pressure is relieved.

When rosin, which I prefer as a sizing, is employed, I dissolve it in benzol, alcohol or other like solvent, and either dip the tablet into the solution and then withdraw it and allow the solvent to evaporate, or this sizing can be applied by a brush.

Upon the sized paste board or other fibrous disk the record material may be applied in any desired manner, but in order that the record material form a uniform and at the same time thin layer, I have found that it is best that it be applied in a fluid state. For this purpose the record material may be dissolved in a suitable solvent and the sized disk dipped into that mass or painted with the same, so that after the evaporation of the solvent there remains upon the surface of the disk a thin layer of the record material. I have found that the layer of record material need not be thicker, but may be thinner than $\frac{1}{16}$ of an inch; it is thus a mere film.

The record material which is particularly adapted for the production of my improved sound record tablet consists of shellac as a binder and of an oxid of a metal, preferably the natural oxid of iron as the powdery body. To prepare this material for application to the tablet, I dissolve the shellac in alcohol and mix into this solution the requisite quantity of metal oxid, so that the whole mass forms a rather thin paint or emulsion. I have found the proportion of two parts of shellac to three parts of iron oxid, gives good results.

This mode of preparing the record material by dissolving the shellac or other rosin, or gum, or other binder, and then mixing the oxid of iron or other proper substance

into it, gives an exceedingly intimate and uniform mixture, such as cannot be obtained by stirring the powdery body into the molten mass of the binder. Another important advantage results from this process of making the record material is that it avoids the necessity of fusing the shellac or other binder and thus the danger of deteriorating the same by the high temperature to which it must be subjected. The paint thus obtained is applied to the sized fibrous disk either by a brush, as in ordinary painting, or the disk is immersed in the paint. The alcohol evaporates readily and there is then upon the disk a hard thin film of record material. A sound record is impressed upon this disk, upon one or both surfaces, by heating the disk until the record material becomes plastic, and then pressing onto it a suitably prepared matrix of a sound record, and holding it in contact with the disk until the latter has cooled and the record material has become quite hard.

The record tablet constituted as above described is very much tougher and stronger than record tablets entirely composed of record material, and it receives and retains the impress of a matrix fully as well as if it were entirely composed of record material, since the card board or other fibrous base, particularly when impregnated throughout with sizing, yields under the pressure of the matrix sufficiently for the purpose. At the same time my improved tablet is very much cheaper than tablets which are made entirely of record material such as the shellac mixture now used.

The sizing described, because it is hard and resisting when cold and softens under the action of the degree of heat usually employed in the manufacture of sound record duplicates from a matrix of a sound record may be termed "thermoplastic", which term is also applicable to the specific sound record material hereinbefore described as well as to other sound record materials of the gramophone class.

When the tablet blank is subjected to the heat and pressure usually employed the plasticity of the sizing permits some displacement of the fibers of the base from their initial relations and furthermore there will be some flowing of the sizing when softened by heat and the structure is subjected to pressure. The softened sizing appears to serve as a lubricant for the fibers of the body material of the base permitting and facilitating the movement of the fibers one upon another to an extent sufficient to cause the base to readily conform to the grosser irregularities in the active faces of the matrix or die or both when a sound record duplicate is being pressed, and to also conform to any lack of true parallelism between the matrix and die or where the pressing

surfaces are not true planes. Because of this automatic adjustment of the base to the matrix and die as the sound record groove is being impressed into the record material 5 on the surface of the tablet, the active face of the matrix is brought into intimate contact with the record material at all points and a perfect impression results.

When the sized base has been cooled to 10 ordinary temperatures before the pressure is relieved, the sizing hardens and sets and anchors the fibers against their normal or inherent tendency to return or spring back when relieved from pressure. It follows, 15 therefore, that the base of the tablet, is itself thermoplastic.

When a tablet is formed wholly of gramophone material in which case they may be termed "homogeneous" tablets to distinguish 20 them from the composite tablets of the present invention, and especially with homogeneous tablets formed of the shellac mixtures now in common use, there is a mass flow of the material which is not only wearing on the active face of the matrix, but the 25 dies are liable to dish because, in the manufacture of homogeneous tablets of shellac mixtures, it is customary to apply the material in the form of a heated lump or mass to the middle portion of the matrix and to 30 then force the hot plastic material outward to the edges of the matrix.

With a tablet constructed in accordance with the present invention the pressure is 35 very evenly distributed at all times over the entire active surfaces of the matrix and die since the tablet blank, that is, the tablet before the sound record groove is impressed therein, is nearly or quite coextensive with 40 the matrix. Consequently there is no liability of dishing the die and for this reason the die may be made much thinner and the heating and cooling is expedited and handling is facilitated.

45 The normal characteristics of the fibrous material of the base of the tablet, in so far as this fibrous material resists any marked changes in shape under the pressure employed, predominate in the sized and coated 50 tablet blank, and while the sizing imparts thermoplasticity to the base of the tablet, such thermoplasticity is not sufficient to cause the base to lose its shape when heated or to then flow under pressure except to the 55 very limited extent necessary to cause it to conform to irregularities in or want of parallelism between the matrix and die or of tablet blank with either of them. What adjustment of the base of the tablet blank to 60 the matrix or die or both of them may occur while the impressing of the sound record groove is progressing is so limited in extent that there is no danger of rupturing or otherwise injuring the thin film of record 65 material on the surface of the tablet blank.

Furthermore, the record material of the film while flowing sufficiently to insure a perfect conformity to the matrix under the action of heat and pressure, does not flow to any such extent or cause such wear on the matrix 70 as occurs when the tablets are made of homogeneous material.

While the improved tablet or tablet blank is lighter and far less frangible than the homogeneous tablets due to predominant 75 characteristics of the fibrous body material, and can also be more cheaply and expeditiously produced than can the homogeneous tablets, the brilliancy of reproduction from sound record grooves impressed in the improved or composite tablets is fully equal to 80 that from homogeneous tablets. This is due to the hardness imparted to the base of the tablet, by the sizing; the composite tablet with the sound groove impressed therein 85 being comparable to homogeneous tablets of the shellac compositions in resonant qualities.

The thermoplastic material of the base portion of the tablet imparts such characteristics 90 to the base that the bending and expansion coefficients of the base and surfacing of record material are so nearly alike as to prevent cracking of the surface film of record material, and warping of the 95 tablet.

While it is practicable to coat only one surface of the fibrous disk with the record material, I have found it preferable to coat the disk on both sides and on the edges in 100 order to prevent warping; and this I do whether a sound record is impressed only on one side or both.

While I have found the record material composed of shellac and metallic oxid to 105 be the best for the purpose of my invention, I am by no means confined to the use of these materials. Other compounds may be used although not with like advantage.

I do not herein claim the process of making 110 the record tablets, since such process is claimed in another application, Serial No. 252,840, filed by me on March 30, 1905, as a division of this case.

Having now fully described my invention 115 I claim and desire to secure by Letters Patent:

1. A sound record tablet consisting of a base of stiff fibrous material, with a sizing which softens when heated applied to its 120 surface, and a layer of gramophone record material upon the sizing, substantially as described.

2. A sound record tablet consisting of a stiff fibrous base, with a sizing that softens 125 when heated applied to its surface, and a layer of gramophone record material superimposed thereon and a sound record groove impressed therein, substantially as described.

3. A sound record tablet consisting of a 130

disk of cardboard, having its surface sized with rosin, and a layer of gramophone record material applied thereto, substantially as described.

5 4. A sound record tablet consisting of a disk of cardboard, with a sizing of rosin applied to its surface, a layer of gramophone record material superimposed thereon, and a sound record groove impressed into the
10 record material, substantially as described.

5. As a new article of manufacture, a normally flat record blank of sufficient rigidity to substantially maintain its normal shape in ordinary handling, said blank having a homogeneous core or center made up of
15 a porous body of fibrous material and a bond of size permeating said body, a surface coating of size on said body and a surface of plastic gramophone material on the coating of size, said plastic material being
20 adapted to receive and retain impressions, substantially as described.

6. A sound record tablet consisting of a base of stiff fibrous material with a sizing
25 that softens when heated applied to its surface, and a layer of suitable record material upon the sizing, substantially as described.

7. A sound record tablet consisting of a stiff fibrous base, with a sizing that softens
30 when heated applied to its surface, and a layer of suitable record material superimposed thereon and a sound record groove impressed therein, substantially as described.

8. A sound record disk tablet consisting
35 of a base of fibrous material having resinous material upon its surface and in its body and a surface of suitable record material applied to said base.

9. A sound-record tablet consisting of a
40 base of stiff fibrous material with a sizing that softens when heated applied to its surface, and a layer of disk record material upon the sizing, substantially as described.

10. A sound-record tablet consisting of a
45 stiff fibrous base, with a sizing that softens when heated applied to its surface, and a layer of disk record-material superimposed thereon and a sound record groove impressed therein, substantially as described.

11. A sound-record disk tablet consisting
50 of a base of fibrous material having resinous material upon its surface and in its body and a surface of disk record-material applied to said base.

12. A sound-record tablet consisting of a
55 base of stiff fibrous material with a sizing applied to its surface, and a layer of disk record-material upon the sizing, substantially as described.

13. A sound-record tablet consisting of a
60 stiff fibrous base, with a sizing applied to its surface, and a layer of disk record-material superimposed thereon, and a sound-record groove impressed therein, substantially as
65 described.

14. A sound record tablet consisting of a base of fibrous material of sufficient stiffness to maintain its shape, a sizing applied to its surface, and a surface of record material sufficiently hard to practically resist
70 the action of a pointed stylus and applied to said sized base.

15. A sound record tablet consisting of a fibrous base, stiffening material rendering the base plastic under the action of heat
75 and pressure and capable, when cold, of rigidly maintaining the form imparted to it under the action of heat and pressure, and a surface coating of gramophone record material.
80

16. A sound record tablet composed of a formed fibrous base, a thermo-plastic material incorporated in said base, said material being of a character unsuited for the reproduction of gramophone sound record
85 impressions therein, and a surface coating of gramophone record material.

17. A sound record tablet blank comprising a fibrous structure, a layer of resinous record receiving material thereon, and a
90 thermoplastic material stiffening the fibrous structure to resist bending under normal conditions of use to an extent to cause the cracking of the surface layer of record material.
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18. A sound record tablet blank comprising a fibrous structure, a layer of record receiving material thereon containing shellac, and a thermoplastic material stiffening the fibrous structure to resist bending under normal
100 conditions of use to an extent to cause the cracking of the surface layer of record material.

19. A sound record tablet blank comprising a fibrous structure, a layer of resinous
105 record receiving material thereon, and a thermoplastic material applied to the fibrous structure and imparting stiffness and rigidity to the tablet blank.

20. A sound record tablet comprising a
110 fibrous structure, a layer of resinous record receiving material thereon having a record groove impressed therein, and a thermoplastic material applied to the fibrous structure and imparting stiffness and rigidity to
115 the tablet.

21. A sound record tablet comprising a fibrous structure, a layer of record receiving material thereon containing shellac and having a sound record groove impressed therein,
120 and a thermoplastic material applied to the fibrous structure and imparting stiffness and rigidity to the said tablet.

22. A sound record tablet blank comprising a fibrous structure, a layer of resinous
125 record receiving material thereon, and a thermoplastic material unsuited for the reproduction of sound from a sound record groove impressed therein, said thermoplastic material being applied to the fibrous struc-
130

ture and imparting stiffness and rigidity to the tablet blank.

23. A sound record tablet blank comprising a fibrous structure, a layer of gramophone record receiving material thereon and containing shellac, and a thermoplastic material unsuited for the reproduction of sound from a gramophone sound record impressed therein, said thermoplastic material being applied to the fibrous structure and imparting stiffness and rigidity to the tablet blank.

24. A sound record tablet comprising a fibrous structure, a layer of record receiving material thereon containing shellac and having a sound record groove impressed therein, and a thermoplastic material unsuited for the reproduction of sound from a gramophone sound record impressed therein, said thermoplastic material being applied to the fibrous structure and imparting stiffness and rigidity to the tablet.

25. A tablet adapted for sound record duplicates having a surface layer of gramophone record material containing shellac and a base or under-structure including thermoplastic material and means resistant to the spreading of the surface layer of gramophone material under the action of heat and pressure incident to impressing a sound record groove into said surface layer from a matrix thereof.

26. A disk-shaped sound record tablet having a surface layer of gramophone record material containing shellac and having a sound record groove impressed therein, and a base or under-structure including thermoplastic material and means resistant to the spreading of the surface layer of gramophone material under the action of heat and pressure incident to impressing a sound record groove therein from a matrix thereof.

27. A sound record tablet blank comprising a base or under-structure of fiber and thermoplastic material with the fiber predominating and the thermoplastic material rendering the base yieldable under heat and pressure and when cold resistant to distorting forces, and a surface coating of thermoplastic material capable when heated of receiving the impress of a record matrix and when cold of retaining such impress and then resistant to the action of the stylus of a sound reproducing machine of the gramophone type.

28. A sound record tablet comprising a base or under-structure of fiber and thermoplastic material with the fiber predominating and the thermoplastic material rendering the base yieldable under heat and pressure and when cold resistant to distorting forces, and a surface coating of thermoplastic material capable when heated of receiving the impress of a sound matrix and when cold of retaining such impress and then resistant to the action of a stylus of a sound

reproducing machine of the gramophone type, the surface coating having a sound record groove impressed therein.

29. A sound record tablet blank comprising a base or under-structure of fiber and thermoplastic material with the fiber predominating and the thermoplastic material rendering the base yieldable under heat and pressure and when cold resistant to distorting forces, and a surface coating of thermoplastic material containing shellac and capable when heated of receiving the impress of a sound record matrix and when cold of retaining such impress and then resistant to the action of the stylus of a sound reproducing machine of the gramophone type.

30. A sound record tablet comprising a thermoplastic disk-shaped base or under-structure and a surface coating of gramophone or disk record material with a sound record groove impressed therein, both base and surface material yielding under the action of heat and pressure for the impress of a sound record groove in the surface layer, and the base when cold retaining the shape imparted to it under heat and pressure and also being resistant to distorting forces, the thermoplasticity of the base or under-structure being due to a different material from that of the record receiving material but of substantially the same bending coefficient.

31. A sound record tablet blank comprising a fibrous base or under-structure yieldable under the action of heat and pressure, and a surfacing of gramophone or disk record material, the base or under-structure and the surfacing possessing different degrees of thermoplasticity.

32. A sound record tablet blank comprising a thermoplastic base or under-structure and a surfacing of gramophone or disk record material, the base or under-structure being thermoplastic to a less degree than the surfacing material.

33. A sound record tablet comprising a thermoplastic base or under-structure and a surfacing of gramophone or disk record material with a sound record groove impressed therein, the base or under-structure being thermoplastic to a less degree than the surfacing material.

34. A sound record tablet blank comprising a formed fibrous base or under-structure impregnated with a thermoplastic material rendering the base when cold hard and resisting to distorting forces, and a surfacing of gramophone or disk record material.

35. A sound record tablet comprising a formed fibrous base or under-structure impregnated with a thermoplastic material rendering the base when cold hard and resisting to distorting forces, and a surfacing of gramophone or disk record material having a record groove impressed therein.

36. A sound record tablet blank comprising

ing a formed fibrous base or under-structure impregnated with thermoplastic material rendering the base when cold hard and resisting to distorting forces, and a surfacing of gramophone or disk record material containing shellac.

37. A sound record tablet blank having a thermoplastic surface resistant to the wear of the stylus of a gramophone or disk type of sound reproducing machine, and a non-frangible base or under-structure containing a characteristically predominant mass of substantially non-thermoplastic material and sufficient thermoplastic material to render the base or under-structure yieldable to the action of heat and pressure and when cold resistant to distorting forces.

38. A sound record tablet blank having a thermoplastic surface containing shellac and resistant to the wear of a stylus of the gramophone or disk type of sound reproducing machine, and a non-frangible base or under-structure comprising a normally porous material containing sufficient thermoplastic material to render the base or under-structure compactible when heated and subjected to pressure and when cold resistant to distorting forces.

39. A sound record tablet having a base of a normally absorbent material with its interstices infiltrated with thermoplastic material rendering the base yieldable under the action of heat and pressure, and a surfacing of gramophone or disk record material.

40. A sound record tablet comprising a disk of tenacious fibrous material infiltrated with a thermoplastic material rendering the disk yieldable under the action of the heat and pressure used for impressing the record groove from a sound record matrix and when cold maintaining the disk in the shape imparted to it under the action of the heat and pressure employed against the action of distorting forces, and a surface layer of gramophone or disk record material.

41. A sound record tablet comprising a disk of tenacious fibrous material infiltrated with thermoplastic material rendering the disk yieldable under the action of heat and pressure and when cold maintaining the disk in the shape imparted to it under heat and pressure and against the action of distorting forces, and a surface layer of gramophone or disk record material containing shellac.

42. A sound record tablet having a surface layer of material adapted for the reception of a sound record groove and the reproduction of the sound therefrom, and a base or under-structure comprising a continuous or unbroken body of fiber and a material rendering the base or under-structure resonant.

43. A sound record tablet having a surface layer of gramophone record material containing shellac, and a base or under struc-

ture comprising a continuous or unbroken body of fiber and a material imparting to the base or under-structure resonant qualities similar to those of the surface layer.

44. A sound record tablet having a surface layer of gramophone record material containing shellac, and a base or under-structure comprising a continuous or unbroken body of fiber and a thermoplastic material imparting to the base or under-structure resonant qualities similar to those of the surface layer.

45. A sound record tablet having a base or under-structure composed of a disk of fibrous material and a material applied thereto and imparting resonant qualities to the base or under-structure, and a surface layer of a material adapted for the reproduction of sound from a sound record groove formed therein.

46. A sound record tablet having a base or under-structure composed of a disk of fibrous material and a material applied thereto and imparting resonant qualities to the said base or under-structure, and a surface layer of resonant gramophone material.

47. A sound record tablet having a base or under-structure composed of a disk of fibrous material and a material applied thereto and imparting resonant qualities to the said base or under-structure, and a surface layer of gramophone material containing shellac.

48. A sound record tablet having a base or under-structure composed of a disk of fibrous material infiltrated with a material imparting resonant qualities to said base or under-structure, and a surface layer of a material adapted for the reproduction of sound from a sound record groove formed therein.

49. A sound record tablet having a base or under-structure composed of a disk of fibrous material and a material applied thereto and imparting resonant qualities to the base or under-structure, and a surface layer of resonant material adapted for the reproduction of sound from a sound record groove formed therein and containing a sound record groove.

50. A sound record tablet having a base or under-structure composed of a disk of fibrous material and a material applied thereto and imparting resonant qualities to the said base or under-structure, and a surface layer of resinous material adapted for the reproduction of sound from a sound record groove formed therein and containing a sound record groove.

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

JOSEPH SANDERS.

Witnesses:

CHARLES JACKSON,
LEO P. NACHMAN.