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Coll-Palagos

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[54] **EMBOSSING ROLLERS AND METHOD OF EMBOSSING**

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Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 858,136, Sept. 15, 1969, abandoned.

[52] **U.S. Cl.**..... **264/219,** 204/25, 204/41, 264/293

[51] **Int. Cl.**..... **B29c 1/02,** B28b 11/08, C23b 5/56

[58] **Field of Search** 204/23, 25, 41, 140.5; 264/219, 284, 293; 101/32, 5

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[57] **ABSTRACT**

A new and useful method for modifying embossing rollers, plates or dies is provided capable of imparting any relief pattern or texture of the highest quality to textiles, papers, synthetic materials including artificial leather, plastic materials including vinyl and polyamide fabrics, sintered metals, wood, sheet metal, and the like. In one specific embodiment of the invention, a method is provided for modifying embossing rollers capable of imparting to the surface of a vinyl plastic material, the appearance and texture of smooth leather grain, and in particular the appearance of wet leather.

The process includes the steps of electroplating a deposit of a metal having a high to medium levelling effect and high brightness over the entire surface of the roller and plating the roller with a metal characterized by a relatively lower levelling effect, as a finishing coating.

6 Claims, No Drawings

EMBOSSING ROLLERS AND METHOD OF EMBOSSING

CROSS-REFERENCE TO COPENDING APPLICATIONS

This application is a continuation-in-part of an application filed Sept. 15, 1969, Ser. No. 858,136 for EMBOSSING ROLLERS in the name of Miguel Coll-Palagos, now abandoned.

FIELD OF THE INVENTION

The present invention relates to a new and improved embossed roller, plate or die which is obtained by electroplating a deposit of a suitable metal having a high or medium levelling effect, such as copper, over the entire surface of an engraved roller and a second plating with a metal having a lesser levelling effect such as chromium, as a finishing coating. The new and improved roller thus obtained is capable of reproducing designs from an original pattern thereby providing a uniform pattern of high lustre without employing a fluorocarbon, polyester or like film lamination in the reproduction operation.

DESCRIPTION OF THE PRIOR ART

For many years, the embossing industry has searched for new methods and procedures to create and reproduce faithfully, embossing and graining rollers, plates or dies so as to impart, on suitable substrates such as paper, leather, artificial leather, synthetic materials such as thermoplastic materials, synthetic fibers, vinyl fabrics, metal foil, and the like, relief patterns or textures of the highest quality and appearance. Unfortunately, these attempts have met with limited success since the copy or result is not generally as detailed and as bright as desired. In many instances, additional steps are required such as, for example, buffing or other finishing steps but even such added efforts do not create a reproduction comparable to or simulating the texture, appearance, or quality of the original material. This is particularly true when a high lustre is desired for the final product as, for example, when a shiny or wet leather finish is desired on vinyl or leather materials. In order to achieve the desired shiny or wet appearance, it has been the practice to use a fluorocarbon or polyester film lamination, particularly Mylar films, in the embossing step. Although this Mylar processing yields the desired wet look, it is economically unattractive since large amounts of Mylar are consumed in the processing.

Conventional procedures whereby the industry attempted to impart embossing effects on different materials included, for example, machine engraving and electroforming. Machine engraved embossing rollers do not however possess the surface finish quality which is required, for instance, to impart the brilliance and richness of leather grains on vinyl fabric material. Electroforming, on the other hand, has not yet developed the mold-making technique that would assure a successful and accurate reproduction of a seamless embossing roller or cylinder which is required to emboss patterns and textures that are required and demanded for example, in footwear, wearing apparel, fine upholstery fabrics, and the like.

Thus, conventional embossed rollers, even when used with Mylar film, could not successfully reproduce articles of clothing such as, for example, leather products. The reproductions of natural leather usually obtained were characterized by streaks and a very hazy overall effect and such products did not possess the elegant appearance of the original leather. Furthermore, the reproductions were also marred by undesirable lines and sharp edges, and an undesirable feel. Such products did not even resemble the appearance or elegance of good quality leather. Thus, using conventional engraved embossing rollers, it was not possible to obtain a surface finish quality such as that required, for instance, to impart the brilliance and richness of fine leather grains on vinyl fabrics. Up to the present time, it was not possible to reproduce faithfully embossing and graining plates to impart on substrates such as paper, leather, artificial leather, plastics, metal foil, and the like, relief patterns or textures of a high and delicate quality. Furthermore, it has been heretofore impossible to obtain vinyl or leather substrates which while faithfully reproducing the grain of the original leather, possess the high lustre and brightness of the so-called wet look without employing a Mylar film lamination in the embossing step.

DETAILED DESCRIPTION OF THE INVENTION

The present invention provides a new and useful procedure for modifying embossing rollers, plates or dies so as to produce articles having the desired surface patterns or designs which are characterized by the brightness and feel of natural leather grains. Using the modified roller of the present process, there is obtained a reproduction of the burnished leather effect, i.e., a high lustre leather grain, that is difficult to distinguish from the original design. The modified rollers of the present process can also be used to obtain substrates having the so-called wet look without employing a Mylar film lamination.

Any conventional design or any new design or pattern found in nature or made by man, in whatever fashion, can be reproduced not only in appearance but also in feel and textural reflexion. The modified embossed roller obtained by the process of this invention may also reproduce any design or pattern such as that found on the surface of a natural leather, reptile or animal skin, wood, crinkle foil, and the like.

In accordance with the process of the present invention, there is obtained a new and improved embossed roller by subjecting a machine engraved or electroformed roller to a combination of plating steps. Firstly, the embossed roller is subjected to a bright metal plating step with a metal characterized by a high or medium levelling effect, to produce a combined brightening and smoothing effect on the roller. Illustrative metals are copper, iron, nickel, and the like. There is thus obtained a deposit of a metal having the aforesaid smoothing and brightening effect over the entire surface of the embossing roller. This is followed by a second plating step which is used as a finishing coating for the roller and the second plating is suitably effected by the use of a metal having a relatively lower levelling effect such as chromium or nickel. The second plating step provides a hard coating surface which is resistant to corrosion and erosion while at the same time enhancing the textured pattern of the end desired product.

The shape and configuration of the embossing rollers, plates or dies employed in conjunction with the new method of the present invention is not critical and

it is to be understood that any roller, plate or die of practically any shape suitable for imparting the desired grain or texture to the material which is to be embossed is acceptable for use in conjunction with the present process. The roller, plate or die can be made of a wide variety of materials including ferrous or non-ferrous metals such as aluminum and aluminum alloys. The advantages of aluminum rollers are that such rollers are characterized by better heat transfer, easier machining and less weight than steel rollers. Further, it is also possible to utilize effectively plastic rollers having a metal coating on the surface and illustrative plastic rollers are those fabricated from ABS, polycarbonates, polyvinyl chloride, rigid urethanes, and the like.

The procedures used in engraving embossing rollers, dies, plates and the like, are conventional and the particular method employed for engraving is not critical to the success or operability of the present process. Thus, the embossing rollers, plates or dies, can be engraved by many procedures and illustratively, by hand, by machine, chemical or photochemical techniques.

Using the present procedure, quite surprisingly, it is now possible to obtain a modified roller, plate or die which can successfully impart a natural grain to paper, aluminum foil, synthetic materials such as polypropylenes, urethanes, cellulose, synthetic fabrics, and the like, and even to a material such as wood. Surprisingly, the modified rollers obtained by the present process can be applied to any material that can be embossed whether such material is a synthetic or a natural substance. Thus, for example, modified rollers of the present process, when applied, for example, to the reproduction of natural leather, the resulting product is characterized by a glossy and shiny brilliance, an excellent "feel" or "touch;" the product looks like a skin which has actually been blended in. It has also been found that by employing the modified rollers of the present invention, the wet leather look can be imparted to the vinyl or leather substrate without the use of conventional Mylar film lamination in the embossing process.

The present invention accordingly represents an important improvement in the art since it avoids the disadvantages associated with the use of conventional embossed rollers. The new and improved process of the present invention involves a combination of steps including modifying the roller with (1) a bright metal plating and (2) a second metal plating step. In the first plating step, the metal used is generally ductile and bright having a high or medium levelling effect on the surface of the roller. Suitable metals include, for example, copper, nickel or iron. It has been found that the use of copper is most suitable. In the second plating step, generally a metal having a relatively lower levelling effect such as, for example, chromium or nickel, is used.

The electroplating procedures used are conventional and involve utilizing the roller as the cathode in an electrolytic bath. The electroplating enhances the surface characteristics of the roller, plate or die so that said roller imparts to the material to be embossed, a lustrous leatherlike finish. Any suitable or conventional electrolyte can be used in the electroplating bath. As indicated above, a plurality of electroplating steps is employed in order to secure the desired surface characteristics comparable to those of the original material. Thus, for example, in the production of an embossed vinyl material possessing the characteristics of a natural leather which is highly desirable, for example, in the footwear industry, the first electroplating step is effected by use of a metal having a high or medium levelling effect such as copper followed by a second electroplating step using a metal having a relatively lower levelling effect such as chromium.

It has been found particularly useful to conduct the first plating step by initially flash-coating the metal having the high or medium levelling effect by well known periodic reverse current plating techniques to the roller followed by electroplating that metal on the roller. The conventional copper cyanide periodic reverse current solutions which are well known in the art are particularly useful for this flash-coating. This method insures complete and even coverage of the roller.

In order that the invention may be more fully understood, the following Example is given by way of illustration only.

EXAMPLE

A 6-foot embossing roller was engraved with a leather grain effect. The embossing effects previously obtained on a polyvinyl chloride fabric were unsatisfactory since the fabric was characterized by a dull-plastic look and did not possess the lustre of the wet look.

The embossed roller composed of a conventional steel such as SAE 1035 was stripped of metals previously plated. After the stripping of the roller, the roller was subjected to a copper flash from a cyanide bath having the following composition and under the following conditions:

Copper cyanide	3.0	oz/gal
Sodium cyanide	4.5	do.
Sodium carbonate	2.0	do.
Sodium hydroxide to a pH of 12 to 12.6		
Cu by analysis	2.1	do.
Free cyanide	1.0	do.
Temperature	90–110°F.	
Cathodic current density	10–15 Amp/sq.ft.	
Plating thickness	0.05–0.1 thousands of an inch	

On this copper flash, a bright acid copper was electrodeposited and the composition of the plating bath as well as the conditions are as follows:

Copper sulfate	30 oz/gal
Sulfuric acid	5.5 fl. oz/gal
Chloride ion	30 mg/l
UBAC Make-up additive	0.75% (by wt)
UBAC-R1 Additive	0.25% (by wt)
Temperature	90°F.
Cathode current density	100 Amp/sq.ft.
Agitation: Air 1–2 cfm per sq. ft. of soln surface	
Plating thickness:	3–6 mills (for our roller)

The electrolyte was subjected to a moderate agitation as, by stirring, in order to keep the deposit surface free from hydrogen bubbles.

A final chromium plate is deposited on the bright copper surface and a standard hard chromium bath was used having the following composition and under the indicated conditions:

Chromic acid	33.0 oz/gal
Sulfuric acid	0.33 do.
Bath ratio CrO_3/H_2SO_4	100:1
Temperature	110–120°F.
Cathode Current Density	0.7–1.5 Amp/sq.ft.
Plating thickness	0.5 mills (for our roller)

The plating bath determines the levelling effect. i.e., the ability to deposit in recessed areas.

The product obtained by use of a modified roller prepared by the foregoing combined electroplating steps is characterized by the glossy, shiny brilliance of the wet leather look while possessing the "touch" and feel of natural leather. The product is also characterized by an elegant appearance and simulates, in every detail, the appearance and texture of vinyl fabric which has been embossed with the aid of Mylar film.

It is, of course, to be understood that the present invention is by no means limited to the particular methods and devices set forth above, but also comprises any modifications within the scope of the intended claims. Thus, the rollers, dies, and the like, can be made of any material having a conductive surface.

Further, the embossing rollers, molds or dies can be used on many material substrates such as synthetic materials, paper, wood, metal, and the like. Still further, as electrolytes, various substances can be suitably employed.

What is claimed is:

1. In the method of embossing a vinyl substrate material to reproduce a fine or textured pattern thereon, the improvement which comprises contacting said vinyl substrate with a master embossing surface which has been subjected to the following succession of steps:

a. Electroplating the surface with a brightening metal having a high to medium levelling effect selected from the group consisting of copper, iron, and nickel followed by

b. electroplating with a metal having a relatively lower levelling effect selected from the group consisting of chromium and nickel with the proviso that the metal of step (b) has a relatively lower levelling effect than the metal of step (a).

2. A method according to claim **1** wherein the levelling action is effected by subjecting the master surface to the electroplating action of copper.

3. A method according to claim **1** wherein the second electroplating step is effected by contact with chromium.

4. A method according to claim **1** wherein the texture, grain and effect of a natural leather, wet leather, or a patent leather is reproduced on a vinyl fabric by engraving the surface of a roller with a natural leather grain, subjecting the roller to a copper flash, electroplating the resulting surface with bright copper to obtain a deposit high ductility, brightness and hardness, subjecting the surface thus obtained to electroplating with chromium and then embossing a vinyl fabric with the resulting modified roller.

5. A method according to claim **4** wherein the roller is subjected to a copper flash in an alkaline cyanide bath prior to electroplating with copper.

6. A method according to claim **1** wherein the engraved master surface is a roller, plate or die.

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