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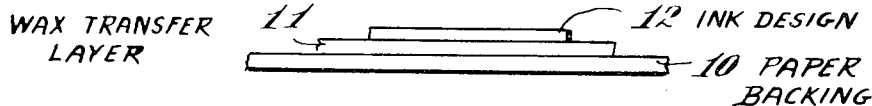
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UNITED STATES PATENTS
 2,862,832 12/1958 Shepherd, Jr..... 161/235
 2,990,311 6/1961 Shepherd, Jr..... 161/235
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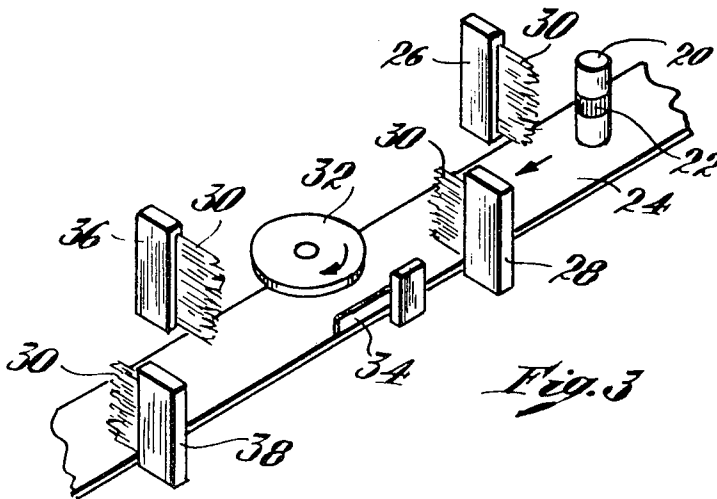
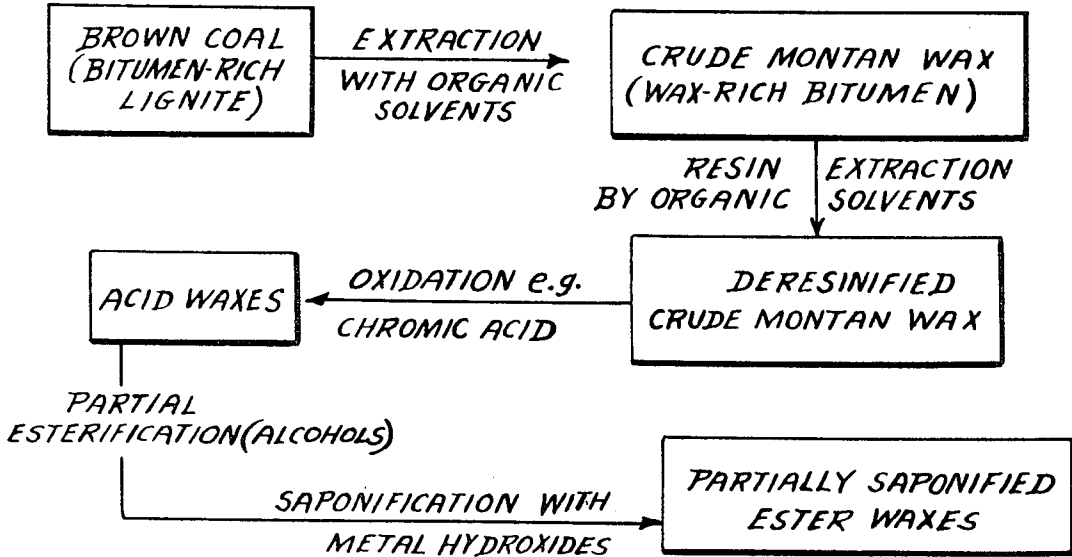
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[54] **CLEAR HEAT TRANSFER AND METHOD OF**
APPLYING THE SAME
10 Claims, 3 Drawing Figs.

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 117/3.2, 156/239, 156/240, 161/235, 161/406,
 161/413
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 B41m 3/12, B44c 1/16
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 230, 237, 239, 240; 117/3.2, 3.1, 92, 168; 161/3,
 5, 234, 235, 406, 413

ABSTRACT: A heat transfer is described for labelling clear plastics which uses as the transfer layer a coating comprising at least 30 percent by weight of an oxidized, esterified, partially saponified montan wax. An ink image is printed over the wax and, after transfer by application of heat and pressure, is smoothed, clarified and glossed by exposure to a jet of hot gas or other heating means to remelt the transferred wax, followed by solidification in the clear state.





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CLEAR HEAT TRANSFER AND METHOD OF APPLYING THE SAME

This application is a continuation-in-part of copending U.S. Pat. Application Ser. No. 602,758 now abandoned.

BACKGROUND OF THE INVENTION

1. Introduction

This invention relates to heat transfers for labelling (class 117, subclass 3.2) and more particularly, to improvements in heat transfers embodying a wax release coating especially adapted for the labelling of plastics.

2. Description of the Prior Art

Improved heat transfer labels based upon the use of various waxes are in substantial commercial use and are disclosed in U.S. Pat. Nos. 2,862,832; 2,984,413 and 2,990,311, all incorporated herein by reference. Apparatus for applying the labels is known and is disclosed for example in U.S. Pat. Nos. 2,981,432 and 3,064,714 also incorporated herein by reference.

In accordance with U.S. Pat. No. 2,862,832, there is provided a heat transfer comprising a backing and a release coating thereon comprising an oxidized wax obtained as the reaction product of the oxidation of hard, high melting, aliphatic, hydrocarbon waxes. These oxidized waxes have melting points between about 50° and 110° C., saponification values between about 25 and 100, acid values between about 5 and 40, and a penetrometer hardness (ASTM-D5-52) below about 15 as measured with 100 grams for 5 seconds at 25° C. U.S. Pat. No. 2,984,413 is similar, but differs from U.S. Pat. No. 2,862,832 by use of an unoxidized wax in the transfer coating. U.S. Pat. No. 2,990,311 is an improvement over the aforementioned patents and provides a transfer consisting of a backing and a transfer layer comprising a uniform mixture of a crystalline wax and a synthetic, thermoplastic, film-forming resin where each ingredient in the composition is present to the extent of at least 15 percent of their combined weights.

Labels comprising an oxidized wax release coating in accordance with the above-noted patents have presented limitations in the labelling of some articles, particularly packaging containers such as bottles or the like made of clear or opaque plastic or of plastics such as polyvinyl chloride or polystyrene which have relatively low softening temperatures. In effecting transfer, the wax layer is melted and some of the wax transferred with the design or image to the receiving surface where it solidifies. The transferred wax normally solidifies as a cloudy film which is not normally noticeable or objectionable where the receiving surface is opaque. However, it noticeably detracts from the clarity and attractiveness of the design when the receiving surface is of clear plastic. The film of cloudy wax surrounding the image can be particularly noticeable.

It is accordingly the principal object of the present invention to provide heat transfers generally of the above type which can be smoothed and clarified to avoid reduction in the attractiveness of the transferred image, and which can be applied to plastic surfaces with low softening temperatures, together with methods of applying the same.

SUMMARY OF THE INVENTION

In accordance with the present invention it has been found that clear images can be provided on receiving surfaces by employing in the wax release coating, a modified montan wax which has been oxidized, esterified, and partially saponified as more fully described hereinafter. Following transfer, the wax transferring with the design is remelted by means of a high-temperature jet of gas or any other suitable means which heats the wax to or above its melting point with minimum heating of the underlying surface, followed by cooling to solidify the wax in a clear, smooth state. Cooling at ambient conditions is normally satisfactory, although forced cooling can be employed for faster and sometimes better clarification, and is especially useful where the articles are to be immediately handled as in packing.

The modified montan waxes herein employed have similar properties to those specified in U.S. Pat. No. 2,862,832 except that somewhat higher saponification values can be employed. Thus they have melting points between about 50° and 110° C., saponification values between about 25 and 150, acid values between about 5 and 40 and a penetrometer hardness (ASTM-D5c852) below about 15 as measured with 100 grams for 5 seconds at 25° C. They should be clear in thin liquid layers and have relatively high-melt viscosities.

Additives such as fillers, wax extenders, and resins, especially synthetic resins, may be added to the wax without adverse effects as illustrated in the following examples and to improve various properties such as gloss, printability and the like.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention can be better understood by reference to the accompanying drawing in which:

FIG. 1 is a transverse section of a heat transfer in accordance with the present invention;

FIG. 2 is an illustrative flow chart for the preparation of modified montan waxes herein employed; and

FIG. 3 is a schematic, isometric view of apparatus for applying a high-temperature gas jet to the transferred image for clarification.

Referring to the drawing, a backing 10 of paper or the like is coated with a transfer layer 11 containing at least 30 percent by weight of an oxidized montan wax and a design 12 is printed on the exposed surface of the layer.

The oxidized montan waxes herein disclosed are prepared in accordance with the treatments shown in FIG. 2 and are available in various grades from the American Hoechst Corp. of Mountainside, New Jersey. For example Hoechst waxes OP, X55, 0 and Special can be employed. Such waxes, useful herein, have high-melt viscosities compared to other more common waxes which have quite low-melt viscosities a few degrees above their solidification point, a property considered important in obtaining smoothness and clarity as herein disclosed. Thus, the waxes should have a melt viscosity at 25° F. above their solidification point of at least about 150 centipoises. These waxes are also substantially clear when melted in a liquid layer of about ¼ inch or less in thickness. These waxes are montan waxes which have been oxidized, esterified and partially saponified by treatments illustrated in FIG. 2. While not always described in the trade literature as oxidized waxes, the above waxes have been subjected to oxidation and have the properties above specified.

The above waxes in the amounts proscribed appear to be unique in providing clarity in transfer labels by feasible means. It is believed that their complex composition and relatively high-melt viscosity substantially diminish their ability to crystallize when cooled so that these waxes, which are substantially clear when melted, can be relatively rapidly cooled to a clear solid in a substantially amorphous state.

The transfer layers of the present invention can be applied to the backing by any convenient method such as by emulsions, hot melts or as solvent solution. The coated paper is then printed with a design by conventional printing equipment such as letterpress, rotogravure, and flexographic presses and with the conventional ink, in a plurality of colors if desired and including inks made from powdered metal. The term design as used herein includes both printing and art work or a combination of both.

The oxidized, modified montan waxes herein disclosed are relatively viscous, brittle and/or costly if used alone and it is preferred to use them in admixture with various additives such as other waxes, fillers and resins such as those exemplified in the above referenced U.S. Pat. No. 2,990,311 to improve cost, coating properties, gloss, printability, and the like in the finished transfer coating. Suitable formulations are given in table 1 wherein all parts are by weight.

TABLE I

Example	1	2	3	4	5	6	7	8	9	10
Hoescht OP ¹	80	80	80	80		74	58		38	
Hoescht X55 ²					75			42		30
Paraffin	20				25	8	18	22	32	42
Microcrystalline wax		20						6		
Cardis One ³							12	12	10	7
Castorwax			20			14				
Carnauba wax						4				
Beeswax				20						
Pentalyn H ⁴							12	12	13	12
Elvax 410 ⁵								6	7	9

¹ Hoescht OP is a hard, oxidized montan wax modified as indicated in FIG. 2 and having a Drop Point (ASTM 566-49) of 212-221° F., a Congealing Point (ASTM D938-49) of 165-175°F., an acid No. of 10-15 and a saponification number of 100-115.

² Hoescht X55 is a similarly modified montan wax having a Drop Point of 208-218° F., a Congealing Point of 167-176° F., an acid No. of 10-15 and a saponification Ac. of 90-110.

³ Cardis One is a polyethylene modified microcrystalline wax of the Warwick Wax Division of the Western Petrochemical Corporation.

⁴ Pentalyn H is the pentaerythritol ester of hydrogenated rosin and is available from Hercules Chemical Company.

⁵ Elvax 410 is a copolymer of ethylene and vinyl acetate and is available from E. I. duPont Company.

The microcrystalline wax used in the above examples was Warco 150° F. (example 2) of the Warwick Wax Division of Western Petrochemical Corporation of Ultraflex White (example 8), of Petrolite Corporation, the Castorwax was a hydrogenated castor oil obtained from the Baker Chemical Company, and the paraffin wax was Sunoco 5512 wax of the Sun Oil Company having a melting point of about 160° F.

The paper is then printed on the waxed side with a glossy, organic-solvent type gravure ink. After the ink has dried, the design is transferred to the receiving surface by rolling pressure from a heated surface at a temperature between about 250°-600° F., for example 350° F. The transfer can also be preheated if desired. After transfer the paper backing 10 is immediately removed while hot, leaving the design firmly attached to the surface.

In effecting transfer, the molten wax transferring with the ink tends to be uneven and cloudy, detracting from the attractiveness of the transferred image.

To improve the appearance of the transfer and to clarify the wax, it has been discovered that the transferred image, including the transferred, solidified wax, can be exposed to jets of hot gas, either as a direct gas flame or as hot air jets at 300°-400° F., or higher, for a period of time just sufficient to melt the wax. By this means only the surface of the design, including the wax, is heated and cooling is relatively rapid merely with exposure to the ambient atmosphere and a clear film results. If desired, however, forced cooling may be employed. Such forced cooling is of advantage where it is desired to immediately handle the labeled articles for packing or the like.

Apparatus suitable for remelting the wax layer is illustrated at FIG. 3. A clear plastic bottle 20 or the like, having transfer label 22 applied thereto, is placed on conveyor 24 and moved past a first pair of heating stations 26 and 28. Heating stations 26 and 28 are fed with gas to produce a flame 30 which directly impinges on the article 20 and label 22 as they move past the station on the conveyor 24. Conveyor 24 moves at a speed to carry the bottle 20 past the heating stations 26 and 28 for a time just sufficient to melt the wax layer adhering to and around the periphery of the label 22 while providing a minimum of heat to the body of container 20.

After the article 20 has passed heating stations 26 and 28, it

moves past rotating table 32 and against guide 34 which together rotate the bottle by an amount, normally about 90° sufficient to expose portions of the label unheated due to the peripheral curvature of container 20. Thereafter the container 20 passes a second pair of heating stations 36 and 38 which similarly heat both sides of the label for a time just sufficient to melt the wax without substantially heating the bottle 20. Multiple stations as indicated in FIG. 3 at 26, 28, 36 and 38 are useful to fully heat and clarify labels extending around round objects. For heating objects with less curvature or less surface area, a lesser number of stations are required.

While shown as in FIG. 3, the heating jets or gas can comprise a gas flame directly impinging on the label 22, it has also been found sufficient to pass air over electric heating elements or through a flame sufficient to heat it to about 300°-400° F., and then to discharge the heated air against the label surface to melt the wax without substantial heating of the container 20.

It should be understood that the foregoing description is for the purpose of illustration only and that the invention includes all modifications within the scope of the appended claims.

I claim:

1. In a heat transfer comprising a backing and a transfer coating thereon, said coating containing an oxidized wax obtained as the reaction product of the oxidization of a hydrocarbon wax, said coating having a melting point between about 50° and 110° C., an acid value between about 5 and 40, a saponification value between about 25 and 150, and a penetrometer hardness below about 15 as measured with 100 grams per 5 seconds at 25° C., the improvement wherein said oxidized wax is an oxidized, partially esterified and partially saponified montan wax which, at a temperature at least 25° F. above its solidification point has a melt viscosity of at least about 150 centipoises, whereby designs comprising commercial inks can be printed on the surface of the coating by conventional commercial processes and transferred onto permeable or impermeable surfaces by the application of heat and pressure and clarified, after transfer, by jets or hot gas which melt the wax.
2. A heat transfer according to claim 1 where said oxidized wax comprises a predominant amount of said transfer coating.
3. A heat transfer according to claim 1 where said oxidized wax comprises at least 30 percent by weight of said transfer coating.
4. A heat transfer according to claim 3 wherein said oxidized wax is substantially clear when melted in a liquid layer less than about ¼ inch in thickness.
5. A heat transfer according to claim 3 where said transfer layer includes at least one synthetic resin.
6. A heat transfer according to claim 3 further comprising a transferable ink design printed over said transfer coating.
7. The method of labelling the surface of a receiving body which comprises (a) providing a heat transfer according to claim 6, (b) transferring said design to said surface by contacting the surface with said design while applying heat and pressure thereto to melt the wax layer, and thereafter smoothing and clarifying the image by (c) remelting the wax adherent to said surface by means of a high-temperature jet of gas for a time sufficient to melt said wax without substantial heating of said body, and (d) solidifying the wax in a clear state.
8. The method according to claim 7 wherein said high-temperature jet of gas is a flame which impinges on said transferred wax.
9. The method according to claim 7 wherein said jet of gas is air at a temperature of at least about 300° F.
10. The method according to claim 7 wherein said receiving body is a clear plastic.