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PLAYING CARD AND PROCESS FOR
MAKING THE SAME

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This invention relates, in general, to playing cards and in particular to a process for coating playing cards and to correlated improvements designed to enhance the appearance, wear and washability of such coated cards.

The invention has particular reference to coated playing cards having a base formed of a plastic material hereinafter called "plastic playing cards." Such plastic cards are provided, in their best embodiment, with one or more coatings of a transparent film-forming composition for the purpose, inter alia, of protecting the printing applied to the plastic card modifying the surface to reduce the gloss, decrease the slipperiness and to impart a proper slip, and finally to render the cards moistureproof, stainproof and washable. Therefore, the coating must be not only transparent but also non-tacky, moistureproof, washable and free of objectionable surface gloss. It has been found that when such a coating composition is applied to the smooth, glossy surface of the non-fibrous plastic card base, the coating frequently adheres imperfectly to the base so that the coating tends to crack, peel or separate from the base when the cards are shuffled, bent, moistened or otherwise handled during playing or washing. However, this adhesion must be obtained without the development of brittleness which results from ordinary chemical methods of using in the coating a solvent which will dissolve the surface layers of the base sheet.

Therefore, it is a general object of the present invention to improve the adhesion of the coating to plastic playing cards without changing the physical strength of the plastic.

It is a specific object to provide a method of coating plastic playing cards in a simple and economical manner with a strongly adherent coating.

It is a further specific object to provide a plastic playing card having a transparent, non-tacky, non-slippery, washable coating thereon which adheres firmly to the base during use and washing.

Objects of the invention will be in part obvious and will in part appear hereinafter.

According to the present invention, plastic playing cards are provided with strongly adhering coatings of the type just described by applying to the surface of the uncoated plastic base, preferably after printing the base, a multiplicity of particles of a comminuted material which exhibits a chemical adsorption to the base and of such particle size and in such an amount that the particles do not detract from the appearance of the coated card, and thereafter applying a coating

of a film-forming composition over the surface of the card carrying such particles, whereby the particles improve greatly the adhesion of the coating to the plastic base.

The comminuted material employed consists of particles of a compound of an element capable of forming molecular coordination complexes by reason of covalency or residual valence, the particles being small enough to enable the compound to form coordination complexes with the molecules in the surface of the plastic base, whereby the lacquer coating is anchored to the base by reason of the covalences or residual valences exercised by said metal compounds for the plastic base on the one hand and the coating on the other.

The classes of elements which are capable of forming molecular coordination complexes are those elements which exhibit residual valences according to the Werner theory. Of this class the compounds employed in the present invention comprise anhydrous solid compounds of metals, preferably amphoteric metals, which have a tendency to form coordination complexes according to Werner's theory, such for example, as the solid salts and solid oxides of copper, magnesium, aluminium, silicon, zinc, tin, vanadium, chromium, molybdenum, manganese, iron, cobalt, nickel and the like. Because of the low molecular weight, the high tendency to form coordination complexes and its amphoteric character of magnesium, I prefer to employ anhydrous solid compounds of magnesium, in particular magnesium silicate, magnesium fluoride, magnesium oxide, magnesium carbonate, magnesium chloride, magnesium sulfate. Other examples of compounds which are useful as the comminuted material, are anhydrous stannic chloride, powdered clay, bentonite, talc, soapstone and the like.

The compound selected should be preferably colorless, white or of a light shade when powdered and the material should be inert in the solvents used in the film-forming composition. Generally speaking, the finer the particle size, the less material is required, the less alteration in transparency and the better the adhesion. The particles should have a size of less than 80 mesh and preferably less than 100 mesh of which 50% should pass a 200 mesh screen. For each compound there appears to be a threshold value for the particle size below which the covalences and residual valences are most effective in anchoring the particles to the surface. The amount of comminuted material to be employed to produce proper adhesion is extremely small, since in-

proved adhesion of the coating is obtained with an amount of powder deposited on the surface which is invisible to the naked eye.

The process of the invention is applicable to plastic playing cards made from various types of plastic materials, such, for example, as cellulose derivatives, preferably organic esters of cellulose, such as cellulose acetate, cellulose formate, cellulose butyrate and the like, and cellulose ethers; also synthetic resins of suitable type such, for example, as vinyl resins, copolymers of vinyl compounds, methyl methacrylate resins, urea-formaldehyde resins, glyptal resins, and mixtures of cellulose derivatives and resins. To the plastic base, there is usually added suitable plasticizers, drying oils, fillers, pigments, waxes and other ingredients depending upon the nature of the plastic and the type of card desired. The formation of the plastic base sheet used in the manufacture of plastic playing cards is well known and such process, per se, forms no part of the present invention.

It is customary to print the plastic card with the necessary characters, designs, figures and other indicia in a suitable manner, for example, by a photo-offset process, a letter-press process, or by rotogravure or other conventional printing process, which processes, per se, also form no part of the present invention.

After the printing operation, in the process of the present invention, the printed card is treated to deposit on one or both surfaces an invisible deposit comprising a multiplicity of fine particles of comminuted material.

The comminuted material may be applied to the card in any suitable manner as by dusting or spraying the solid particles on the plastic base or by treating the base with a suspension or solution of the particles in a liquid inert to both particles and plastic base, such as water, alcohol, benzene and the like depending upon the nature of the materials, and thereafter evaporating the liquid to leave the particles on the plastic base.

The dry plastic base carrying the particles on the surface is next coated with the film-forming composition such, for example, as a solution in a suitable organic solvent of a cellulose derivative such as a cellulose ester, a cellulose ether, a cellulose ester-ether, or a synthetic resin, a drying oil or a drying oil-modified resin or a mixture of these film-forming ingredients, to which composition may be added the usual plasticizers, gums, fillers and the like, and a moistureproofing agent such as a wax. The composition may be applied in any suitable manner but is preferably applied by spraying, in a plurality of coatings, which upon evaporation of the solvent leaves a transparent, non-tacky, non-slippery protective coating.

Without limiting the invention by an theoretical explanation, it now appears that the particles of comminuted material are attracted to the surface of the base plastic card base by physico-chemical surface forces which may be electrical (static charges) and that the film produced by the coating operation is attracted to the particles by similar forces so that the particles may be considered as forming a multiplicity of separate anchors to hold the coating to the base sheet. That the particles serve to increase the adhesion to the base sheet is surprising and unexpected in view of the conventional practice in the lacquering art of always avoiding the application of a lacquer to a dusty surface and the usual admonitions of lacquer manufacture that the surface to be coated should be clean and free of grit. Accordingly,

the present invention achieves new and commercially valuable results by proceeding contrary to the teachings of the prior art.

By way of more specific illustration but not by way of limiting the invention, there will be given the following specific example: A playing card base sheet formed of plasticized cellulose acetate is first printed and then dusted on both sides with magnesium carbonate having a particle size of between 100 and 200 mesh, the amount of powder applied to the base being less than that amount which will form a visible deposit. Both sides of the base sheet carrying the particles are coated three times each by spraying with a nitro-cellulose lacquer comprising a plasticizer and a wax. The coating adheres to the base tenaciously even when the card is repeatedly bent or shuffled, and during normal washing of the cards.

By the present invention there has been provided a simple and economical method of improving the adhesion of coatings to plastic playing cards. The particles employed do not detract from the feel, appearance, or transparency of the coating and greatly improve the adhesion of the coating during wear and washing of the cards. While various changes may be made in the process and in the nature and application of the comminuted materials, the invention is not to be limited except as defined by the appended claims.

I claim:

1. In a process for the manufacture of organic plastic playing cards, the steps comprising applying to an organic plastic base sheet an invisible deposit comprising a multiplicity of particles of a finely comminuted solid anhydrous inorganic compound of a metal which forms molecular coordination complexes, and applying over said particles a coating of moisture-proof organic film-forming composition.

2. In a process for the manufacture of organic plastic playing cards, the steps comprising printing an organic plastic base sheet, applying to the printed base sheet an invisible deposit comprising a multiplicity of particles of a finely comminuted solid anhydrous inorganic compound of a metal which forms molecular coordination complexes, and applying over said particles a coating of a transparent moisture-proof organic film-forming composition.

3. In a process for the manufacture of organic plastic playing cards, the steps comprising dusting the surface of an organic plastic base sheet to deposit thereon a multiplicity of particles of a finely comminuted solid anhydrous inorganic compound of a metal which forms molecular coordination complexes, and applying over said particles a coating of a moisture-proof organic film-forming composition.

4. In a process for the manufacture of organic plastic playing cards, the steps comprising treating an organic plastic base sheet with a suspension of a finely comminuted solid anhydrous inorganic compound of a metal which forms molecular coordination complexes, in a liquid which is inert to said base sheet, evaporating said liquid to deposit on said sheet an invisible deposit comprising a multiplicity of particles of said comminuted material, and applying over said particles a coating of a moisture-proof organic film-forming composition.

5. As an article of manufacture, a playing card comprising an organic plastic base sheet, a multiplicity of particles of a finely comminuted solid anhydrous inorganic compound of a metal which forms molecular coordination complexes, on the

surface of said base sheet, and a moisture-proof organic coating over said particles, the particles serving to anchor said coating to said base sheet.

6. As an article of manufacture, a playing card comprising an organic plastic base sheet having on its surface an invisible deposit comprising a multiplicity of particles of finely comminuted solid anhydrous inorganic compound of a metal which forms molecular coordination complexes, and a transparent moisture-proof organic coating over said particles, the particles serving to anchor said coating to said base sheet.

7. As an article of manufacture, a playing card comprising an organic plastic base sheet, a multiplicity of particles of a finely comminuted solid anhydrous inorganic compound of a metal which forms molecular coordination complexes on the surface of said base sheet, and a plurality of moisture-proof organic coatings over said particles, the particles serving to anchor said coatings to said base sheet.

8. As an article of manufacture, a playing card comprising a printed organic plastic base sheet having on its surface an invisible deposit comprising a multiplicity of particles of finely comminuted solid anhydrous inorganic compound of a metal which forms molecular coordination complexes, and a transparent moisture-proof organic coating over said particles, the particles serving to anchor said coating to said base sheet.

9. As an article of manufacture, a playing card comprising an organic plastic base sheet, a multiplicity of particles of a finely comminuted anhydrous inorganic magnesium compound on the surface of said base sheet, and a moisture-proof organic coating over said particles, the particles serving to anchor said coating to said base sheet.

10. A playing card comprising a base sheet of organic material having a coating of transparent waterproof organic material anchored thereto by particles of an inorganic magnesium compound which are fine enough to pass an 80 mesh screen and are distributed over the surface of the base sheet.

11. A playing card comprising a base sheet of cellulose acetate having particles of magnesium carbonate fine enough to pass an 80 mesh screen distributed over the surface thereof and covered by an adhering film of transparent, waterproof, cellulosic material.

12. A method of producing playing cards which comprises the process steps of dusting onto the surface of a base sheet formed of organic plastic material, an inorganic compound of a metal which forms molecular coordination complexes, and in a form fine enough to pass an 80 mesh screen, and thereafter coating said base sheet with a transparent, waterproof, organic material.

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