Patented Sept. 3, 1946 2,407,179

UNITED STATES PATENT OFFICE

2,407,179

INSTANTANEOUS RECORDING COMPOSITION

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No Drawing. Application December 31, 1942, Serial No. 470,912

7 Claims. (Cl. 106—37)

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This invention relates to a sound record and particularly to a record of the instantaneous recording type characterized by its low surface noise and high fidelity after many playings.

The methods of forming sound tracks in records are well known in the art. The method whereby the sound track is formed directly in the record surface in response to the sound actuated pick-up device is usually designated as "Instantaneous Recording" as contrasted with other methods whereby the track is impressed in the record surface by means of a previously formed die or matrix. Record blanks for instantaneous recording may be in the form of discs, cylinders, flexible tape, loops, etc. The sound track in such instantaneous recording records is usually formed by slitting, cutting or otherwise operating on the surface of the record blank with a sound-actuated recording stylus to leave a sinuous groove which the playing stylus will follow to reproduce the recorded sound.

The composition from which the record blank is made has considerable influence not only upon the fidelity of the reproduction but also upon the amount of extraneous noise heard when the record is played. Thus, if the composition is too hard the recording stylus will not cut smoothly through it during the recording and the surface of the sound track instead of being smooth, will be rough due to tearing or chipping by the stylus. Such rough surfaced sound tracks lead to high noise levels during the playing of the record. Records made from excessively hard material are also subject to deterioration due to the breaking off during use and handling of the minute projections in the sound track which serve to actuate the playing stylus. Such deterioration soon leads to lack of fidelity in the reproduction. On the other hand, records made from too soft a composition are subject to excessive wear by the playing stylus and consequent loss of fidelity after a few playings. Other properties of the composition from which the record blank is made are also of importance. Thus, if the material is too elastic the cutting stylus will tend to slide over the surface rather than cut cleanly through it. When compositions are used which are subject to embrittlement upon aging, it is apparent that the value of the record will depreciate.

Record blanks for instantaneous recording have heretofore usually been made from nitro cellulose compositions because these have been found to possess the desired degree of hardness and elasticity. Such compositions are, however, subject to the serious objection that nitro cellulose

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is highly inflammable and presents a considerable fire hazard. Nitro cellulose compositions are furthermore subject to considerable embrittlement upon aging. Attempts to use ethyl cellulose compositions have also been made, but records prepared from the heretofore used compositions are invariably noisy and of inferior quality.

It is, therefore, an object of the invention to provide a composition adapted to the manufacture of instantaneous recording sound records having a high fidelity of reproduction and a low noise value after repeated playing.

An additional object is to provide a sound record blank having a low fire hazard and adapted to having formed thereon a high fidelity sound track by instantaneous recording methods.

These and related objects are readily accomplished by plasticizing ethyl cellulose with a lower alkyl ester of ricinoleic acid. Record blanks prepared from such compositions are easily cut or embossed by the recording stylus during instantaneous recording to produce sound tracks free from extraneous irregularities and surface roughness. The finished records are particularly characterized by their low degree of inflammability. Due to the toughness of the composition and its lack of embrittlement upon aging, there is little tendency for the playing stylus to wear away the sound track such as is the case when other plasticizers for the ethyl cellulose are used. Consequently, the records may be played back many times without diminishing the quality of the recording or raising unduly the noise level of the record.

Organo-soluble ethyl cellulose having an ethoxy content of from 45.5 to 49.5 per cent, and preferably of from 48 to 49 per cent, and an intrinsic viscosity of from 5 to 100 centipoises, when determined in the Ubbelohde viscosimeter on a 5 per cent by weight solution in a mixture of 80 parts by volume of toluene and 20 parts of ethanol, may be used in preparing the composition. Ethyl cellulose of such ethoxy content and intrinsic viscosity is readily available commercially. From 50 to 95 per cent by weight of ethyl cellulose may be used in the composition. Lower alkyl esters of ricinoleic acid which may be used as plasticizers in preparing the composition include the methyl, ethyl, propyl, butyl, n-octyl, 2-ethyl-hexyl, decyl, and lauryl esters. Alkyl esters having from 1 to 12 carbon atoms inclusive in the alkyl group may be used to particular advantage. The lower alkyl esters of an acyl ricinoleic acid, e. g. of acetyl ricinoleic acid,

propionyl ricinoleic acid, etc., may also be used, if desired.

From 5 to 40 per cent by weight of the alkyl ricinoleate plasticizer may be used in preparing the record blanks. The amount of plasticizer used in any particular instance will depend to some extent upon the hardness and ease of recording desired, upon the ethoxy content and intrinsic viscosity of the ethyl cellulose used, and upon the type of record blank which it is desired to produce. When a relatively hard record blank is desired, less plasticizer may be used than when a relatively soft blank is desired. In certain instances minor amounts of relatively non-volatile plasticizers other than the alkyl ricinoleates, such as the aryl phosphates, the alkyl phosphates, the soft, non-oxidizing resinous plasticizers, etc., may also be incorporated in the composition, if desired. Fillers, pigments, soluble dyes, and other modifying agents may also be incorporated in the composition.

In practicing the invention the ethyl cellulose composition may be molded in the form of discs, or cylinders, or the ingredients may be dissolved in a volatile solvent and the solution used in the casting of films which may be subsequently cut or trimmed to the desired size. Discs or cylinders composed of other materials may, if desired, be surface-coated with the composition and the sound track may be formed in the coating.

Certain advantages of the invention may be seen from the following example which is merely by way of illustration and is not to be construed as limiting.

EXAMPLE

A composition was prepared by dissolving 75 parts by weight of ethyl cellulose, having an ethoxy content of about 48 per cent and a viscosity of about 10 centipoises, and 25 parts of methyl ricinoleate in 235 parts of a mixture of 80 parts by volume of toluene and 20 parts of ethanol. The mixture was stirred until solution was complete, centrifuged to remove a small amount of insoluble matter and poured onto a polished aluminum disc about 10 inches in diameter. The disc was spun horizontally until the solution had spread evenly over its surface, and then placed in a dust free cabinet to dry. The record blank was air dried for 16 hours at room temperature and then oven dried at 90° C. for 6 hours and placed in a constant temperature room at 25° C. for testing. The dried film on the aluminum plate was about 0.01 inch thick. Similar record blanks were prepared using 25 parts of ethyl ricinoleate, isopropyl ricinoleate, butyl ricinoleate, and by way of comparison of monophenyl-di-(o-xenyl) phosphate, as plasticizers in place of the methyl ricinoleate.

To test the record blanks for extraneous noise accompanying recording, they were each placed on a recording machine and rotated at 78 revolutions per minute. An unmodulated groove was cut at the same radius in each blank with the same recording stylus with no input to the recording head. The records were then played back and the volume of noise was determined with a cathode ray oscillograph. The deflection of the oscillograph was measured in millimeters and the measured values converted to decibels by the formula:

$$\text{Decibels} = 20 \log \frac{E_2}{E_1}$$

where E_2 is the measured reading of the oscillograph and E_1 is an arbitrary constant value chosen equal to the lowest reading observed in any of the tests.

Each record was played a number of times. The noise level of each after 1, 10 and 20 playings is recorded in the accompanying table. The low noise level after repeated playing characteristic of records made from the composition containing the ricinoleate plasticizers is apparent.

TABLE

Noise level in decibels of records after repeated playings

Plasticizer	Noise level after times played		
	1	10	20
Methyl ricinoleate	4	11	12
Ethyl ricinoleate	0	4	6
Isopropyl ricinoleate	0	11	13
Butyl ricinoleate	6	10	12
Monophenyl-di-(o-xenyl) phosphate	4	------	23

I claim:

1. A sound record of the instantaneous recording type, the composition whereof includes ethyl cellulose and as a plasticizer therefor a lower alkyl ester of ricinoleic acid.

2. A sound record as claimed in claim 1 wherein the ethyl cellulose has an ethoxy content of from 45.5 to 49.5 per cent and an intrinsic viscosity of from 5 to 100 centipoises.

3. A sound record as claimed in claim 1 wherein the amount of ethyl cellulose is from 50 to 95 per cent by weight of the composition.

4. A sound record as claimed in claim 1 wherein the amount of the alkyl ricinoleate plasticizer is from 5 to 40 per cent by weight of the composition.

5. A sound record as claimed in claim 1 wherein the alkyl ricinoleate plasticizer has from 1 to 12 carbon atoms in the alkyl group.

6. A sound record as claimed in claim 1 wherein the ricinoleate plasticizer is butyl ricinoleate.

7. A sound record as claimed in claim 1 wherein the ricinoleate plasticizer is 2-ethyl-hexyl ricinoleate.

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