Sept. 9, 1969 R. S. AVERY 3,466,218

ARTICLE FOR MULTIPLICATE MARKING

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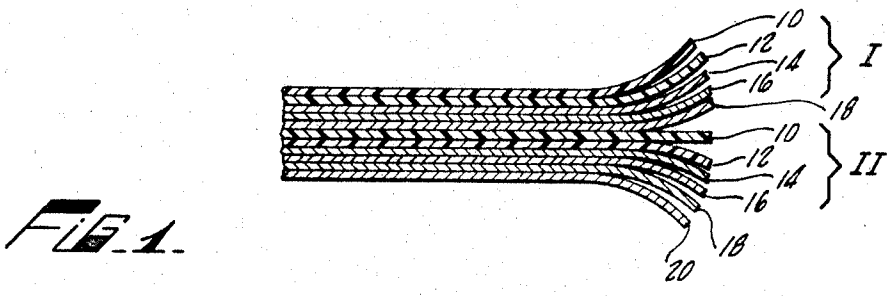


FIG. 1.

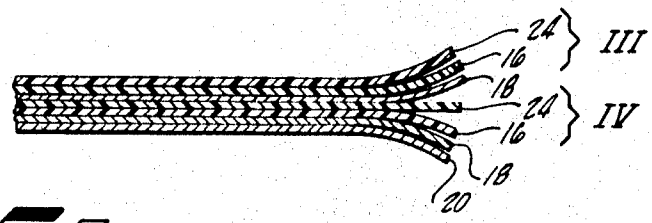


FIG. 2.

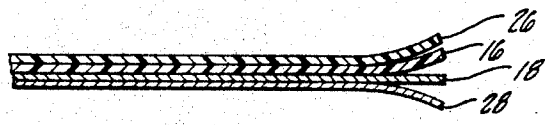


FIG. 3.

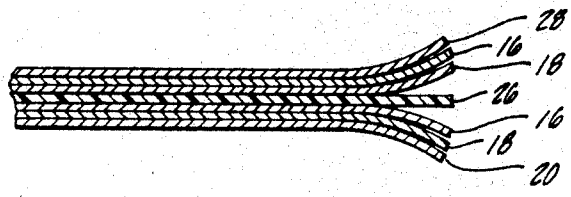


FIG. 4.

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ARTICLE FOR MULTIPLICATE MARKING

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Continuation-in-part of application Ser. No. 345,676, Feb. 18, 1964. This application June 19, 1967, Ser. No. 647,890

The portion of the term of the patent subsequent to July 25, 1984, has been disclaimed

Int. Cl. B32b 7/02; B44f 1/08; G03c 11/02

U.S. Cl. 161—33 2 Claims

ABSTRACT OF THE DISCLOSURE

A multiple layer article in which at least two of the layers retain an image responsive to embossment and at least one of the layers is responsive to embossment so that a change in color takes place in the embossed image.

Cross-reference to related application

This application is a continuation-in-part of my co-pending application, Ser. No. 345,676 filed Feb. 18, 1964, now U.S. Patent No. 3,332,829.

Background of the invention

There are many instances when a common identification indicia is desirably duplicated. Thus, one of identical indicia members would be applied to an object as a label, and a duplicate applied to or impressed upon an index record card for inventory control purposes. The duplicate can also be utilized in conjunction with identification of photographic plates as, for example, those made through use of X-radiation. The present invention encompasses a multiplicate marking system applicable as such. According to this invention, such a system is embodied in a multiple web, embossment-responsive article.

It is accordingly an important object of the present invention to provide a multiplicate marking article.

A further object is to provide an article for multiplicate marking, comprising two or more embossment-responsive webs, at least one of which is an embossment-responsive color-changing web, and another is capable of retaining an embossed image which, without color change, is an exact and accurate duplicate of the image embossed on the color changing web. The former web is metallic and, upon embossment, can, for example, be used as a printing face or for forming upon an X-radiation-sensitive plate a duplicate of the embossed image.

Summary of the invention

The present invention provides an article for multiplicate marking comprising first and second cold-embossment-responsive webs, at least one of which is color-changing-responsive to embossment and the other of which retains an image responsive to embossment. A layer of pressure-sensitive adhesive is adhesively connected on one of its sides to the first web and is adhesively connected on the other of its sides to the second web. The adherence between the one side of the pressure-sensitive adhesive layer and the first web is substantially stronger than the adherence between the other side of the layer and the second web so that the pressure-sensitive adhesive layer and the first web are strippable as a unit from the second web. The adherence between the pressure-sensitive adhesive layer and the second web is, however, sufficiently strong so that the second web remains attached to the first web during handling and embossing.

Brief description of the drawings

The present invention will be more fully understood from the following description made in conjunction with the accompanying drawings which are as follows:

FIGURE 1 is an enlarged, fragmentary cross-sectional view of a multiplicate marking article made in accordance with the present invention wherein the color-changing webs are of laminated construction;

FIGURE 2 is an enlarged, fragmentary cross-sectional view, similar to FIGURE 1, of a second embodiment wherein the color-changing webs are of unitary construction;

FIGURE 3 is an enlarged, fragmentary cross-sectional view of a third embodiment of the invention comprising two embossment-responsive webs, one being an embossment-responsive color-changing web, and the other an embossment-responsive web capable of retaining an embossed marking; and

FIGURE 4 is an enlarged cross-sectional view of an alternate arrangement of the embodiment of FIGURE 3.

Before explaining the present invention in detail, it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also, it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

Description of the preferred embodiments

The embodiment of the invention shown in FIGURE 1 comprises a plurality of embossment-responsive color-changing webs, each of which is of laminated construction as distinguished from a unified web. As shown in FIGURE 1, the laminated webs are designated I and II.

At the top, web I includes a transparent color-changing coating **10** which may be formed of acrylonitrile butadiene-styrene polymer or the like. This material displays the phenomenon of color change when distorted beyond the yield point. Such color change occurs when the distortion is performed while the coating is cold or at room temperatures. This is visible from the front face of web I.

Numeral **12** designates a transparent film of plastic such as Mylar. This is a trademark for a highly durable, transparent, water-repellent film of polyethylene terephthalate resin, characterized by outstanding strength, electrical properties, and chemical inertness. This carrier film does not exhibit a change in color when embossed. In the extended scope of invention, equivalent carrier films of this nature can be utilized.

Numeral **14** designates a base color coating that forms the background for color changes produced in layer **10** when the total structure comprising both webs I and II is distorted, as by embossing.

Numeral **16** designates a pressure-sensitive adhesive coating. This optionally, though preferably, is adjacent to a release coating **18** to permit laminated web I to be stripped away from web II. The coating **18** may originally form the lowest coating of web I or the top coating of web II.

Web II is also a laminated structure suitable having the pattern of layers **10**, **12**, **14**, **16**, and **18** repeated. At the bottom, however, there is additionally a removable protective backing **20**.

The construction comprising webs I and II as shown in FIGURE 1 actually has a total thickness of only a few thousandths of an inch because of the low order of thickness of the various layers. Therefore, it is to be understood that this construction can be formed into an elon-

gated tape to which embossing pressures can be applied by means of a suitable tool.

When the multiplicate construction of FIGURE 1 is embossed, accurate, fool-proof duplicates will be made in each of webs I and II in a single operation.

In an exemplary use, a tape embossing tool would simultaneously emboss both webs I and II. Then, during the cut-off operation, a tab would be formed so that the protective backing **20** could be removed from web II. The exposed adhesive **16** would thereafter be applied to a suitable article, applying web II as a label. The upper web I would then be peeled away and placed elsewhere as an exact duplicate of web II.

It is to be understood that color-changing coating **10–I** can be the same or different from color-changing coating **10–II**. Thus they may have the same or different sensitivity to color change.

In any event, these materials have the characteristic of becoming opaque or exhibiting different light reflection when distorted beyond the yield point. The effect is to produce a contrast embossment on a background determined by base color coating **14**.

The base color coatings **14–I** and **14–II** also can be different. Thus, white on blue and white on red would be produced from a composite structure wherein coating **14–I** was red and coating **14–II** was blue. Thus, the original and duplicate would always be readily identifiable as such.

The color coatings **14–I** and **14–II**, or either of them, may be over rather than under their associated base film **12–I** or **12–II**, in which case the base film or films may be either transparent or opaque.

The previously described embodiment relates to a laminated web construction. Thus, the color-changing coatings **10** have been placed upon, rather than being a characteristic of, the plastic carrier film **12**. However, the invention also encompasses unified color-changing webs or non-laminar webs. This construction is shown in FIGURE 2.

At the top, there is a unified color-changing plastic web **24** as distinguished from the laminated webs I and II of FIGURE 1.

Web **24** is suitable made of a film of acrylonitrile butadienestyrene polymer or like color-changing film of appropriate thickness to constitute a unified color-changing web in the absence of a supporting base, such as the layer **12** of FIGURE 1. The web **24** may be transparent or have appropriate coloring agents milled in. If transparent, a color coat (not shown) corresponding to coat **14** of FIGURE 1 may optionally be applied to web **24**.

Beneath web **24** is a pressure-sensitive adhesive coating **16**, and beneath that a release coating **18**. This forms a so-called unified web III which can be stripped from the subjacent web IV.

Web IV also includes a unified color-changing plastic web **24** beneath which is a coating of pressure-sensitive adhesive **16**. A release coating **18** provides the means whereby the removable protective backing **20** can be stripped away. Web IV may be modified in the ways discussed above in connection with web III.

It will be noted that the multiplicate article III–IV is ready for use with the adhesive components protected from dust by the impervious top layer **24** and the protective backing **20**.

For use, the multiplicate article III–IV is embossed by suitable means to produce accurate fool-proof duplicates as made with the first embodiment.

Thereafter, the protective backing **20** is removed and web IV applied to a surface. Then the upper web III is peeled away for use elsewhere. The release coating **18–III** makes this possible.

It is to be understood that though the prior embodiments have been described as two-web constructions, the broad scope of invention includes multiplicate constructions, meaning at least two webs. Depending upon the capacity of embossing machinery, five or six webs or more may be employed.

As unified webs, other materials that can be employed include unplasticized straight polyvinyl chloride and polyvinyl chloride-polyvinyl acetate copolymers. Other so-called rigid plastics of this nature may also be encompassed within the invention.

In the foregoing embodiments of the invention, it is to be understood that the following apply: The upper layer will be found to undergo a sharper color change than the bottom layer in an embossing operation wherein both color-changing webs have the same color change sensitivity. This produces an advantage in the fact that the original and duplicate are always readily identifiable as such. However, substantially exact duplicates can be produced if the bottom web incorporates greater color changing sensitivity than the top web. By such construction, duplicate images having the same color contrast are produced.

From the foregoing, it will be evident that the invention is extensible to a multiplicate system wherein one of the webs is embossment-responsive, but not necessarily sensitive to color change. This would include an aluminum foil, heavy plastic web, or the like as one of the layers. This web, however, is capable of retaining an embossed image that is functional as a printing face.

One of the webs can also be a material which is normally opaque to electromagnetic radiations such as X-radiation. For example, the web can be a lead foil of a thickness such that transmission of X-radiation is significantly impeded. Upon embossment of such a web, either stretching of the foil in the embossed area occurs with attendant reduction in the foil thickness or, alternatively, the foil is punctured in the shape of the embossed image. In either case, transmission of X-radiation through the embossed area is enhanced so that such an embossed web can be used for forming upon an X-radiation-sensitive plate a duplicate of the embossed image. For the same purpose, the web can be a medium within which lead particles or powder are uniformly dispersed. Upon embossment of such a web, the concentration of lead particles in the embossed area is reduced, thereby enhancing the transmission of X-radiation through the embossed area.

An embodiment in which one of the webs is embossment-responsive without color change is shown in FIGURE 3. At the top, there is a color-changing plastic web **26** suitably of the nature of the unified web **24**, shown in FIGURE 2, or the laminated structure **10**, **12**, **14**, as shown in FIGURE 1. Next, is a pressure-sensitive adhesive layer **16** and then a release coating **18**. At the bottom there is an embossment-responsive metal foil web **28**. No protective backing is necessary since web **28** functions as such.

In this embodiment, the top web **26** undergoes a color change on being deformed, as has been previously described. The web **28**, though embossment-responsive, does not necessarily undergo a color change but does retain its embossed configuration. This sheet is utilized for producing printed images that are necessarily exact and accurate duplicates of that embossed on the color-change web **26**.

In the extended scope of invention, the metal foil web **28** of FIGURE 3 can be positioned on top if desired. This is shown in FIGURE 4. Next to the foil web **28** is an adhesive coating **16** followed by a release coating **18**. The color-changing web **26** then follows, with adhesive **16**, release coating **18**, and protective backing **20**.

From the foregoing, it will be understood that a principal advantage of the present invention resides in the fact that there is an absolute guarantee that the original and duplicate or duplicates are always identical. This prevails throughout all embodiments of the invention.

The present invention has substantial utility. Thus, in hospitals, stores, laboratories, libraries, and the like, wherever duplicate records are kept, the present invention can be used.

An exemplary application for use is in libraries for the labeling and inventory control of books. Presume that a book is to be labeling and a printed record of the label as applied to the book provided at a remote location. A multiplicate article of invention is embossed. Thereafter, one of the embossed webs is applied to the back of the book. Due to the curvature of the book, however, it would not be possible to print or take an impression from the label thereon to apply it to an index card. However, the other embossed web can be applied to a flat backing and placed in a press to transfer the indicia therefrom as by a carbon transfer paper, to an index card. Under the conditions of the present invention, this printed record is exactly the same as that recorded on the back of the book, even though placed in a remote location from the book.

I claim:

1. An article for multiplicate marking comprising first and second cold embossment-responsive webs, at least one of which is color changing-responsive to embossment and the other of which significantly impedes transmission of X-radiation in its unembossed state and retains an image responsive to embossment, a layer of pressure-sensitive adhesive adhesively connected on one of its sides to said

first web and adhesively connected on the other of its sides to said second web, the adherence between said one side of the pressure-sensitive adhesive layer and said first web being substantially stronger than the adherence between said other side of said layer and said second web so that the pressure-sensitive adhesive layer and said first web are strippable as a unit from said second web, the adherence between said layer and said second web being sufficiently strong so that said second web remains attached to and protects the pressure-sensitive adhesive layer during handling and embossing.

2. An article as set forth in claim 1 wherein the other web is lead foil having a thickness such that transmission of X-radiation through the unembossed foil is significantly impeded.

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JACOB H. STEINBERG, Primary Examiner

U.S. Cl. X.R.

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