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(19)

(54) SWITCH-PROOF LABEL

(71) We, MONARCH MARKING SYSTEMS, INC., a corporation organised and existing under the laws of the State of Delaware, United States of America, of P.O. Box 608, Dayton, State of Ohio, 45401, 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: —

The invention relates to labels.

Objects are frequently marked or identified with the intention that the marking be either "permanent" or uniquely characteristic of the object or objects so marked. Examples of such markings include ownership information, serial numbers, licenses, permits, statutorily required information, and certification that an object possesses certain characteristics or conforms to certain statutory requirements.

Various methods are employed to achieve these results. The use of relatively convenient and inexpensive labels presents problems in that, if the label can be switched from one object to another, in a manner that is not readily detectable, the validity of the information contained on the label is subject to question.

The three U.S. patents mentioned below show various approaches to the problem.

U.S. patent No. 3,152,901, to Johnson, shows a credit card which, when delaminated, causes a photographic image to be defaced. The concept employed is significantly different than that described here.

U.S. patent No. 3,494,818, to Marchese, shows a laminated label having "buried" printing.

U.S. patent No. 3,925,584 to Suzuki et al, shows a laminated sealing tape which is tamper proofed, *inter alia*, by the use of adhesive layers of varying bond strengths.

The object of this invention is to provide convenient relatively inexpensive labels useful for marking objects in a manner such that if one were to attempt to transfer the label to another object the label would be destroyed or defaced to such an extent that its transference would be noticeable.

The invention in one aspect provides a laminated label comprising:

a) a flexible transparent or translucent plastic film,

b) having reverse printed on one side thereof an information containing pattern, and

c) a layer of pressure sensitive adhesive bonded to the printed side of said plastic film, where

d) the printed information containing pattern has a greater affinity for the pressure sensitive adhesive than the plastic film,

e) so that when the laminated label has been mounted upon an object and removal is attempted which causes delamination of the plastic film and the pressure sensitive adhesive, at least a tamper indicating amount of the printed information pattern remains adhered to at least a portion of the pressure sensitive adhesive which remains on the object.

In another aspect the invention provides a method of forming a laminated label which comprises;

a) reverse printing an information containing pattern on one side of a layer of flexible transparent or translucent plastic film,

b) applying a layer of pressure sensitive adhesive to said printed side of said plastic film, where said printed information containing pattern has a greater affinity for said pressure sensitive adhesive than for said plastic film so that when the laminated label has been mounted upon an object attempted removal from which causes delamination of the plastic film and the pressure sentistive adhesive, at least a tamper indicating amount of the printed information pattern remains adhered to at least a portion of the pressure sensitive adhesive which remains on the object.

In a preferred embodiment, the free side of the adhesive film of the label is covered by a release sheet.

Once applied to a substrate, if removal of the label is attempted, the label delam-

inates in a manner such that the outer sheet separates leaving at least a portion of the adhesive layer, having at least a portion of the printed pattern adhering thereto, adhered to the substrate.

One preferred embodiment, according to the invention will now be described by way of example with reference to the accompanying drawings in which: —

Figure 1 is a schematic representation of the label of the invention with a release sheet in place.

Figure 2 is a representation of the label, upon an object, in a state of partial delamination.

With reference to Figure 1, the label of the invention 1 comprises an external layer of flexible transparent or translucent plastic film 2. The film has sufficient transparency or translucency so that a pattern printed on one side is visible through the film. The chemical nature of the plastic film is not critical so long as it has sufficient film integrity for its intended use and provides a surface which has appropriate ink affinity characteristics as set forth hereinafter. Preferred films include polyester films such as condensation products of terephthalic acid and a glycol such as ethylene glycol, or isophthalic acid and a glycol, or mixtures of terephthalic acid, and isophthalic acid and a glycol. A particularly useful film of this type is highly oriented polyester known in the trade as "Mylar" (Registered Trade Mark) film. Other useful polymer films include films of acrylic polymers and interpolymers; cellulosic polymers, including cellulose acetate, cellulose acetate butyrate, celulose acetate propionate and mixtures thereof; polyolefins, including homopolymers and interpolymers of ethylene or propylene; polystyrene, polycarbonates and vinyl chloride polymers, and inter polymers, including such polymers compounded with property modifying adjuvants such as those known in the film art.

On the interior surface 3 of the exterior film 2 there is reverse printed an information containing pattern 4 (thickness exaggerated in the drawing) of letters, numbers, words, designs, bar codes or other forms of human or machine readable information. The method of printing is not critical and can be any printing process useful in printing upon plastic films including flexographic, letterpress and gravure printing techniques.

The chemical composition of the ink employed to print the pattern 4 is not critical, however the ink must produce a printed pattern which has greater affinity for, i.e. adhesion to, the adhesive layer 5 than to the inner surface 3 of the outer layer 2. Generally, the ink employed has an adhesion to the outer layer 2 which would normally be considered "poor" in comparison to normal film printing standards.

A particularly useful ink is a flexographic letterpress ink consisting of 10% of a phthalocyan blue pigment and 90% of 25: 75 resin-vehicle mixture, where the resin is a modified phenolic resin and the solvent consists of (by volume) 80% ethyl alcohol, 10% ethylene glycol monoethylether, and 10% n-propyl alcohol.

In a preferred embodiment of 1 mil "Mylar" (Registered Trade Mark) film was reverse printed with the above ink and the printing dried by 140°F. force air through a slit nozzle 1/2 inch away from the printed side of the film.

The printed film was then coated on its printed side with a layer of pressure sensitive adhesive 5. The chemical composition is not critical so long as the adhesive layer will adhere sufficiently to the film 2 to provide a unitary laminate, but will adhere more strongly to the printing and to the article to which the label is affixed than the bond strength between the printing (ink) and the outer film 2.

A particularly useful pressure sensitive adhesive, useful in conjunction with the ink, described above, is a 55% solution of thermosetting acrylic solution polymer in 75% ethyl acetate and 25% toluene (by volume), having a Brookfield viscosity of between 12,000-18,000 cps at 25°C. Representative physical data of a 1 mil dry film of this adhesive applied to a "Mylar" (Registered Trade Mark) film (cured at 250°F. for 2 minutes) are as follows:

Quick stick (rolling ball-incline plane)

$$\frac{\text{Inches of Fall}}{\text{Inches of Travel}} = 1.2$$

180° Peel Adhesion (Pressure Sensitive Tape Council Test Method PSTC-1)

Initial = 56 oz

Overnight = 76 oz

20° Hold (1/2x1/2 inch adhesive strip, 20 chrome plated bar, 200 gm wt) = 19 hours

50°C. Creep (1x1/2 inch adhesive strip attached at the vertical to stainless steel plate, 250 gm wt) = 24 + hours

Williams Plastometer (100°C.) = 1.73.

The effects of the use of this adhesive, which displayed selection adhesion levels, as described above, provided a laminated label which delaminated upon removal from the article to which it is affixed. And, as shown in Figure 2, when the film 2 was lifted from the labeled article 8, the adhesive layer 5 held the printed pattern 4 to the labeled article and the film 2 was free of all or at least a substantial part of the printed pattern. As represented in Figure 2, the printed numbers 4 remain adhered to the adhesive layer 5, when the film 2 has been delaminated to the line x-x'. The

portion of the label to the left of the line x-x' represents the label in its normal service appearance.

While in the embodiment described in detail the adhesion properties of the elements of the laminate are chosen so that all or substantially all of the ink is removed from the film upon which it was originally printed, inks and adhesives can be employed where the relative adhesion properties are such, that only a minor but tamper indicating amount of the printing is removed from the film on which it was originally printed. In other words, the relative adhesion properties of the elements of the laminate can be chosen so that, upon delamination, any desired proportion of the ink adheres, respectively, to the adhesive layer and to the outer layer, so long as at least a tamper indicating amount of the ink adheres to the adhesive layer, which in turn remains adhered to the article. It is further noted that while all the adhesive layer may remain adhered to the article upon delamination, it is only essential that a portion of the adhesive layer, having thereon a tamper indicating amount of ink, remain adhered to the article. Thus, it is possible that bond strength between unprinted areas of the outer sheet and the adhesive layer is such that at least a portion of the adhesive layer adheres to the unprinted areas of the outer sheet and is removed with the outer sheet upon attempted removal of the label.

In yet another embodiment, the information containing pattern can be printed on the inner surface of the outer layer of the label with at least two inks having significantly different adhesion characteristics, so that, upon subsequent delamination of the label, a first ink adheres exclussively or primarily to the outer layer, while a second ink is removed from the outer layer upon which it was originally printed and adheres exclusively or primarily to the adhesive layer.

While the relative thickness of the various layers in the laminate is not unduly critical and is primarily dictated by economics and the properties desired for a particular use, typically, the outer film layer 2 will have a thickness of between about 0.5 mil and about 6 mils, while the adhesive layer will have a thickness between about 0.3 mil and about 3 mils.

To further exemplify the invention, in one embodiment, the pressure sensitive adhesive layer adhered to the object to which it is affixed with a bond strength of about 75 ounces, while the bond strength between the outer layer and the ink was about 20 ounces. The bond strength between the adhesive layer and the release paper was about 1 ounce (PSTC-1).

With reference to Figure 1, in order that the label can be handled and stored more readily, for example, individually, in a rolled tape form, or a flexible sheet form, the object adhering surface 6 of the label 1 can be temporarily covered with a release sheet, of the type conventionally known in the art, for example, a silicone treated release paper. In a preferred embodiment the release paper is a semi-bleached release paper coated on its adhesive contacting side with a silicone release agent. As is conventional, the release level is selected with a tight enough release level to allow the label to be conveyed to the object being labeled without premature separation of the release sheet, but with a release level low enough so that the release sheet can be readily intentionally removed to expose the adhesive layer for bonding when desired. The release level should be lower than the level of adhesion of the ink to the outer sheet to prevent delamination of the label upon removal of the release sheet.

While there has been described, above, the invention and what are now considered its best embodiments, it is understood that other materials, such as are known in the art or described, above, may be substituted for those exemplified. All parts and percentages set forth above are by weight unless otherwise specified.

WHAT WE CLAIM IS: —

1. A laminated label comprising:

(a) a flexible transparent or translucent plastic film,

(b) having reverse printed on one side thereof an information containing pattern, and

(c) a layer of pressure sensitive adhesive bonded to the printed side of said plastic film, where

(d) the printed information containing pattern has a greater affinity for the pressure sensitive adhesive than the plastic film.

(e) so that when the laminated label has been mounted upon an object and removal is attempted whicr causes delamination of the plastic film and the pressure sensitive adhesive, at least a tamper indicating amount of the printed information pattern remains adhered to at least a portion of the pressure sensitive adhesive which remains on the object.

2. A laminated label, as in claim 1, wherein the plastic film is a polyester film.

3. A laminated label, as in claim 1 or claim 2, which has a release sheet covering the otherwise exposed side of the pressure sensitive adhesive layer.

4. An object having adhered thereto the laminated label of claim 1 or claim 2.

5. An object, as in claim 4, wherein the

affinity of the adhesive for the surface to which the laminated label is adhered and to the printed pattern is greater than the affinity for the printed pattern for the film.

6. A method of forming a laminated label which comprises:

(a) reverse printing an information containing pattern on one side of a layer of flexible transparent or translucent plastic film,

(b) applying a layer of pressure sensitive adhesive to said printed side of said plastic film, where said printed information containing pattern has a greater affinity for said pressure sensitive adhesive than for said plastic film so that when the laminated label has been mounted upon an object attempted removal from which causes delamination of the plastic film and the pressure sentitive adhesive, at least a tamper indicating amount of the printed information pattern remains adhered to at least a portion of the pressure sensitive adhesive which remains on the object.

7. A method, as in claim 6, including the step of applying the labels to an object wherein the affinity of the adhesive for the surface to which the laminated label is adhered and to the printed pattern is greater than the affinity of the printed pattern for the film.

8. A laminated label substantially as herein described with reference to the accompanying drawings.

9. A method of forming a laminated label substantially as herein described with reference to the accompanying drawings.

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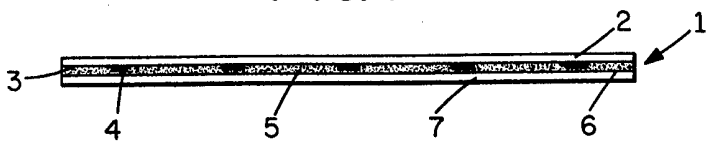
1589395 COMPLETE SPECIFICATION
1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

FIG. 1



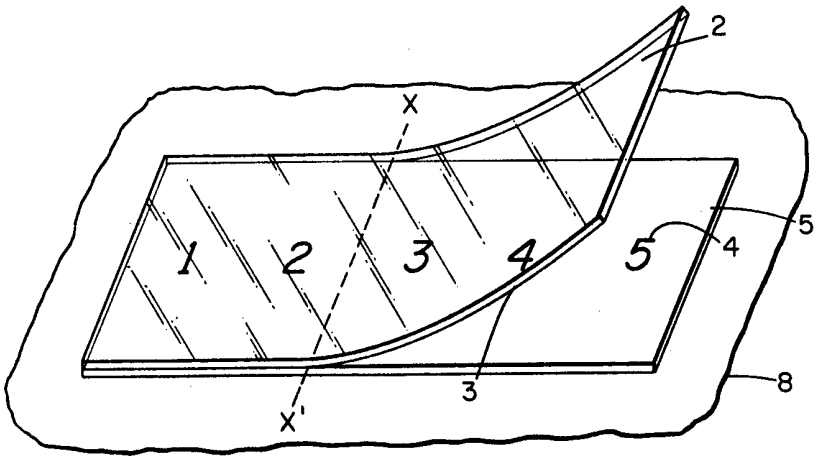


FIG. 2