May 22, 1934. E. M. PATTERSON ET AL 1,960,025

PROCESS FOR THE FORMATION OF RECORDING BLANKS

Filed Oct. 29, 1932

FIG. 2

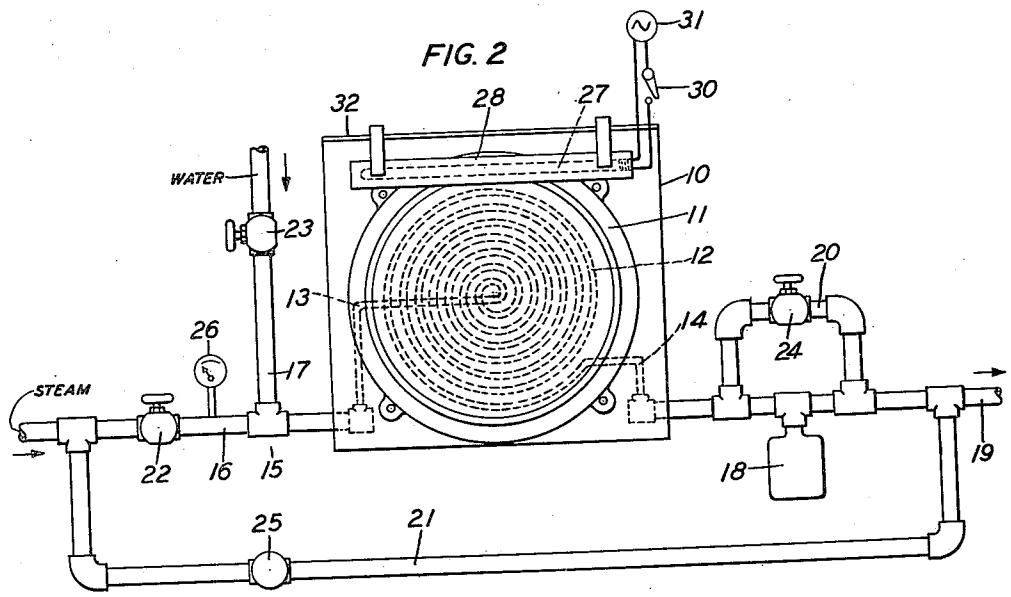


FIG. 3

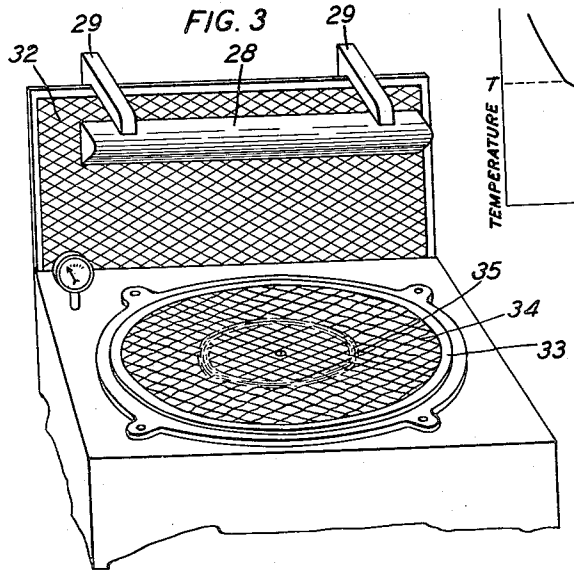
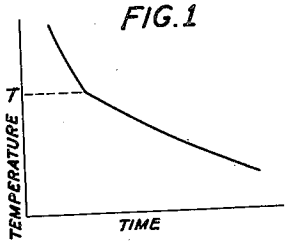


FIG. 1



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Patented May 22, 1934

1,960,025

UNITED STATES PATENT OFFICE

1,960,025

PROCESS FOR THE FORMATION OF RECORDING BLANKS

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Application October 29, 1932, Serial No. 640,260

5 Claims. (Cl. 91—70)

This invention relates to recording processes and apparatus and particularly to the process of preparing a blank wax disc and to the apparatus used therein.

In the improved methods of recording sound, the wax discs used are comprised of a thin layer of wax supported by a stiff and preferably recessed metal disc. These recording discs are obtained by carefully heating the metal disc to just above the melting point of the wax and then melting enough wax on the surface to fill completely with a thin even layer the recess in the surface. When the recess is filled, the metal disc is allowed to cool to room temperature and is then ready for use.

Although this method yields wax blanks with excellent cutting properties, the surface of the blank so formed is usually uneven. This causes the recording stylus to cut at irregular depths since it cannot adjust itself immediately to the changing record surface passing under it and hence the impedance offered to the stylus varies correspondingly, thereby impairing the quality of the recorded sound.

The object of this invention is a blank wax recording disc with a perfectly even surface and the invention accordingly consists in the method and apparatus whereby this object is attained.

A peculiar property of the recording wax is made use of in the present novel process to secure the desired even surface. We have observed that if the cooling process of the normal recording wax disc is interrupted at a predetermined temperature a ripple will be seen to form in the wax and traverse the entire disc leaving behind a perfectly even surface. We have discovered that this temperature is the same as that at which the slope of the cooling curve of the wax changes, that is, the temperature at which the rate of cooling suddenly becomes slower. After the ripple has passed over the surface, the cooling process can be resumed until room temperature is reached.

The apparatus used in this invention comprises a temperature controlled table upon which the support for the wax is placed and an illuminated regular pattern located so that its reflection in the wax surface can be readily seen from the operator's position at the table. The reflection is an aid in observing the progress of the ripple across the surface of the disc.

The accompanying drawing will serve to illustrate the principal apparatus used in the process:

Fig. 1 is a typical cooling curve for the wax used;

Fig. 2 is a plan view of the temperature controlled table with the pipe connections thereto shown schematically; and

Fig. 3 is a perspective of the table and illuminated pattern with the reflection of the pattern shown on the surface of the wax.

In Fig. 2, 10 is the table in the center of which is a metal plate 11 in which is formed a spiral channel 12 with an inlet at 13 and an outlet at 14. The inlet is connected to a T 15 to which are connected a steam lead 16 and a water lead 17. The outlet 14 is connected to a steam trap 18 and a sewer lead 19 with an auxiliary by-pass lead 20 bridging the steam trap 18. A second by-pass lead 21 bridges the entire apparatus and connects the steam lead 16 to the sewer lead 19 thereby providing against any extreme conditions occurring in the steam lead 16 that might be harmful to the apparatus.

Four valves are provided, one (22) in the steam lead 16, another (23) in the water lead 17, a third (24) in the steam trap by-pass 20, and a fourth (25) in the main by-pass 21. Valves 22, 23 and 24 may be of the quick opening type since they are constantly in use, and valve 25, which is seldom used, may be of the standard wheel type. Valve 22 is a reducing valve which is capable of very fine adjustment. A pressure gauge 26 indicates the fluid pressure within the spiral channel 12.

The lamp is shown at 27 backed by a reflector 28 which is supported by brackets 29, 29. A switch 30 and a source of electrical energy 31 complete the circuit through the lamp 27. The light from lamp 27 falls upon a vertical regular pattern 32 which may have any desired configuration and for the purpose of illustration is shown as a series of intersecting oblique lines. A stiff recessed support 33 is shown in place on the plate 11 with a layer of melted wax 34 filling the recess in the support 33.

The method of securing an even surface on the wax 34 will now be described and it consists, in general, of the following steps:

First, the wax to be used is carefully selected and its cooling curve obtained. Our experience has been that bleached Montan wax containing lead stearate is satisfactory. Having selected the wax, a recessed support is procured and placed upon the plate 11.

Next, the water valve 23 and by-pass valve 25 are closed and the steam trap by-pass valve 24 and steam valve 22 are opened. This allows

steam to pass through the system and force out the water remaining from the last cooling process. The steam used may be saturated steam at a pressure of, for example, about 80 pounds per square inch. After approximately fifteen seconds the by-pass valve 24 may be closed and the steam sent direct to the steam trap 18 whereupon the pressure within the system will begin to build up. When pressure gauge 26 shows a pressure of perhaps 28 pounds per square inch, which is assumed to correspond to the correct melting temperature for the wax used, the steam supply is cut off just sufficiently to maintain the pressure at this figure.

A recessed disc is placed upon the heated table and a lump of wax is held in contact with it until enough wax is melted to fill the recess in the disc. It is understood, of course, that the disc is perfectly level so that the thickness of the wax layer is approximately uniform throughout. The recess should preferably be less than 60 mils deep since waxes of greater thickness exhibit a tendency to break away from the disc on cooling and in addition do not form a ripple very easily. A movable gas burner may be passed quickly over the surface to remove any bubbles in the liquid wax.

When the wax is perfectly clear, steam valve 22 is partly closed until the gauge 26 indicates a pressure of 10 pounds per square inch which, for the sake of illustration, is taken as the pressure corresponding to the temperature T of Fig. 1 at which the change in slope occurs in the cooling curve of the wax. The image of the scanning chart 32 is now carefully observed. The lines of the pattern will appear greatly distorted at first. Next, the wax surface will start to level and, finally, a ripple 35 will form at the center and expand radially until it disappears. After this ripple has passed over the wax, the surface will reflect an undistorted image of the scanning chart 32. The time consumed for this operation is generally not in excess of three minutes after the correct pressure is reached.

Directly after the ripple has passed over the surface the steam valve 22 may be closed and the by-pass valve 24 and water valve 23 may be opened. This permits cooling water to circulate through channel 12 and pass around steam trap 18 into the sewer lead 19 thereby cooling plate 11 and the record blank in contact with it. In two or three minutes the wax should be solid and the disc cool enough to be handled.

The exact cause of the ripple is not definitely known. We have determined, however, that it is dependent to some extent upon the type of cooling system, that is, it is most pronounced in the spiral type of cooling system in which the intake is at the center and outlet is at the periphery of the spiral. It is also dependent upon the thickness of the wax layer and gradually becomes less noticeable from a thickness of 20 mils until it disappears at a thickness of about 60 mils. It is in all probability a contraction phenomenon with the poor heat conducting property of the wax as an important factor in its formation.

What is claimed is:

1. The method of obtaining an even surface on a recording wax which consists in forming a layer of molten wax less than 60 mils thick on a suitable support, cooling the wax to a temperature corresponding to the breaking point on a cooling curve of the wax, maintaining the wax at this temperature until a ripple occurs in the surface of the wax and traverses the surface, and then slowly cooling the wax to any desired temperature.

2. The method of obtaining an even surface on a recording wax disc which consists in heating a rigid disc to just above the melting point of the wax, placing the wax in contact with the heated disc until enough wax has melted to cover the disc with an even layer of liquid wax, cooling the melted wax to a temperature corresponding to the breaking point on a cooling curve of the wax, maintaining the wax at this temperature until a ripple forms in the surface of the wax and completely traverses the surface and then slowly cooling the disc to room temperature.

3. The method of obtaining an even surface on a recording wax which consists in forming a layer of molten wax less than 60 mils thick on a suitable support, cooling the molten wax to a temperature corresponding to the breaking point on a cooling curve of the wax, maintaining the wax at this temperature for a predetermined length of time and then slowly cooling the wax to any desired temperature.

4. The step in the method of forming from molten wax a record blank less than 60 mils thick which consists in maintaining for a predetermined period the temperature of the molten wax at the temperature corresponding to the breaking point on the cooling curve of the wax.

5. The method of obtaining an even recording surface on a wax disc which consists in heating a rigid recessed support to the melting point of the wax, holding the wax in contact with the heated support until the recess is filled to a depth less than 60 mils with liquid wax, passing a flame rapidly over the liquid wax to remove bubbles therein, cooling the support from the center outward until the temperature corresponding to the breaking point on a cooling curve of the wax is reached, maintaining the wax at this temperature until a ripple forms and traverses the entire surface and then cooling the wax to room temperature.

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