United States Patent Office

2,710,404

Patented June 7, 1955

2,710,404

ANTI-STATIC SOUND-RECORDING MEDIUM AND METHOD OF MAKING THE SAME

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No Drawing. Original application May 11, 1950, Serial No. 161,476. Divided and this application August 11, 1952, Serial No. 303,836

4 Claims. (Cl. 106—37)

This invention relates to a novel group of anti-static agents adapted to be incorporated in a sound-recording medium to reduce the tendency of static electrical charges to accumulate on the surfaces of such a medium, and more particularly to sound-recording media incorporating such anti-static agents and a method of making such media. The anti-static agents of the present invention are particularly useful for reducing the accumulation of static charges on the well-known "wax" recording cylinders, and will be illustratively described in that environent. The phrase "sound-recording wax" will be used hereafter to designate the material of which such cylinders are made, although as is well known sound-recording "waxes" are ordinarily largely composed of metallic soaps, higher fatty acids, or both, and may contain no wax at all in a strict chemical sense.

The present application is a division of my pending application Serial No. 161,476 filed May 11, 1950, now abandoned. The claims of the present case are directed to sound recording media incorporating anti-static agents such as those claimed in my co-pending case, and to methods of making such media.

For many years sound-recording wax cylinders have been used for a variety of sound-recording purposes. As ordinarily used, such cylinders are mounted on a horizontal rotating mandrel of a dictating machine, and a laterally movable sound-responsive stylus cooperates with the rotating cylinder to cut a helical sound track in the surface thereof. As an incident of this cutting action, short, curly fibers of the wax material are removed from the surface of the cylinder, which fibers are sometimes referred to as chips, and a container or chip collector is usually provided beneath the cylinder to collect those chips that fall off the cylinder. It is, of course, desirable that all of the chips fall off the cylinder as soon as they have been formed so that they may be collected and disposed of in an orderly manner, but unfortunately there is a tendency under normal circumstances for the majority of the chips formed to continue to adhere to the cylinder surface. Although the reasons for the adherence of the chips to the surface of the cylinder are not completely understood, my investigations indicate that the principal reason for this undesired adherence of the chips is the accumulation of a static electrical charge on the surface of the cylinder.

The removal of the chips from the surface of the cylinder is desirable for a variety of reasons. The cylinders are usually kept in cylindrical containers having an interior lining made of a fibrous fabric, and if the chips are not completely removed from the cylinder surface, they may be transferred to the interior of the container. Continued use of a container that has been contaminated with chips may cause the sound record to be scratched or otherwise deformed as the cylinder is inserted into or withdrawn from the container. If the chips are not removed by contact with the interior of the container, they may interfere with transcription of the sound record. Moreover, the adhering chips are generally untidy since,

if they do not fall into the chip collector of the dictating machine for disposal in a controlled manner, they have a tendency to fly off in the atmosphere and adhere to clothing, carpets and the like.

It is accordingly an object of the present invention to provide a wax sound-recording medium in cylindrical or other form that is of such a character that chips cut from the surface thereof by a sound-responsive stylus do not tend to adhere to the surface of the medium. It is another object of the invention to provide an improved anti-static agent adapted to be incorporated in a sound-recording wax to reduce the tendency of static electrical charges to accumulate on the surface of the sound record. It is a further object of the invention to provide a sound-recording wax incorporating such an anti-static agent. It is still another object of the invention to provide a method of making such an anti-static agent and a method of incorporating it effectively into a sound-recording medium. Other objects of the invention will be in part obvious and in part pointed out hereafter.

The objects of the present invention may be achieved in general by providing a sound-recording wax containing a relatively small quantity of N-2-hydroxyethyl lactamide. I have found that the tendency of static electrical charges to collect on the surface of a sound-recording wax containing a small proportion of N-2-hydroxyethyl lactamide, is materially reduced, and that when this compound is incorporated in the wax nearly all of the chips formed by the action of a sound-responsive stylus thereon fall off as soon as they are formed. The quantity of lactamide incorporated in the sound-recording wax may vary from 2% to 10% by weight, although in most cases preferred results are obtained by using about 4% by weight of the lactamide.

The present anti-static agent is preferably added to the wax while the wax is in molten condition and prior to the time that it is cast into a cylinder. Although N-2-hydroxyethyl lactamide may be added to the molten wax as such, I prefer rather to add to the wax monoethanolamine lactate which, during the process of manufacturing the wax cylinder, is converted into the lactamide. Thus, in one aspect, the present invention comprises incorporating in a sound-recording wax a compound selected from the group consisting of monoethanolamine lactate and N-2-hydroxyethyl lactamide. So far as I am aware, N-2-hydroxyethyl lactamide and monoethanolamine lactate are both new compounds.

In order to point out more fully the nature of the present invention, the following illustrative procedures are given for making the monoethanolamine lactate and N-2-hydroxyethyl lactamide, and also for incorporating them in a sound-recording wax to produce a sound-recording medium having anti-static properties: A heated stainless steel vessel equipped with a motor driven agitator and condenser is charged with 105 lbs. of 85% lactic acid. Using gentle agitation, 61 lbs. of monoethanolamine is added slowly to the acid. The resulting mixture is heated at 175° F. for one hour, after which the temperature is raised to the boiling point and about 15 lbs. of the material distilled off. The material remaining in the vessel is crude monoethanolamine lactate.

The crude reaction product is transferred to a vacuum still and distilled under reduced pressure. The fraction boiling at about 367° F. at 43 mm. is segregated as monoethanolamine lactate. It is a viscous, light yellow-colored liquid, insoluble in benzene and kerosene and soluble in water, acetone, and denatured ethyl alcohol, S. D. #1. Its specific conductivity, although not comparable with that of a metal, is substantially higher than the conductivity of other chemically related materials.

The monoethanolamine lactate as thus formed may be

incorporated in a conventional sound-recording wax, for example, the wax formula disclosed at page 35 of "The Reproduction of Sound" by Henry Seymour (1918), in the following manner: A suitably heated vessel is charged with 3,333 lbs. of S. Stearine (commercial stearic acid) and the S. Stearine is melted. To the molten S. Stearine a solution of 208 lbs. of 98% caustic soda in 525 lbs. of water is slowly added. As the caustic soda solution is added, neutralization of the S. Stearine occurs and the mixture is heated to such an extent as to remove all water from the resulting soap mixture.

After completion of this neutralization step, 178 lbs, of red lead is added to the mixture in the reaction vessel. The addition of the red lead may be effected by removing a small quantity of the molten soap mixture from the heated vessel and mixing the red lead in powder form therewith, after which the mixture of red lead and soap is added to and mixed with the main body of material in the vessel.

When the red lead has been incorporated into the molten soap, 212.5 lbs. of monoethanolamine lactate, 950 lbs. of paraffin wax, and 119.5 lbs. of myrtle wax are successively added to the mixture in the kettle, and heating of the mixture continued at about 375° F. for a period of about 24 hours. During this heating period the monoethanolamine lactate is converted into N-2-hydroxyethyl lactamide.

At the end of the heating period the molten mixture is cast into cylinders in the usual manner, and the cylinders machined to form the desired sound-recording surface.

Cylinders made in accordance with the foregoing procedure are strikingly superior to conventional cylinders in respect to the extent to which chips fall off the surfaces thereof when they are cut by a sound-responsive stylus. Moreover, tests have shown that the electrical conductivity of the wax is appreciably increased by incorporation of the present anti-static agent therein.

As previously indicated, the monoethanolamine lactate of the foregoing procedure may be replaced by N-2-hydroxyethyl lactamide, which may be prepared as follows: A suitable reaction vessel is charged with 106 lbs, of 85% lactic acid and 67 lbs. of monoethanolamine (about 10% excess amine) added thereto slowly with stirring. After addition of the acid is completed, the reaction mixture is heated to 275° to 280° F. and maintained at this temperature for about 2 hours. At the end of this period, 41 lbs. of the product is removed by distillation. The remaining material is crude N-2-hydroxyethyl lactamide which, either in the crude state or after refining, can be added to the molten wax in the manner previously described for the lactate.

It is, of course, to be understood that the foregoing detailed procedure is illustrative only and that numerous changes may be made therein without departing from the scope of the invention. As indicated previously, the desired result may be achieved by adding either N-2-hydroxyethyl lactamide or monoethanolamine lactate to the molten wax. However, there is some advantage in using the lactate since it is easier to make than the lactamide and is automatically converted into the lactamide in the course of the formulation of the sound-recording wax. Many different wax formulae have been previously proposed for sound-recording purposes and my experiments indicate that the present anti-static agent can be used in any of these known formulae to improve the anti-static properties of the resulting sound-recording wax.

Since many embodiments might be made of the present invention and since many changes might be made in the embodiment disclosed herein, it is to be understood that the foregoing description is to be interpreted as illustrative only and not in a limiting sense.

I claim:

1. A sound-recording medium having anti-static properties, said medium comprising a sound-recording wax containing from 2% to 10% by weight of N-2-hydroxyethyl lactamide.

2. A sound-recording medium having anti-static properties, said medium comprising a sound-recording wax containing about 4% by weight of N-2-hydroxyethyl lactamide.

3. The method of making a sound-recording medium having anti-static properties which comprises preparing a melt of a sound-recording wax, mixing with said molten wax between 2% and 10% by weight of monoethanolamine lactate, heating the resulting mixture to convert said lactate to a corresponding lactamide, and cooling and casting said mixture to form a solid sound-recording medium.

4. The method of making a sound-recording medium having anti-static properties which comprises heating a mixture of fatty acid, caustic alkali, and paraffin wax to form a molten mass, adding to said molten mass from about 2% to 10% by weight of monoethanolamine lactate, heating the resulting mixture to convert said lactate to a corresponding lactamide, and cooling and casting the resulting mixture to form a solid sound-recording medium.

No references cited.