

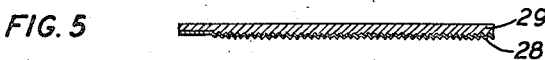
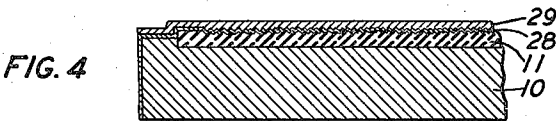
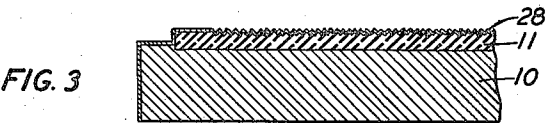
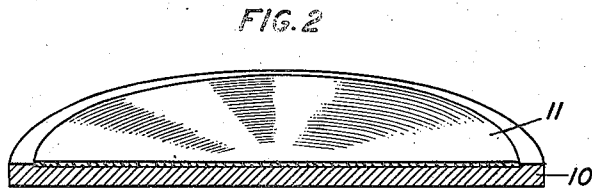
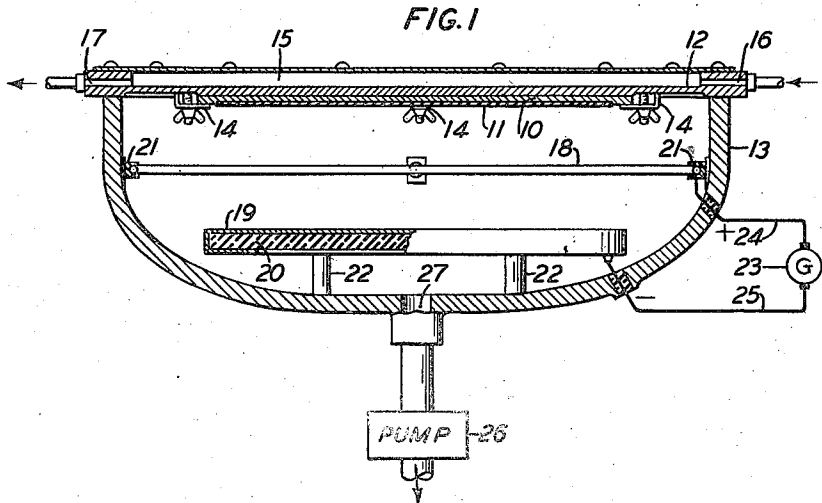
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METAL COATING FOR ELECTROPLATED ARTICLES

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METAL COATING FOR ELECTROPLATED ARTICLES

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3 Claims. (Cl. 274—42)

This invention relates to metal coatings for articles, and particularly to metal coatings for non-conducting phonograph records which are to be electroplated and processed into a permanent form.

Recording processes, in their present stage of development, consist, in general, in inscribing into a homogeneous wax surface a spiral sound track, coating the sound track with an electro-conducting material, usually a vaporized metal, electroplating a copper negative upon the coated surface, and pressing the electroplated negative into a thermoplastic substance, such as cellulose acetate, to form a reproducible record. The coating is done by placing the record for a brief period into a chamber in which a cathode is vacuously dispersed, and the cathode materials commonly used are gold and silver.

It has been found that both gold and silver have certain characteristics that are undesirable. When an electroplate is stripped from the wax record the metal coating comes off with the electroplate and forms the surface which contacts the thermoplastic material in the press. It is essential, therefore, that for perfect records no change be introduced into the quality of this surface which would tend to roughen the groove of the finished record and produce surface noise. In the case of gold the pressure and temperature at which the pressing operation is carried on are sufficient to cause the gold to diffuse into the copper and disappear, leaving a copper pressing surface which soon tarnishes and roughens. Silver, while not diffusible into the copper under these conditions, tarnishes quite rapidly on exposure to air and produces a similarly roughened surface.

The object of this invention is an improved metal coating for a non-conducting surface which will not diffuse into the electroplate, and will not tarnish on exposure to air.

I have found that palladium can be vacuously dispersed or sputtered as readily as gold and silver, and that it forms a hard coating which does not tarnish or diffuse into the copper plate. It also has additional desirable features peculiar to its use in record processing apparatus which will be hereinafter detailed.

The accompanying drawing shows the various steps involved in the process of obtaining a stamper from an original record.

Fig. 1 is an elevation in section of a sputtering apparatus used to coat the original record with metal;

Fig. 2 is a perspective of an original record sectioned along a diameter;

Fig. 3 is a partial elevation in section of the original record after it has been coated, showing the coating enormously exaggerated;

Fig. 4 shows the record after it has been electroplated; and

Fig. 5 shows a portion of the finished stamper.

The sputtering apparatus illustrated is of the water-cooled type, but this particular type is not indispensable to the successful dispersion of palladium, and any sputtering apparatus adapted to coat a record may be employed. With a water-cooled apparatus, however, a special type of record must be used, the form of which is such that the wax is not subjected to internal stresses arising from an extreme temperature gradient within the wax caused by the hot sputtering process on one side and the cooling system on the other.

The special record is shown in Fig. 2. It comprises a rigid metal or other heat conducting disc 10 the surface of which is slightly recessed to receive a layer of recording wax 11 into which the record is inscribed. The wax layer is thin enough to be a conductor of heat, and the disc 10 is just thick enough to maintain its rigidity when it is handled.

Referring to Fig. 1 the initial step in the process is clamping the disc 10, with a record inscribed into its wax surface 11, to the water-cooled cover 12 of a sputtering chamber 13 by means of clamps 14. The cover 12 is cooled by circulating cold water through the hollow portion 15. The water may be admitted through port 16 and exhausted through port 17. Within the chamber 13 is an annular anode 18 and a disc shaped cathode 19. The cathode is formed by covering a glass disc 20 with a sheet of palladium. The anode and cathode are supported by insulators 21 and 22, respectively, and are connected to a suitable source of potential 23 by leads 24 and 25. The chamber 13 is evacuated by means of a suction pump 26, which removes the air from the chamber through an opening 27 at the bottom and center of the chamber 13.

To operate the sputtering apparatus, the wax record is slowly brought to a constant temperature by means of the water circulating through the cover 12, and the chamber 13 is evacuated to a pressure of about .05 millimeter of mercury, at which point a suitable potential is impressed across the electrodes 18 and 19, to cause a glow discharge to take place in the chamber. The discharge is allowed to continue for about ten minutes, at the end of which time the surface 11

is evenly coated with the palladium. The coating is shown greatly exaggerated in Fig. 3 at 28.

The next step is the plating operation. The coated record of Fig. 3 is placed in a copper-plating bath and a substantial layer of copper 29 (Fig. 4) is deposited on the coated surface 28. A peculiarity attendant to the use of palladium and not manifested in other metals commonly used for sputtering is that the wax 11 adheres to the palladium and copper and can only be removed therefrom by force or heat. This is a valuable property, since the copper master record is thus protected by the wax and can be laid aside for a considerable time awaiting further processing without suffering any damage.

When the copper master is to be used in the press, the wax is melted off and the copper master is trimmed and cleaned. It then resembles the master record of Fig. 5. The palladium 28 covers the record surface and is the agency by which the reproducible record is formed, the copper 29 serving merely as a backing for the palladium. It is important, therefore, that the palladium remain unchanged throughout the life of the master record, and this has actually been found to be the case. In the pressing operation the palladium is subjected to a pressure of about one ton

per square inch and a temperature of 300° F. Due to its hardness and inherent resistance to corrosion, the palladium does not diffuse and disappear into the copper under these conditions, nor does it tarnish or roughen to any appreciable degree. Gold, however, does, in time, diffuse into the copper and disappear, leaving a copper pressing surface which soon tarnishes. Silver tarnishes even more readily than copper and hence is also objectionable.

The advantages claimed for palladium are that it sputters very rapidly, is harder than gold, retains its form even under great pressure and does not tarnish. It has further the property of adhering to the wax master record, and thereby enables the latter to be used as a protective covering for the record for as long as is desired.

What is claimed is:

1. A copper stamper for phonograph records surfaced with a transferred layer of sputtered palladium.

2. A thermoplastic phonograph record having a surface coated with sputtered palladium.

3. A wax master phonograph record having a surface coated with sputtered palladium.

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