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CARRIER FOR RECORDING AND PROCESS FOR MAKING SAME

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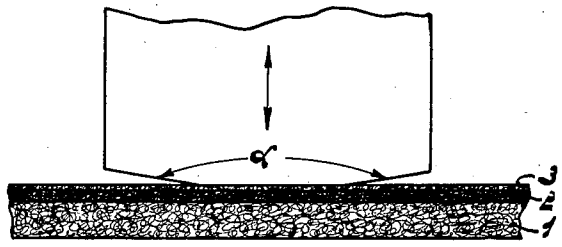


Fig. 1.

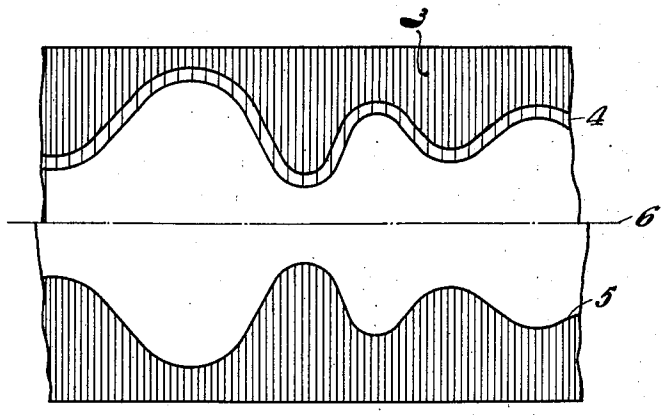


Fig. 2.

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CARRIER FOR RECORDING AND PROCESS FOR MAKING SAME

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12 Claims. (Cl. 274—41.6)

Our present invention relates to carriers of records and to the manufacture of same, and more particularly to carriers for the mechanical recording of optically reproducible vibration tracks, in which the carrier is provided with an opaque covering layer which is partly removed during recording.

By "vibration track" is meant in this connection, a record of any type of vibration, obtained on a carrier by cutting, indenting, or like operation.

A material is referred to as "opaque", herein, when it strongly absorbs light rays of such wave lengths, as are used in the reproduction and/or photographic copying of the record.

One object of the invention is to provide a carrier of the above type, in which the covering layer, after its application to the carrier, requires no after-treatment.

A further object of our invention is to provide for a covering layer which gives an extremely sharp boundary line between the vibration track and its background.

A further object of the invention is to provide a covering layer which possesses a very high "covering capacity" i. e., that even very thin layers thereof are opaque.

By giving a very sharp boundary line and by having a very high covering capacity, covering layers according to our invention, make it possible to obtain records giving very high quality reproduction and from which excellent copies can be obtained. The advantages of records made in accordance with our invention manifest themselves especially in recording high-frequencies.

None of the previously known covering layers met the various objects above set forth, and the records obtained with carriers using such covering layers fell short of meeting the requirements of high-quality reproduction.

For instance, covering layers have been suggested for this purpose consisting of an exposed and developed photographic emulsion. Such covering layers required, after their application to the carrier, a rather involved processing. Furthermore, the size of the grain of such a covering substance prevents the cutting of a track with a sharp boundary line. When a track recorded on a carrier having such a covering layer is viewed under a microscope, instead of showing a sharp boundary line, it shows a hazy boundary zone with a varying degree of opaqueness.

This seems to be due to the fact that when using such emulsions, comparatively large sized and hard silver grains are embedded in an elastic mass of gelatin.

Furthermore the covering capacity of such layers is insufficient below certain thicknesses, as a rule below about 5 microns. On the other hand, it is of great importance to make the covering layer as thin as possible and to preferably go below the above-stated thickness limit, because the thinner the covering layer, the smaller may be the amplitudes imparted to the cutting tool and the smaller the cutting energy required to remove the opaque layer.

Other covering layers, as for instance, lacquer, ink, or dyestuffs, while having the advantage of not requiring, as a rule, an after-treatment, have the objection of having insufficient covering capacity. Furthermore they are liable to show small fissures on their surface and also when cut, instead of giving a smooth boundary line, result in a jagged boundary line.

According to the invention, the light-absorbing substance of the covering layer consists of metals or metal compounds, the particles of which have colloidal dimensions. By particles having colloidal dimensions, are meant such particles, which when viewed under the microscope with hundredfold magnification, cannot be individually discerned.

One of the advantages of using colloids as covering layers, is that they can be easier applied to the carrier than the materials heretofore used.

Furthermore, these substances can be so applied as to give a practically homogeneously opaque covering layer, which gives a very sharp boundary line between the removed and the remaining portions of the carrier, instead of giving, as do carriers using previously known covering layers, a zone of varying opaqueness which decreases inwardly.

A further advantage of our novel covering layers, especially compared with covering layers formed of photographic emulsions, is that the light-absorbing capacity is constant as a function of its depth and thus does not decrease gradually, as in the case with covering layers using photographic emulsions. Because of the above, our novel covering layers provide for a boundary line of extreme sharpness.

A further advantage of our novel covering layers is, that they can be applied to the carrier in daylight and do not require any involved after-treatment.

A still further advantage of our novel covering layers, is that they can be kept considerably

thinner than the covering layers of the prior art because of the very fine particles.

In the drawing forming part of the specification our invention will be described in connection with a specific embodiment as used for the recording of sound vibrations and picture impulses, the vibration track on the carrier being obtained on a film type carrier by a cutting operation with a chisel type of tool, such a method of recording being described in U. S. Patent 1,919,116 to James A. Miller. Such records are reproduced optically, for instance, by means of photocells and/or are photographically copied. However, it should be well understood that our invention is not limited to such application, but applies broadly to mechanically recorded and optically reproducible vibration tracks.

Figure 1 is a section through a film used as the carrier of a sound track and also shows the cutting tool.

Fig. 2 is a top view of the film, the upper part showing a track on a carrier using a covering layer of the prior art, whereas the lower part shows a track made with a covering layer according to our invention.

The film comprises a transparent backing layer 1, for instance of celluloid, an intermediate layer 2, made of a softer material, for example, of gelatin and forming the cutting layer. The layer 2 is covered with an opaque layer 3 made in accordance with the invention.

By using a V-shaped chisel, the cutting edges of which enclose an angle α of approximately 174°, and with the chisel reciprocating in the direction of the arrows, when vibrated in accordance with the vibrations to be recorded, a vibration track as shown in Fig. 2 is obtained. Thereby the chisel cuts through the opaque covering layer 3 in a direction normal to the carrier, and also cuts into the layer 2, to a depth corresponding to the amplitudes of the vibrations to be recorded. The width of the vibration track cut into the carrier thus varies with the amplitudes of the vibrations to be recorded, whereby the amplitudes of the vibrations of the chisel are considerably amplified on the record.

The so obtained vibration track is adapted for optical reproduction by means of a photocell and also for photographic copying of the record.

Referring to Fig. 2, the portion above the dot-dash line 6 shows a track as obtained with a covering layer of the prior art. The boundary between transparent and untransparent portions of the carrier does not take the form of a sharp line, but rather that of a zone 4, the opaqueness of which decreases inwardly, and which results in a hazy border. This is due to the various previously stated reasons, as the coarseness of the covering layer, thickness of such layers, etc.

Such a track is especially objectionable for the reproduction of high frequencies, as in the records the peaks and valleys of such high frequency vibration may fall altogether in the hazy boundary zone and thereby may be obliterated. This not only reduces the quality of the record, but also gives rise to ground noises.

The vibration track shown in the portion below the dot-dash line 6 of Fig. 2 is obtained with a covering layer according to the invention, which, for reasons fully set forth, gives a very sharp boundary line 5. This permits a very exact reproduction, even of the highest frequencies, and also avoids ground noises.

The carrier may have various forms, for instance, it may be a film as above described, or may be in the form of a disc or of a cylinder, and may be used in any of these forms irrespective of the type of recording for which the vibration track is to be used.

With substances according to our invention, covering layers having a thickness of two microns or less are sufficient.

The substances forming the covering layers, according to the invention, are applied to the carrier in their colloidal form, for instance by spraying or rolling on the carrier a suitable colloidal solution of a metal or metal compound.

To prevent that the colloidal particles pass into a dispersion phase of greater roughness (large sized particles), it may be advisable to stabilize the colloid in the process of preparing the layer, by adding to the colloidal metal a protective colloid, before it is applied to the carrier.

To obtain a cohesive and well-adhering layer, preferably a binder, for example, gelatin, is also added. This binder may, at the same time, also serve as the protective colloid.

We have found that metal sulphides are giving especially good results, and especially the mercury sulphide.

Some specific examples of substances suitable to carry out our invention will be given hereafter.

Example I.—An aqueous mercuric-sulphide-sol, which contains 4 to 5 grams of mercuric sulphide (H_gS) and about 2 grams gelatin for 100 cubic centimeters of water, is applied at a temperature of about 40° C., by means of a roll to a base provided with a gelatin layer, after which the whole is dried. To achieve, during the rolling, a good spreading of the solution, wetting agents are added to the colloidal solution, whereby, however, care should be taken that the wetting agent does not reduce the stability of the colloidal system.

For instance the alkyl- and aralkylnaphtalin sulphonic acids are unsuitable for this purpose, whereas the preparation known under the trademark "Alborit", a substance whose chemical composition is not known, is well suited.

The gelatin of the sol serves as the protective colloid, which also brings about the advantage that most of the H_2S, which otherwise is required for the stabilization of the H_gS-sol, can be removed; furthermore, the same gelatin layer also serves as binding material in the covering layer.

The covering capacity of the mercury sulphide is so great, that the covering layer can have a thickness of less than 2 microns.

Example II.—An aqueous colloidal solution of Prussian blue, being ferric-ferrocyanide, which contains 5 grams of Prussian blue for 100 cubic centimeters of water to which is added 1 gram of pepton as a protective colloid and 2 grams of gelatin as binding agent, is applied to the carrier, for instance to a gelatin layer, either in the manner described in Example I or by a spraying process.

In case spraying is used, it is preferable to dilute the above solution four- to five-fold.

The so-obtained covering layer is transparent to blue light, but at a thickness of about 3 microns, has high light-absorbing capacity for both the red and the infra-red, as well as the violet and the ultra-violet, portions of the spectrum.

This high absorption capacity in the red and infra-red portion of the spectrum is necessary for the direct reproduction of the track by means of a photo-electric cell, because the present-day

photo-electric cells have their maximum light sensitivity in the just referred to portions of the spectrum. On the other hand, a high absorption capacity in the violet, and especially in the adjoining ultra-violet portion of the spectrum, is very advantageous for the photographic copying of the record, especially when in such copying work a light source giving ultra-violet light of wave lengths between 3,000 and 4,000Å is used.

Example III.—A colloidal silver solution, which is provided with a protecting colloid, for instance, the material known under the trade-mark of "Collargol" which contains albumen as a protecting colloid, is diluted with water or with water containing alcohol so that a concentration of 3 grams per 100 cubic centimeters is obtained. Preferably gelatin is first added to the solution in the proportion of 1 gram of gelatin to 100 cubic centimeters.

The solution can be applied to the base in the manner described in Example I, or it can be applied by spraying, in which latter case the solution is again diluted four- to five-fold

A layer so prepared requires, for reproduction, a photocell having a different light sensitivity characteristic, namely, a photocell which has its maximum sensitivity in the green and blue portions of the spectrum.

While we have described our invention in connection with a specific embodiment and in a specific application, we do not wish to be limited thereto, but desire the appended claims to be construed as broadly as permissible in view of the prior art.

What we claim is:—

1. In a carrier for the mechanical recording of an optically-reproducible vibration track, an opaque covering layer adapted to be partly removed during the recording and comprising a light-absorbing substance having a metal radical, said substance having particles of colloidal dimensions.

2. In a carrier for the mechanical recording of an optically-reproducinble vibration track, an opaque covering layer adapted to be partly removed during the recording, said layer comprising a protective colloid and a light-absorbing substance having a metal radical, said substance having particles of colloidal dimensions.

3. In a carrier for the mechanical recording of an optically-reproducible vibration track, an opaque covering layer adapted to be partly removed during recording, said layer comprising a binding agent and a light-absorbing substance having a metal radical, said substance having particles of colloidal dimensions.

4. A carrier for the mechanical recording of an optically reproducible vibration track, comprising a base layer, a transparent cutting layer, and an opaque covering layer adapted to be partly removed during the recording, said covering layer comprising a light-absorbing substance having a metal radical, said substance having particles of colloidal dimensions.

5. In a carrier for the mechanical recording of an optically-reproducible vibration track, an opaque covering layer adapted to be partly removed during recording, said layer comprising metallic sulphide particles of colloidal dimensions.

6. In a carrier for the mechanical recording of an optically-reproducible vibration track, an opaque covering layer adapted to be partly removed during recording, said layer comprising mercury sulphide particles of colloidal dimensions.

7. In a carrier for the mechanical recording of an optically-reproducible vibration track, an opaque covering layer adapted to be partly removed during recording, said layer comprising Prussian blue particles of colloidal dimensions.

8. In a carrier for the mechanical recording of an optically-reproducible vibration track, an opaque covering layer adapted to be partly removed during recording, said layer comprising a colloidal silver solution.

9. In a carrier for the mechanical recording of an optically-reproducible vibration track, an opaque covering layer adapted to be partly removed during recording, said layer having a thickness between 2 to 5 microns and comprising a light-absorbing substance having a metal radical, said substance having particles of colloidal dimensions.

10. In a carrier for the mechanical recording of an optically-reproducible vibration track, a covering layer opaque to violet, ultra-violet, red, and infra-red light rays, said layer having a thickness of about 3 microns and comprising a light-absorbing substance having a metal radical, said substance having particles of colloidal dimensions.

11. In the manufacture of carriers for the mechanical recording of an optically-reproducible vibration track, the process which comprises, rolling onto a carrier a colloidal substance having a metal radical to form on the carrier an opaque covering layer.

12. In the manufacture of carriers for the mechanical recording of an optically-reproducible vibration track, the process which comprises, spraying onto a carrier a colloidal substance having a metal radical to form on the carrier an opaque covering layer.

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