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3,468,744

COLOR CHANGEABLE EMBOSSABLE LABEL TAPE

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FIG. 1

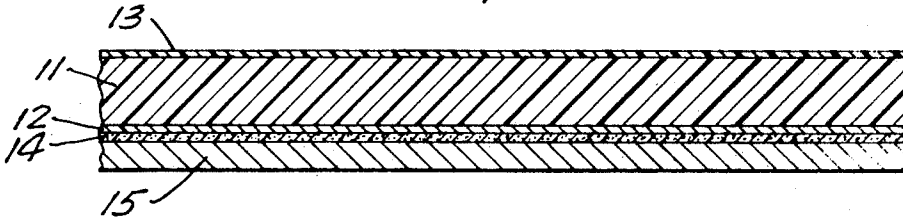
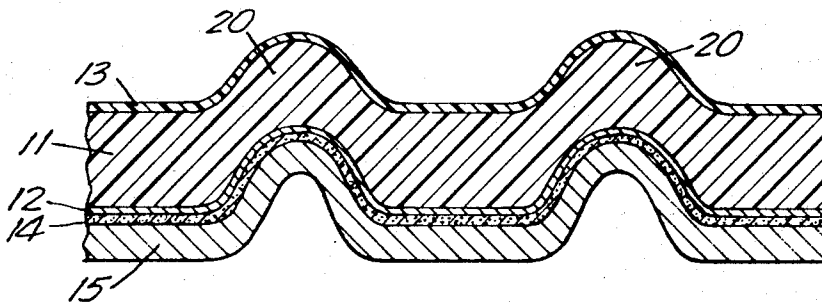


FIG. 2



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COLOR CHANGEABLE EMOSSABLE LABEL TAPE

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U.S. Cl. 161-6 3 Claims

ABSTRACT OF THE DISCLOSURE

An embossable label tape is made by providing a colored backing of unplasticized polyvinyl chloride with a pressure-sensitive adhesive on one face and a transparent colored layer which differs in color from the tape on the other face. When embossed, the polyvinyl chloride locally opacifies, to leave embossed indicia having the color of the colored layer. The polyvinyl chloride may be replaced with other transparent sheet material which opacifies when locally distorted.

This invention relates to embossable pressure-sensitive adhesive label tape.

During the past few years label tape has gained a remarkable acceptance in the marketplace. One popular tape is made on a plastic backing which crazes and becomes opaque when subjected to fairly mild stresses such as are imparted by mating cold embossing dies, the embossed areas standing out white against the surrounding unstressed background. Such tapes are typically made by coating a desired color on the back surface of a light-transmitting film of the type described, thereafter applying a layer of pressure-sensitive adhesive over the colored coating and protecting the adhesive with a removable liner. As supplied to the consumer, the color shows through the film, imparting a more or less uniform appearance. When the tape is embossed, the resultant stress locally opacifies and whitens the plastic backing, thereby preventing the background color from showing through in the areas of embossing, the embossments thus appearing white against the colored background. If a pigmented opaque film (other than one which transmits light) is used, the embossed areas may appear to be either white or a light pastel version of the background color.

Although popular, the label tape just described suffers from certain disadvantages which limit its utility. The fact that it has been possible to obtain only white, or very light pastel, colors in the embossed areas has reduced the eye appeal, and limited the sales, of the product. Additionally, the face surface of the film typically has an imperfect, blemished appearance, e.g., rough, dull, pitted or scratched. To the best of my knowledge, no one was able to overcome these deficiencies prior to my invention.

I have now devised a product having the desirable features of the prior art labeling tape but avoiding its disadvantages. Products made in accordance with my invention have a uniform smooth outer surface, a lustrous appearance, and the embossed letters or other indicia may be any desired color, e.g., yellow, blue, green, red, etc. The effects are dramatic, and these novel products lend themselves to a wide variety of uses and markets heretofore unattainable.

In the accompanying drawing,

FIGURE 1 is a cross-sectional view of a tape product made in accordance with my invention and

FIGURE 2 is a cross-sectional view of the product shown in FIGURE 1 after it has been embossed.

In the drawings, a sheet of clear film 11 (which is of the type which opacifies under mild stress) is colored by providing its back surface with a colored layer 12 and

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its face surface with a transparent colored layer, or topcoat, 13. Over colored layer 12 is applied a layer of conventional normally tacky and pressure-sensitive adhesive 14, which is protected by removable liner 15. When viewed from the face side the tape product's color is an additive blend of colored layers 12 and 13; e.g., if layer 12 is cyan and layer 13 is yellow, the overall effect is green. When the tape is embossed, as shown in FIGURE 2, film 11 opacifies to a whitish color in areas 20 where it has been subjected to embossing strain, thereby preventing the transmission of any cyan color to the face side. In the embossed areas the embossments are, in effect, yellow coated on white and hence appear yellow. The embossed tape thus has an appearance of yellow indicia embossed on a green background. If layer 12 were yellow and 13 were cyan, the embossed tape would have cyan indicia on a green background.

The following specific example is given to indicate the way in which my invention can be made, but is, of course, only illustrative.

EXAMPLE

To one surface of a 10 mil "Luvitherm" unplasticized polyvinyl chloride film was applied a thin coating of a black vinyl ink, obtained by diluting MRX-9243 Black Vinyl Ink (sold by Crescent Ink and Color Company) from its normal 39% solids content to 24%, using methyl ethyl ketone as the solvent. MRX-9243 comprises carbon black pigment in a phthalate-plasticized polyvinyl chloride: polyvinyl acetate binder resin in methyl ethyl ketone. As used, the ink had a viscosity of 23 seconds when measured in a Zahn G-3 Open Cup Viscosimeter of the type commonly employed in the ink industry. The ink was applied to the surface of the "Luvitherm" film with a 120-line knurled ruling mill at room temperature, the coating containing on the order of 1/2 to 1 grain of solid material per 24 square inches. The coated film was then dried 10 seconds in an air circulating oven maintained at 210° F., this brief exposure to heat serving to drive out the methyl ethyl ketone solvent after it had served to promote adhesion of the ink to the film but before it had deleteriously affected the film itself.

The coated film was next treated by applying to the opposite surface a blue vinyl ink, substantially identical to the ink applied to the back surface except that the pigment used was copper phthalocyanine and the viscosity was 15 seconds when measured as described in the preceding paragraph. The ink was applied with a 200-line pyramid-pattern knurled roll, after which the coated sheet was dried as before.

When viewed from either side, the coated film had a smooth, lustrous black appearance. When bent sharply back upon itself the film opacified along the line of bending in the conventional manner, thereby preventing the transmission of color through the film in the vicinity of the fold. Thus, when the fold line was viewed from the black-coated side, it appeared indistinguishable from the remainder of the tape but when viewed from the blue-coated side it appeared blue against a black background. Although this double-coated film is generally considered an intermediate product, it was suitable for embossing to provide blue indicia on a black background, the embossed film then being affixed to a surface, inserted in a plastic name plate, etc.

To the black-coated surface of the coated film just described was applied a heptane solution of a 95.5:4.5 isooctylacrylate:acrylic acid copolymer pressure-sensitive adhesive of the type described in Ulrich U.S. Patent 2,884,126. (A wide variety of normally tacky and pressure-sensitive adhesives may be used, but acrylate adhesives of this type display high holding power, solvent resistance, heat-resistance, and age-resistance.) The solvent

was then evaporated, leaving 12-14 grains of adhesive solids per 24 square inches, and the adhesive protected by applying a 4-mil polyethylene film liner. The finished tape product was slit to the desired width for use in an embossing machine for the manufacture of labels. The face of the tape showed none of the blemished and irregular effect typical of conventional embossable tape products, even when viewed in obliquely directed light. When embossed, the finished tape showed blue indicia against a uniform lustrous black background.

The "Luvitherm" film employed in the foregoing example is an oriented rigid polyvinyl chloride ("Vinoflex 377" resin, marketed by Badische Anilin und Soda Fabrik, containing certain processing aids and minute particles of incompatible material). The film contains about 2-3% of a soap used in emulsion polymerizing the polyvinyl chloride, 0.15% diphenylthiourea and 0.2-0.3% Na_2CO_3 to enhance heat stability, and about 5% "E wax" (a hard, brittle crystalline waxy ester of Montan acids having a melting point of 79-82° C., serving as a lubricant during calendering of the film). Manufacturing procedures are set forth in DeBell & Richardson, German Plastics Process, Department of Commerce, 1946, page 399 et seq. Equivalent rigid polyvinyl chloride films are sold under the trade names of "Polytherm," "Genotherm," "Nicotherm," and "Craytherm." The fact that translucent rigid polyvinyl chloride films become opaque when embossed has been known for over 20 years; see Krannich, *Kunststoffe im technischen Korrosionsschutz*, J. F. Lehmanns Verlag/München-Berlin 1943, pp. 347-352.

Other compositions useful in forming light-transmitting films which are normally clear, hazy, or opalescent, but which opacify when embossed include blends of isotactic polypropylene and butyl rubber, and polystyrene-polybutadiene blends. Rubber-resin blends similar to those used in normally tacky and pressure-sensitive adhesives also display the characteristic of light-transmission before, and opacity after, stretching; although not generally self-supporting, such compositions may be coated on films whose clarity is not affected by stretching. Each of these and other, alternative film structures may be used in the practice of my invention. It is noted that each composition named includes finely dispersed incompatible matter; it is believed that stretching causes the formation of minute voids in the areas immediately adjacent the inclusions, and that such voids cause opacity by changing the film's overall diffraction.

The amount of ink applied to each face of the film can be varied, but if an excessive quantity is applied to the upper surface of the film, the transparent effect is diminished and the lower color does not show through. When such is the case, of course, the embossed indicia do not have the desired contrast with the background. If the back color is black, the topcoat can be any other color; the general overall appearance will be black, but embossed letters will have the color of the topcoat. Especially when colors other than black are used, the exact color effect can be varied by changing the amount of ink applied to the back surface, the face surface, or both. For example, tape having a magenta topcoat and a yellow back coat has a generally orange appearance; when embossed, the resultant letters appear magenta against an orange background. Likewise, when the topcoat is yellow and the back coat is magenta, a somewhat lighter orange appearance is achieved; embossed letters in this case appear yellow. Omission of the adhesive layer permits films coated yellow on one side and magenta on the other to be used to make labels having either yellow or magenta embossed indicia against an orange background. In certain instances I may employ back and face coats of the same color; in such event, embossed indicia stand out relatively pale against a deeply colored background.

Although the use of vinyl inks to impart color is simple, effective, versatile and hence generally preferred, it will

be appreciated that other coatings and coloring techniques may be employed. To illustrate, a metal foil or patterned lamina (e.g., wood grain), may be adhered to the back of the film, or the back surface can be vapor-coated with aluminum, gold, or some other suitable metal. If desired, the adhesive itself may be colored, thereby obviating the need for a separate colored layer. It will also be apparent that if only the topcoat in the tape structure is colored, all other strata being clear, the color of the substrate to which the tape is applied will blend with the color of the topcoat, embossed indicia displaying the color of the topcoat alone. Similarly, although somewhat more costly than simple coatings, extremely thin, flexible transparent colored films of "Saran" or similar materials may be laminated to the upper surface of the structure. My invention likewise contemplates the use of white-opacifying films which are internally dyed or pigmented, thereby obviating the need for a colored back coat. As in the previous illustrations of my invention herein, the product has an original appearance which is an additive blend of the film color and the topcoat color; upon embossing, the background retains the same color, while the embossed indicia assume a color which is an additive blend of the topcoat and the now white or pastel film. In any event, the topcoat must be transparent, or at least display a high degree of light transmission, to obtain the desired effect. It is also important that the top coat be sufficiently adherent, flexible, and extensible that it does not fall off, flake, or check during embossing.

What I claim is:

1. A colored adhesive tape in which a backing of the kind which normally allows transmission of light but becomes opaque when subjected to a mild cold drawing operation, such as embossing, is overlaid on the side opposite the adhesive by a light transmitting film, so that in areas which are rendered opaque the tape takes up the color of the film whereas in other areas it takes up a color which is a combination of the color of the film and color beneath the film.

2. The tape of claim 1 in which the backing is rigid transparent polyvinyl chloride and the light transmitting colored film is a vinyl ink coating.

3. A smooth, lustrous plastic sheet material having a first color and capable of being embossed to provide indicia of either a second color or a third color, as desired, against a background of said first color, said sheet material comprising in combination: a transparent plastic film backing of the type which opacifies when subjected to mild cold deformation, a transparent second-colored layer uniformly adhered to one face of said backing and a transparent third-colored layer uniformly adhered to the other face of said backing, said sheet material having a first color which is the additive combination of said second color and said third color.

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U.S. Cl. X.R.

40-2, 135, 136; 156-196; 161-120, 406, 413

Notice of Adverse Decision In Interference

In Interference No. 97,257 involving Patent No. 3,468,744, T. J. Reinhart, **COLOR CHANGEABLE EMBOSSABLE LABEL TAPE**, final judgment adverse to the patentee was rendered July 13, 1972, as to claims 1 and 2.

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