United States Patent Office

2,710,402

Patented June 7, 1955

2,710,402

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

Richard G. Rowe, Redding Ridge, Conn., assignor to Dictaphone Corporation, Bridgeport, Conn., a corporation of New York

No Drawing. Original application May 11, 1950, Serial No. 161,473. Divided and this application August 11, 1952, Serial No. 303,833

4 Claims. (Cl. 106—37)

This invention relates to a novel anti-static agent 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 an anti-static agent and a method of making such media. The anti-static agent of the present invention is particularly useful for reducing the accumulation of static charges on the well-known "wax" recording cylinders, and will be illustratively described in that environment. 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. 161,473 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 a novel 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 tri-(n-butylamine) phosphate. 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 tri-(n-butylamine) phosphate 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 the tri-(n-butylamine) phosphate 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 phosphate.

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. So far as I am aware, tri-(n-butylamine) phosphate is a new compound.

In order to point out more fully the nature of the present invention, the following illustrative procedure is given for making tri-(n-butylamine) phosphate and also for incorporating it in a sound-recording wax to produce a sound-recording medium having anti-static properties: A stainless steel vessel equipped with a motor driven agitator and cooling coils is charged with 219 lbs. of n-butylamine dissolved in 60 gallons of methanol. To this solution 116.7 lbs. of 85% orthophosphoric acid is added slowly with stirring. During addition of the phosphoric acid a suitable refrigerant is passed through the coils of the reaction vessel to maintain the reaction temperature at about 10° C. The reaction proceeds readily and practically instantaneously and the tri-(n-butyl amine) phosphate is formed as a white precipitate. When addition of the phosphoric acid is complete, the refrigerant is cut off to permit the reaction mixture to warm up to room temperature and stirring continued for about an hour to ensure completeness of reaction.

The tri-(n-butylamine) phosphate thus formed is separated by filtration from other components of the mixture and purified by repeated washings with acetone, after which it is filtered and air dried. The purified powdered product fuses at about 165° C. It is soluble to the extent of about 25 parts per 100 in water at room temperature and to the extent of about 10 parts per 100 in ethanol at 90° C. Its specific conductivity although not comparable with that of a metal, is substantially higher than the conductivity of other chemically related materials.

The tri-(n-butylamine) phosphate 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 tri-(n-butylamine) phosphate, 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.

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.

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. 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 persent 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.

What I claim is:

1. A sound-recording medium having anti-static properties, said medium comprising a sound-recording wax containing from 2% to 10% by weight of tri-(n-butylamine) phosphate.

2. A sound-recording medium having anti-static properties, said medium comprising a sound-recording wax containing about 4% by weight of tri-(n-butylamine) phosphate.

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 tri-(n-butylamine) phosphate and cooling and casting the resulting 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 tri-(n-butylamine) phosphate and cooling and casting the resulting mixture to form a solid sound-recording medium.

No references cited.