

PATENT SPECIFICATION

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(54) INFORMATION STORAGE DEVICE

(71) We, RCA CORPORATION, a corporation organized under the laws of the State of Delaware, United States of America, of 30 Rockefeller Plaza, City and State of New York, 10020, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to the manufacture of information storage devices such for example as video discs, i.e. a record disc storing video information.

A novel video recording and playback system for recording and playback of video information, various features of which form the subject of our patents Nos. 1,392,201—'06 uses a video disc having geometric variations in the bottom of a spiral groove in the disc surface which correspond to capacitance variations representative of video signals. The disc surface is conductive and is coated with a thin dielectric coating. A metal stylus completes the capacitor and, during playback, rides upon the dielectric coating and detects dimensional variations in the groove bottom. These variations are reconstituted in electrical signal form and converted back to video information suitable for display by a TV monitor.

In this system then, the metal stylus is separated from the conductive disc surface only by the thin dielectric layer. In order to be able to produce good quality recordings, this dielectric layer must be uniform in depth and composition, thin enough so that the minute dimensional variations in the groove can be detected in an exact manner and yet without faults or pinholes which would cause shorts due to metal-metal contact during playback. In addition, the coating must be strong enough to withstand repeated passes of the stylus without damage to the coating or to the signal elements on the disc surface. Thus the coating must have lubricant properties as well as high strength. Still further, this dielectric layer must be able to be applied

in a rapid and simple manner, suitable for mass production techniques.

It has been discovered that, according to one aspect of the present invention, thin, uniform, strong coatings of certain polymeric films can be applied readily and rapidly to conductive video discs by glow discharge techniques.

Glow discharge techniques can be employed to coat a conductive video disc having video information recorded in the form of geometric variations in the bottom of a spiral groove with certain polymeric films. The resultant films are uniform, tough dielectric coatings which can be repeatedly contacted with a metal tipped stylus without damage. This method provides discs suitable for low noise, high quality playback of video information recorded in the form of the geometric patterns in the grooves through numerous playbacks.

Monomers suitable for use in forming thin coatings on video discs according to the present invention include styrene, substituted styrenes such as p-methylstyrene and trans-β-methylstyrene and the like; alkyl-substituted silanes such as triethylsilane, trimethylsilane, tetraethylsilane, vinyltrimethylsilane and the like; alkenes and cycloalkenes such as 1,3-butadiene, trans-2-heptene, cyclohexene and the like; alkene-substituted benzenes such as divinylbenzene and the like; halogenated compounds such as tetrafluoroethylene, methylene chloride and the like; and polysiloxanes such as dimethylpolysiloxane and the like. Mixtures of the above, such as mixtures of styrene with trimethylsilane, triethylsilane, tetraethylsilane and the like can also be employed. Styrene is readily available and forms highly crosslinked, tough, adherent films and is therefore preferred.

The thickness of the polymeric film applied to the metallized disc can vary from about 200 to 3000 Å, and preferably is from about 200 to 1000 Å in thickness.

According to the process of the invention, the conductive video disc is mounted in a vacuum chamber, parallel to but separate from

a second conductive disc. The discs act as electrodes during deposition of the film coating. Electrical connections are contacted with the discs and connected to a source of current.

5 The chamber is then evacuated, preferably to a pressure below about 10^{-3} torr, and sufficient monomer is then charged to the chamber so as to deposit the desired amount of polymeric film on the cathode disc. The monomer pressure can vary from about 10 to 2000, preferably 50 to 300 microns. Alternatively, a continuous flow of monomer can be added to the vacuum chamber until the desired film thickness is obtained on the cathode disc.

15 A potential is applied to the discs, causing a glow inside the chamber between the discs. The monomer polymerizes on the surface of the discs. The current must be of sufficient duration to allow deposition of the desired film thickness. The current can be direct current or alternating current. Preferably, alternating current at mains frequency is employed due to its low cost and ready availability. The amount of monomer and current can be varied depending on the thickness of polymeric film desired and the geometry of the deposition system, and can be readily determined by a series of test runs by one skilled in the art.

30 In addition to the desired monomer or mixture of monomers, a carrier gas can also be present during glow discharge. The presence of a carrier gas increases the total pressure of the system and enables one to choose a convenient pressure region in which a glow discharge will form. The carrier gas can be introduced at a pressure from about 100 to about 5000 microns. Suitable inert carrier gases include the noble gases, such as neon, argon, krypton, helium and the like, and nitrogen.

40 When the polymer film of desired thickness has been applied to the conductive video disc, the vacuum is broken and the disc removed from the chamber, ready for playback.

45 The invention can be further illustrated by the following example, but it is to be understood that the invention is not meant to be limited to the details described therein.

50 Example

A vinyl disc about 12 inches in diameter containing a spiral groove on the surface with a pitch of about 4000 grooves per inch and coated with a film of aluminum about 500 Å in thickness, was mounted in a vacuum chamber fitted with another 12 inch diameter aluminum disc such that the two discs were parallel and spaced about 2—3 centimeters apart. One electrical lead from each disc was connected to a source of 60 Hz current such that the applied potential of the glow discharge was 0.8 kV. The chamber was evacuated to a pressure below 10^{-3} torr and styrene injected into the chamber to a partial pressure of 200

microns. Argon was also admitted to the chamber to a partial pressure of 300 microns.

The current was turned on for 40 seconds. After releasing the vacuum, the disc, containing a polystyrene coating, was removed from the chamber.

A uniform tough, adherent film of polystyrene about 500 Å in thickness was deposited on the disc.

WHAT WE CLAIM IS:—

1. An information storage device comprising a storage medium having information recorded in the form of geometric variations in a conductive surface thereof adapted to present capacitance variation to a pickup means and having a polymeric dielectric coating thereon which is from 200 to 3000 Å in thickness.

2. An information storage device according to claim 1 wherein the storage medium is a disc having a spiral groove on a face thereof, said groove having information recorded in the form of geometric variations in the bottom of said groove, and a conductive metal layer on said face conforming to said variations and forming said surface.

3. An information storage device according to claim 2, being a video disc.

4. An information storage device according to claim 1, 2 or 3 wherein said dielectric coating is polystyrene.

5. An information storage device according to claim 4 wherein said polystyrene dielectric coating is from 200 to 1000 Å in thickness.

6. A method of providing a thin, adherent, uniform dielectric coating on the conductive surface of a video disc having video information in the form of geometric variations in said surface thereof, which comprises:

a) mounting said video disc in a vacuum chamber as an electrode, the counter electrode being a conductive disc mounted parallel to and spaced from said video disc surface,

b) evacuating said chamber to a pressure below about 10^{-3} torr,

c) introducing a monomer into said chamber to a pressure of from 10 to 2000 microns, and

d) establishing a glow discharge between said discs whereby said monomer is polymerized on the surfaces of said discs.

7. A method according to claim 6 wherein said monomer is selected from the group consisting of styrene, a substituted styrene, an alkyl-substituted silane, an alkene, a cycloalkene, an alkene-substituted benzene, a halogenated olefin, and a polysiloxane.

8. A method according to claim 6 wherein said monomer is styrene.

9. A method according to claim 6, 7 or 8 wherein said video disc has a spiral groove in said surface thereof and a metallic layer thereon, said video information being in the

a second conductive disc. The discs act as electrodes during deposition of the film coating. Electrical connections are contacted with the discs and connected to a source of current.

5 The chamber is then evacuated, preferably to a pressure below about 10^{-3} torr, and sufficient monomer is then charged to the chamber so as to deposit the desired amount of polymeric film on the cathode disc. The monomer pressure can vary from about 10 to 2000, preferably 50 to 300 microns. Alternatively, a continuous flow of monomer can be added to the vacuum chamber until the desired film thickness is obtained on the cathode disc.

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30 In addition to the desired monomer or mixture of monomers, a carrier gas can also be present during glow discharge. The presence of a carrier gas increases the total pressure of the system and enables one to choose a convenient pressure region in which a glow discharge will form. The carrier gas can be introduced at a pressure from about 100 to about 5000 microns. Suitable inert carrier gases include the noble gases, such as neon, argon, krypton, helium and the like, and nitrogen.

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c) introducing a monomer into said chamber to a pressure of from 10 to 2000 microns, and

d) establishing a glow discharge between said discs whereby said monomer is polymerized on the surfaces of said discs.

7. A method according to claim 6 wherein said monomer is selected from the group consisting of styrene, a substituted styrene, an alkyl-substituted silane, an alkene, a cyclo-alkene, an alkene-substituted benzene, a halogenated olefin, and a polysiloxane.

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- form of geometric variations in the bottom of
id groove.
10. A method according to any preceding
claim wherein said monomer is styrene at a
5 pressure from 50 to 300 microns.
11. A method according to any of claims
6—10 wherein carrier gas is also introduced
in said chamber in step *c* to a pressure of
from about 100 to about 5000 microns.
- 10 12. An information storage device having
a polymerically coated information storing
conductive surface substantially as herein-
before described.
13. Information storage device according
to claim 12 being a video disc. 15
14. Method of making a video disc for
capacitive sensing, substantially as herein-
before described.
15. A video disc made in accordance with
any of claims 6—11 or 14. 20

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