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H. WESTERKAMP

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METHOD OF PRODUCING SOUND BAND MATRICES

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Fig. 2.

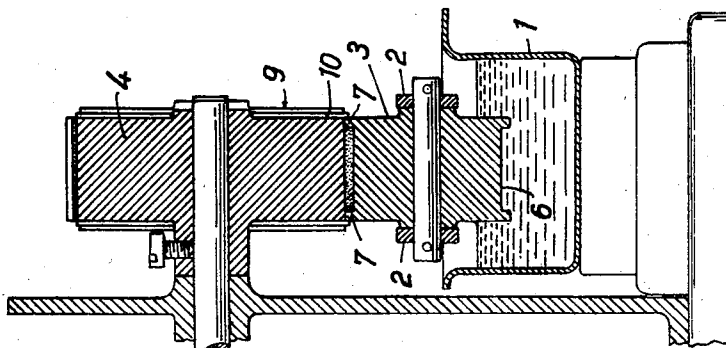
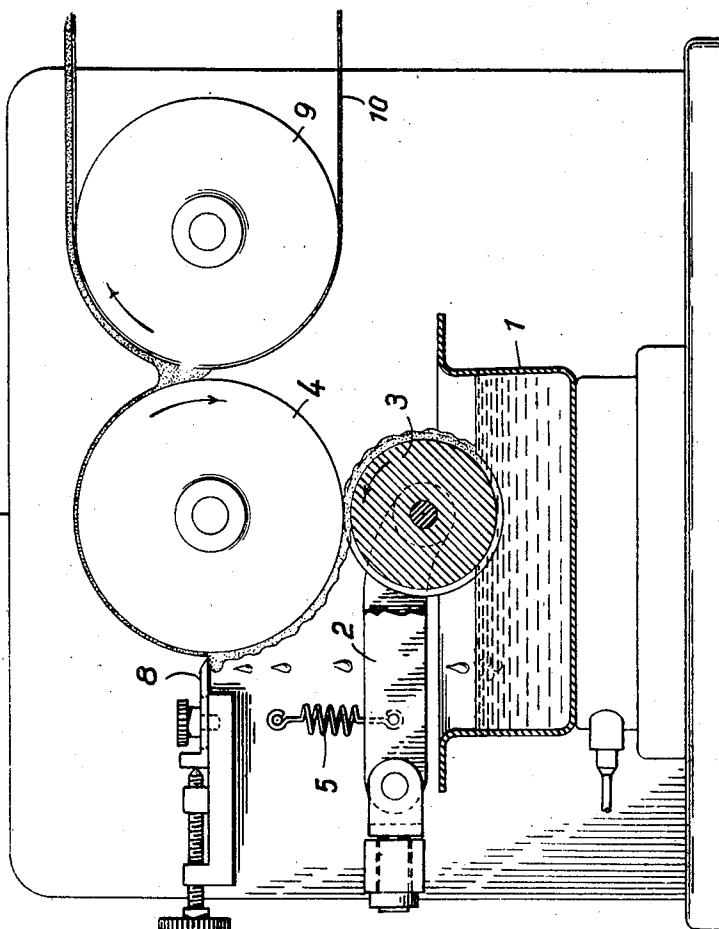


Fig. 1.



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## UNITED STATES PATENT OFFICE

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METHOD OF PRODUCING SOUND BAND  
MATRICESHugo Westerkamp, Cologne-Poll, Germany;  
vested in the Alien Property CustodianApplication October 5, 1940, Serial No. 359,975  
In Germany October 20, 1939

6 Claims. (Cl. 18—57)

The invention relates to a method of producing sound band matrices by coating the original sound band with a liquid gelatinous substance or gelatinizing albumins and, after the matrix substance has hardened, drawing off the so-formed band-shaped coating from the original sound band. Coating the recorded surface of the original sound band with the matrix substance may, for example, be effected by means of a rotating roller partly dipping into a bath of the substance, said roller feeding the substance in a thin layer, either directly or by insertion of a feeding roller, to the surface of the original sound band.

The application of the matrix substance to the recorded surface of the original sound band is particularly difficult if this band consists of a wax band, because the slightest contact of the comparatively soft wax with a solid body will at least destroy the record, if it does not cause the wax layer to come off its base. But also in the case of original sound bands not having a sound record layer of wax, a direct contact of the surface of the original sound band with a solid body will impair the quality of the sound band matrix, in which connection it should be noted that in applying layers of a substance to bands, a direct contact between the band and the element feeding the substance was hitherto considered necessary for securing a uniform distribution of the substance on the band or for preventing the formation of air bubbles.

According to the invention, the uniformly thick layer of the matrix substance, which is continuously fed to the surface of the original sound band, moving at a uniform speed, is dammed by said sound band, preventing direct contact between the sound band and the element feeding the substance. This damming causes an accumulation of substance bridging over the space between the original sound band and the feeding element, which accumulation may be termed a damming wave, in other words: a small but definite quantity of substance uniformly distributed over the width of the original sound band is formed directly at the place of application, from which quantity the original sound band draws the substance required to form the matrix.

Especially if the original sound band has a recorded wax layer, it is advisable to mix the matrix substance with an addition reducing its surface tension, for example a soap solution or alcohol, in order that the substance shall properly enter even the smallest groove-shaped sound tracks.

The uniformity of the damming wave formed, which is maintained in the course of making the matrix as well as in the state of rest, is attained according to the invention by keeping the thickness of the gelatine layer or the like, fed to the place of application, smaller than the thickness of the layer of substance received by the original sound band, and by correspondingly increasing the feeding speed of the layer of gelatine supplied. As thorough experiments have shown, the ratio of the speed, at which the matrix substance is fed to the place of application, to the linear speed of the original sound band should preferably be made about 5 to 1.

In feeding the layer of the matrix substance to the place of application by means of a roller, it is advisable to keep the thickness of the layer of substance fed by the roller so small as not to exceed a few hundredths of a millimetre. Furthermore, the velocity of rotation of the feeding roller is preferably kept below the empirically determinable critical velocity at which the matrix layer has the tendency to accumulate on the central portion of the roller.

The space between the original sound band and the feeding roller, the velocity of this roller and of the band, and the thickness of the layer of substance fed by the roller should be adjusted so that, in the final result, a complete consumption of the substance fed, without air bubbles, is made possible by a most uniform application to the original sound band without the band touching the roller.

At the place of application, the original sound band is preferably moved in a direction opposite to that in which the matrix substance is fed.

For carrying out the method according to the invention, it is advisable to use the device for producing wax ribbons for mechanical sound recording purposes shown in the U. S. patent application "Method and device for producing wax ribbons for mechanical sound recording" of Richard Ruhnau, Serial No. 353,978, filed August 23, 1940.

A constructional example for carrying out the method according to the invention is illustrated in the accompanying drawing in which:

Fig. 1 is a diagrammatical side view of a device for carrying out the method according to the invention,

Fig. 2 is a section through the device shown in Fig. 1 on the line II—II.

The gelatinous substance or the gelatinizing albumin is liquified in a vessel 1 by adding a solvent or is introduced in liquid state into the

vessel. Preferably, an addition reducing the surface tension, for example a soap solution or alcohol, is mixed with the substance.

A roller 3, hereinafter called bailing roller, mounted to rotate on an arm 2 pivotally connected by a universal joint, partly dips into the bath and is rotated by a mechanically driven roller 4. A spring 5, attached at one end to the arm 2 and at the other end to a stationary part of the device, draws the bailing roller 3 towards the circumference of the roller 4. As will be seen from Fig. 2, the bailing roller 3 is provided at its circumference with a rather wide groove 6, the depth of which is so dimensioned that a sufficient quantity of the matrix substance will be permitted to pass between the rollers 3 and 4 and will be supplied to the roller 4.

The edge ribs 7 touch the straight generatrix of the roller 4.

The bailing roller 3, in its rotation, takes up matrix substance from the vessel 1 and transfers it to the upper roller 4. The film of the substance deposited upon the roller 4, hereinafter called feeding roller, is partly removed again by an adjustable knife-shaped stripping plate 8 and returned into the vessel 1. The rest of the layer of substance remaining on the feeding roller is free from air bubbles and partakes completely uniformly in the rotation of the feeding roller.

A roller 9, arranged opposite the feeding roller 4, serves to convey the recorded original sound band 10. The band conveying roller 9 is adjustable with respect to the feeding roller 4, and both rollers turn in the same direction. In operating the device, the band conveying roller is moved towards the feeding roller by means of a suitable shifting device so far as to cause the film of substance to slightly touch the band arriving in opposite direction whereby the liquid substance is dammed, thus ensuring the uniform transfer of the substance to the band.

The best results are obtained if, by means of the stripper 8, the thickness of the layer of substance is reduced to a few hundredths of a millimetre, and if the circumferential velocity of the feeding roller 4 is considerably increased with respect to the running speed of the band so that the circumferential velocity of the roller 4 and the running speed of the band are in the proportion of about 5 to 1.

It was found that the operating speed of the device is limited by the fact that the film of substance, if the roller 4 rotates too quickly, has the tendency to accumulate to an elevation in the centre of the roller, whereas the edges of the roller remain nearly free from the substance.

The optimum operating speed is easily found by experimenting, if regulating means are provided for the driving motor. It has also been found to be advantageous to arrange strippers at the roller 4 in such a way that any substance adhering to the sides of the rollers is also returned into the vessel 1, as it would otherwise lead to thickening of the edge portions of the matrix.

Finally, it was found advisable to make the width of the substance rollers 3 and 4 a little smaller than the width of the original sound band. The object of this is to prevent the liquid substance from running over the edges of the band.

It is preferable not to produce the matrix in one single operation, owing to the fact that it is difficult to uniformly apply the matrix substance in a very thin layer. Therefore, the matrix

substance is applied to the original sound band in several thin layers one upon another until the coating thus formed, when hardened, has the thickness of the matrix desired. When this thickness is reached, the band-shaped coating is drawn off the original sound band; it represents the matrix ready for use. Each individual comparatively thin layer of the matrix substance applied at a time is dried before applying the next layer. For this purpose, slight heating is advisable in order to remove the solvent contained in the matrix substance.

What is claimed, is:

1. A method of making a matrix for preparation of duplicate sound records from an original sound band which has mechanically-cut sound tracks in a soft wax coating supported on a carrier layer, without mechanical contact with said soft wax coating of materials other than the matrix-forming material, which comprises the steps of advancing the original sound band through a deposit zone, preparing a layer of liquid film-forming material selected from the group consisting of gelatine and gelatinous albumins, and containing a solution effective to reduce the surface tension of the layer, said layer being substantially as wide as the matrix to be formed and having a uniform thickness which is a fraction of that of the matrix layer to be formed, bringing the layer into the deposit zone at a predetermined constant rate of speed, said rate of speed being greater than the rate of advancement of the original sound band, and contacting the original sound band with the material from said layer for damming the same against movement in the direction of said layer and withdrawing from the dammed-up material a uniform film of greater thickness than said layer for forming the said matrix, and stripping the matrix from the sound band.

2. A method of making a matrix for preparation of duplicate sound records from an original sound band which has mechanically-cut sound tracks in a soft wax coating supported on a carrier layer, without mechanical contact with said soft wax coating of materials other than the matrix-forming material, which comprises the step of advancing the original sound band through a deposit zone, preparing a layer of liquid film-forming material selected from the group consisting of gelatine and gelatinous albumins, and containing a solution effective to reduce the surface tension of the layer, said layer being substantially as wide as the matrix to be formed and having a uniform thickness which is a fraction of that of the matrix layer to be formed, bringing the layer into the deposit zone at a predetermined constant rate of speed and in a direction relatively opposite to that of the movement of the original sound band, said rate of speed being a multiple of the rate of advancement of the original sound band, and contacting the original sound band with the material from said layer for damming the same against movement in the direction of said layer and withdrawing from the dammed-up material a uniform film of greater thickness than said layer for forming the said matrix, and stripping the matrix from the sound band.

3. A method of making a matrix for preparation of duplicate sound records from a sensitive original sound band having a plurality of mechanically-cut sound tracks extending lengthwise therein, which comprises the steps of advancing the original sound band past a deposit

zone, preparing a layer of predetermined thickness of a liquid film-forming material selected from a group consisting of gelatine and gelatinous albumins and containing a solution effective to reduce the surface tension of the layer and having a uniform thickness not exceeding a few hundredths of a millimeter, bringing the said layer to said zone in a direction relatively opposite to that of the movement of the original sound band and at a predetermined uniform rate of speed which is substantially five times the rate of speed of the sound band, said layer being substantially as wide as the matrix to be formed, and causing the layer of film-forming material to contact with and be dammed by and built up on the advancing original sound band and where- with the original sound band in its continued advance past the point of contact withdraws from the dammed-up supply of material and carries with itself a film of said material conforming to its surface and to the sound track therein and constituting the body of said matrix and having a thickness which is substantially five times the thickness of said prepared layer, drying the deposited layer and returning the original sound band with said layer thereon through the deposit zone whereby to effect a further deposit and thickening of the matrix, and stripping the matrix from the original sound band.

4. A method of making a matrix for preparation of duplicate sound records from a sensitive original sound band having a plurality of mechanically-cut sound tracks extending lengthwise therein by employment of rollers rotatable about parallel axes, which comprises the steps of moving the original sound band in contact with the periphery of the first rollers past a deposit zone located between the rollers, preparing upon the second roller a layer of predetermined thickness of a liquid film-forming material selected from a group consisting of gelatine and gelatinous albumins and containing a solution effective to reduce the surface tension of the layer, rotating the second roller in a peripheral direction relatively opposite to that of the rotation of the first roller and at a predetermined uniform rate of speed which is substantially five times the rate of speed of the sound band, said layer being substantially as wide as the matrix to be formed and being of uniform thickness, and causing the layer of film-forming material to contact with and be dammed by and built up on the advancing original sound band without mechanical contact of the second roller with the sound band, and where- with the original sound band in its continued advance past the point of contact withdraws from the dammed-up supply of material and carries with itself an attenuated film of said material conforming to its surface and to the sound track therein and constituting the body of said matrix, and stripping the matrix from the original sound band.

5. A method of making a matrix for preparation of duplicate sound records from a sensitive original sound band having a plurality of mechanically-cut sound tracks extending lengthwise therein by employment of rollers rotatable about parallel axes, which comprises the steps of moving the original sound band at constant speed

in contact with the periphery of the first roller past a deposit zone located between the rollers, preparing upon the second roller a layer of a liquid film-forming material selected from a group consisting of gelatine and gelatinous albumins and containing a solution effective to reduce the surface tension of the layer and thus having a predetermined uniform thickness not exceeding a few hundredths of a millimeter, rotating the second roller at a peripheral speed below that at which the material of the layer collects toward the center of length thereof and thereby bringing said layer to said zone in a direction relatively opposite to that of the movement of the original sound band and at a predetermined uniform rate of speed which is substantially five times the rate of speed of the sound band, said layer being of slightly less width than the matrix to be formed, and causing the layer of film-forming material to contact with and be dammed by and built up on the advancing original sound band without mechanical contact of the second roller with the sound band and wherewith the original sound band in its continued advance past the point of contact withdraws from the dammed-up supply of material and carries with itself attenuated film of said material conforming to its surface and to the sound track therein and constituting the body of said matrix, drying the deposited layer and returning the original sound band with said layer thereon through the deposit zone whereby to effect a further deposit and thickening of the matrix, and stripping the matrix from the original sound band.

6. A method of making a matrix for preparation of duplicate sound records from a sensitive original sound band having a plurality of mechanically-cut sound tracks extending lengthwise therein by employment of rollers rotatable about parallel axes, which comprises the steps of moving the original sound band at constant speed in contact with the periphery of the first roller past a deposit zone located between the rollers, preparing upon the second roller a layer of a liquid film-forming material selected from a group consisting of gelatine and gelatinous albumins and containing a solution of soap, rotating the second roller at a rate above that of the first roller but below that at which the material collects toward the center of length thereof and thereby bringing said layer to said zone in a direction relatively opposite to that of the movement of the original sound band and at a predetermined uniform rate of speed which is substantially five times the rate of speed of the sound band, said layer being of slightly less width than the matrix to be formed, and causing the layer of film-forming material to contact with and be dammed by and built up on the advancing original sound band and where- with the original sound band in its continued advance past the point of contact withdraws from the dammed-up supply of material and carries with itself a film of said material conforming to its surface and to the sound track therein and constituting the body of said matrix and having a thickness which is substantially five times the thickness of said prepared layer, and stripping the matrix from the original sound band.

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