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(54) PRINTING ON PLASTIC FILMS

DRUCKEN AUF KUNSTSTOFFOLIEN

IMPRESSION SUR FILMS PLASTIQUES

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- **PATENT ABSTRACTS OF JAPAN vol. 008, no. 069 (M-286)31 March 1984 & JP-A-58 215 392 (SANYO DENKI KK) 14 December 1983**
- **DATABASE WPI Section Ch, Week 7316, April 1973 Derwent Publications Ltd., London, GB; Class A03, AN 73-22509U & JP-A-48 011 408 (KYODO PRINTING CO LTD) 1973**

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Description

The present invention relates to printing and more particularly, though not exclusively, to the printing of plastics to produce documents which are harder to copy; it also relates to the construction of the document produced, intermediate products made, and their methods of manufacture.

With improvements in photocopying, documents can be more easily reproduced. Thus, the forging of documents is becoming a major problem. The range of documents being forged is vast. The production of security cards, money, tickets and membership cards are just some examples of the areas in which forging and copying is proving difficult to control.

Since paper documents also wear quickly there has been a desire to produce plastics documents of, for example, the type described. However, to date, the attempts to make plastics documents, which meet the needs of the user or operator, have not proved satisfactory.

One of the problems with printing onto plastics derives from the colourants used. Firstly, the colourants used can be removed from plastics by the use of solvents such as acetone, thereby leaving the documents open to alteration. To overcome this problem attempts have been made to bond a further plastics layer over the printed layer thereby enclosing the ink. Two major problems have, however, become apparent. Firstly, it has been found that plastics, for example, PVC or polyester/polyethylene film will not fully bond to itself or each other where one or the other has been coloured with an ink or dye stuff. It has also been found that printing directly onto plastics and then bonding a further plastic film thereto, thereby encapsulating the ink or dye, proves unsatisfactory since the ink or dye tends to run/bleed immediately or within a short time, resulting in a blurred print. Whilst this problem can be diminished by drying the ink using high powered infra-red or ultra-violet light, the process is time consuming and expensive.

It is an object of the invention to improve upon the known products and to devise a method for doing so. The present invention can be used to provide products which substantially do not bleed or which bleed at controlled rates.

In accordance with one aspect of the present invention there is provided a process for printing a plastics film, comprising printing a colourant onto a layer of particulate or colloidal material, which material is releasably bound to a backing; transferring the colourant onto a first plastics film by placing the first plastics film over the printed layer and subjecting the plastics film and printed layer to a substantially constant heat, and removing the backing characterised in that the particulate or colloidal material has a particle size of from 5 to 0.006 μm (microns).

Preferably the particulate or colloidal material is inorganic.

Preferably a second plastics film is bonded to the first plastics film, thereby encapsulating the colourant in the plastics.

By producing a document in this way, avoidance of bleeding of the inks used can be achieved, if desired, and, furthermore, if a second layer of plastics is bonded to the printed plastics layer it will bond even where colour has taken. This is thought to be because the ink plus the particulate material becomes bonded within the polyethylene. Also, by bonding a second layer thereto it becomes difficult or impossible to tamper with the first printed layer since the inks are enclosed within the plastics.

Preferably, the plastics film is a polyester film coated with polyethylene, such as that purchased from Morane (Banbury, U.K.) under the trade name Morafast.

Other plastics, such as, for example, polyvinyl chloride may be used, but the ink can be removed with acetone. However, the bonding properties of polyethylene make it preferred and the ink is, after bonding, unaffected by acetone. Thus, where a polyethylene coated polyester film is used, it is preferred that the ink or dye is transferred to the polyethylene coated surface.

The colourant used may be any ink or dye but the following are preferred: diethylene glycol based ink using food dyes as colourants.

These inks are particularly favoured when used with polyethylene since they are cheap to use and print well.

The material of a particulate or colloidal nature is preferably silica, a sand, silicon, clay or chalk. Silica is most preferred and is referred to throughout the remainder of the specification, although the above alternatives can be used also.

Preferably the particles are provided in a coating with latex (e.g. PVA) or starch.

Preferably the backing is a dense paper exceeding 80 gm^{-2} (gms per square metre) to avoid tearing when the paper is removed, although other materials could be used. Preferably, the paper has a low level of loose fibres or no loose fibres. Parchment paper is preferred and is produced by dipping paper in conc. H_2SO_4 and then washing.

The colourant or ink can be applied by hand, or by machine. Suitable machines include, for example, computer controlled printers, dot matrix, laser and ink jet printers or printing plates etc, but ink jet printers are preferred.

The ink can be transferred to the plastics film by bringing the plastics film into contact with the surface of the material having a particulate nature, which material has been printed over, and subjecting it to a constant heat. This can be done by passing the two layers through a standard laminator. The temperature required will depend on the plastics used and the thickness of the sheets.

The backing layer, usually paper, can then be peeled off, with washing and scrubbing if necessary, to leave a printed plastics sheet which has absorbed the ink. Consequently, it is more difficult to remove the inks by the use of sol-

vents than with conventionally printed plastics.

As pointed out above, printed plastics can also be bonded to a further plastic sheet to encapsulate the ink or dye making the product "tamper proof". This is of particular importance in documents of a security nature.

According to a further aspect of the invention there is provided a printed plastics document obtainable by the above specified process and wherein a second plastics film is laminated to the first plastics film to encapsulate the colourant and the layer of particulate or colloidal material having a particle size of from 5 to 0.006 μm (microns).

Preferably the particle size of most or substantially all the particles is from 5 microns to 0.006 μm (microns) in diameter, more preferably from 1μm to 0.006 μm.

The particle size can be determined by passing particles through a graded series of sieves and determining which sieves the particles will or will not pass through.

The plastics film used may be formed from any of the plastics hereinbefore mentioned, but the preferred plastics film is a polyester/polyethylene laminate.

Preferably the layer of particles is formed on the polyethylene side of the laminate.

Without wishing to be bound by theory it is believed that the improved printing quality derives from the colourant being transferred to the plastics from the particles in a "dry state".

By using different loadings of silica, different types of document can be produced - loadings of 4 to 8 g/m^2 (preferably 5-7 g/m^2) give transparent documents. Loadings of 8-20g/m^2 (preferably 10 to 15 g/m^2) give opaque documents.

In order to produce documents which substantially do not bleed when the backing is removed, the layer of particulate or colloidal material preferably should not be exposed to an atmosphere of above 40% humidity for any lengthy period of time (e.g. not for longer than 20 minutes). Desirably, the second plastics film should then be laminated to the first plastics film at a temperature of at or above 177°C (350°F). This also applies to the silica, plastics layers and/or paper prior to being used for a product intended not to bleed.

In order to produce documents having printing which is initially legible but which later begins to bleed, the said layer preferably should be exposed to an atmosphere of above 40% humidity (e.g. 40 to 80% humidity). Also, the first plastics film can be subjected to a very fine water mist. Desirably the layer takes in no further moisture from the atmosphere. The second plastics film then desirably is laminated to the first at a temperature at or below 177°C (350°F).

Having printed onto the plastics, further additional steps can be taken to improve security, depending on the type of document being produced.

For a laminated document, for example, money, tickets etc. a mark akin to a "water mark" can be introduced. The mark, as it is hereafter referred may be produced as follows:

A sheet of paper preferably with a weight in excess of 80 g/m^2, but lower weights can be used, and having coated thereon fine particles of silica has a design embossed thereon using a metal die or other means for embossing paper. Preferably, the impression is made on the coated side so that the coated side is depressed, although it will work, though less effectively, the other way round. The embossed sheet, is then placed, particle side down over a first plastics sheet and the two sheets are passed through a laminator in the same way as has been described with reference to the transfer of inks from the coated sheet. The backing paper is then removed, and when a second plastics film is bonded to the first film, a mark is visible which mark contains no inks and does not appear to the hand to be raised or lowered in the end product.

Features of the invention will now be described, by way of example only, with reference to the following specific embodiments.

To produce a printed plastics document which also comprises a "watermark" the following procedure can be followed:

A sheet comprising a parchment paper backing and having thereon a layer of silica, has a design printed on the silica layer. The inks or dyes used are standard printing dyes and the design is applied by a computer controlled printer, printing plate or other means.

At another place along the sheet, preferably a place which has not been printed, a part of the coated surface is raised by embossing the paper with a metal die having a raised design thereon.

The printed sheet is then covered, for example, with a 100 μm (microns) thick polyester plastics sheet with a 16 μm (micron) thick polyethylene coat on at least one side, so that the polyethylene coat faces the silica coated surface of the printed sheet. The two are heated to a temperature at which the polyethylene melts sufficiently to take up ink. For the sheet of the given examples this temperature will desirably be between 32°C (90°F) and 60°C (140°F), preferably about 38°C (about 100°F) and can be achieved by passing the respective sheets through, for example, a pouch or role laminator. It should be appreciated that the features exemplified above are not limiting. The polyester sheet is preferably above 30, e.g. up to 500 μm (microns) thick and the polyethylene coat is preferably from 12, e.g., up to 20 μm (microns)thick. It is desirable that the heat applied is constant and that sufficient pressure is exerted to expel any air from between the sheets.

The backing paper is then removed. Generally it can be peeled off, but if it is well stuck down it can be soaked and scrubbed as necessary.

Where the paper was embossed, the raised parts caused the polyethylene to be "pushed out" as the paper was

laminated to the plastics. When another plastics layer is placed into contact with the sheet, the paper having been removed, and laminated a distinctive mark is left. The amount of heat used in lamination affects the clarity of the mark. The hotter the lamination the less clear the resulting mark. Generally a lamination temperature of greater than 49°C (120°F) is used.

Where lamination is used to encapsulate the ink it is possible, to incorporate other items between the sheets being laminated. Thus, for example, signature strips or electronic chips can be introduced and incorporated within the final product. In the laminate, desirably, the silica layer is sandwiched between two polyethylene layers.

The results given in Table 1 below show how the present invention can be used to produce documents of different bleed times:

The Examples illustrated by the Table were performed using parchment paper and a diethylene glycol ink comprising a food dye. The ink was prepared by treating yellow food dye obtainable under the trade mark "GOLD SEAL" (from Clayton & Jowett Ltd, Runcorn, England) until its volume was reduced by 75% due to evaporation. 100 ml of the remaining liquid was then mixed with diethylene glycol to give a level of 20% u/v glycol in the final ink. The paper was loaded with an even layer of silica at a particle size of 0.010 μm (microns) and at a level of 10 g silica/m^2 and was then printed with the dye. The printed layer was then placed against a polyester (150 μm (microns) thick) /polyethylene (16 μm (microns) thick) plastics film and heated at a temperature sufficient to transfer the printed layer to the plastics film polyethylene layer and the parchment paper was then removed. The resultant product comprising the plastics film and the printed layer was then left at the humidity level and exposure time given in the Table before finally laminating a second layer of the plastics material to the first layer at the temperature given in the Table. The length of time taken for the ink used to bleed (i.e. for the printing to become blurred to the naked eye) was determined by regular inspection and is given in the Table.

Bleeding could be effected with other ink jet inks provided that after removing the backing paper the layer of silica is exposed to an atmosphere of at least 40% humidity and the temperature at final lamination was below 177°C (350°F).

Yellow, magenta and cyan food dyes are obtainable under the trade mark "GOLD SEAL" and can be used to form ink jet inks as aforesaid, (except that 75% rather than 50% of the volume of the dye is evaporated). By mixing these dyes in appropriate proportions different colours can be produced, as desired.

TABLE 1

Example	Length of Time to Bleed	Temp. to Transfer Print	humidity %	length of time Exposed	temp. at final Lamination
1	1 year	38°C (100°F)	40	15 mins	163°C 325°F +
2	6 months	38°C-93°C (100-200°F)	75	30 mins	163°C 325°F
3	1 month	38°C-93°C (100-200°F)	75	60 mins	163°C 325°F
4	2 weeks	38°C-93°C (100-200°F)	40-50	60 mins	163°C 325°F
5	1 week	38°C-93°C (100-200°F)	75	3 hours	163°C 325°F

It is desirable in certain circumstances for bleeding to occur after a given time. This is the case, for example, where a ticket or card is intended to be valid for a limited period only, the expiry of this period being indicated by bleeding of the ink. By appropriate variation of humidity, temperature at final lamination and ink used, the time can be varied at which bleeding occurs.

By appropriate variation of these parameters cards can be produced which will normally only bleed after several months (see e.g. Example 2). However, bleeding can be accelerated by puncturing or tearing the card to expose the silica to the atmosphere. One application of this is for consumer products having labels. The label can be formed with a line or point of weakness to which it is attached via a tag, to the consumer product. When the label is removed from the tag, tearing along the line of weakness exposes the silica to accelerate bleeding.

Even if the label is somehow reattached to the clothing, bleeding can still occur. This is advantageous in avoiding fraud by indicating to shopkeepers when a label has been removed from the consumer product. In the case of clothing, this label, after being pierced, will then attract moisture from the body. If the label shows signs of slight bleeding where it was pierced, this will show the garment has just been "tried on". If the article is worn for more than two hours the whole of the label will have bled (given the label is 2.54cm x 2.54cm (1" x 1"). However, the ink does not come out of the label.

A further refinement of this technique is for the tag of the label to be attached to the consumer product via adhesive which coats a removable holographic image on the tag. Thus, if it is attempted to remove the label by pulling at the tag and avoiding the line or point of weakness the label and tag can be removed together, but this destroys the holographic image. A label comprising the removable holographic image and adhesive is also within the scope of the present invention.

It has also been found that if a hologram printed on polyester and placed, e.g. in the centre of a number of various other sheets of printed laminate, then the special effects can be made which to date no-one has been able to photocopy, or even copy using a scanning unit.

It has been found that anything printed above the hologram (which is itself transparent) if tilted to the light appears to become embedded within that hologram. Also, any part of the top-most layer, if the item is tilted accordingly, is all that can be viewed, so that in the case of a credit card, this top part could be printed with the name, signature and account number of an authorised user.

In one embodiment a hybrid document can be produced i.e. one embodying the printed plastics described with an insert of printed paper or a material which can be marked when pressure is applied thereto. Since the printed material used will eventually fade in time, it is preferred in some embodiments to coat the plastics with a material which reflects ultra-violet light or to use an ultra-violet resistant polyester, which light is responsible for the fading.

In other embodiments, however, the fading of the ink due to exposure to U.V. light can be used advantageously. For example, tickets such as concert or football tickets may have certain information printed in an ink which on exposure to a high dosage of ultra-violet light will be destroyed.

Furthermore, the following additional features can be included:

1. Only one part of an image or pattern may be applied to a document. The other part of the pattern is held by the person receiving the tickets at the entrance to the establishment (theatre, football ground, Wimbledon etc.). That person can then quickly place the transparent ticket over the template he holds and if the pattern/image is complete then that ticket is "passed". Also a fingerprint can be applied, and because of the transparent nature of the document this can be placed over a recorded fingerprint for verification.
2. A heat sensitive material or chemical may be used on the ticket so that a pre-defined number/pattern or image etc. shows up under certain conditions.
3. Fibre optics may be incorporated into a document. They can be applied so that either:

   a) One or more fibres which have been etched via a laser or other means with either words or a design, are affixed on or between the laminate sheets so that when a light is applied to the edge of the card, where viewed from the front of the card. It has also been found that if the amount of light is measured at the start of the fibres, the amount of light received at the other end will depend on the amount and size of the words or design etched onto the fibres due to light being diverted through the design. Therefore the amount of light received at the end can be anticipated and measured and if the light does not reach or is over a certain level, then, the card/document will be suspect.
   b) A number of fibres are set in such a way that light transmitted onto one edge of the card is received at another edge. Light sensors can then be used to detect the received light and to read it at an angle which is oblique to the direction in which light enters the card, and if the correct message is not received then the card is considered "suspect".
   c) The fibres can be arranged in such a way that they can be read as a number i.e. using the same principle as a bar code. Each card can have its own unique number or bar code.
   d) A fluorescent fibre can be also used whereby light is transmitted via the surface of the fibre to the fibre ends. These too can be etched and read by a light sensor/reader.

If in the case of a credit card, for example, fibre optics are placed across the whole of the card information such as A/C number, name, etc., plus any other information, can be etched in and read by an automatic reader by moving the card relative to the reader.

Using this method a wealth of untamperable information can be held within the card so that a magnetic strip is no longer required. A magnetic strip can, however, be fixed/sprayed onto or into a product of the present invention if desired.

Generally, a person will read the transparent document against a plain background. If the document is placed against, for example, a white background the details of the document will show up clearly.

In the case of a document that may be used where there is no suitable background to hand, a plain hinged back can be affixed to the document. The person inspecting the card can both see the card clearly, and by raising the flap can see that no changes or insertions have been made.

It has also been found that if a number of printed films are laminated together, the colour is enhanced. Also "3D" images can be made by the fact that for example: - mountains and sky can be printed on a first film, trees and bushes

on a second etc. If, as has been found, clear film is inserted between these printed films, an effective 3D effect can be made or at least some depth of field achieved.

Another addition to the security aspect includes printing a document so small, that it cannot be read by the naked eye, but can be read with the use of a magnifying glass.

In another embodiment security can be enhanced by applying a prism effect.

In this embodiment the plastics incorporates a number of prisms - some running in one direction and some running in another. To read a document a correcting card is required or the card can be tilted to a certain angle to be able to read it.

In another embodiment, security can be enhanced by the addition of a foil, preferably metal which has been embossed with lettering or design. This foil is encapsulated between the sheets of plastics material. Also, this foil can be encapsulated in a plane state so that e.g., with credit cards, if the card is stamped with round letters and/or numbers these can be easily read by the naked eye.

If an electrically conductive ink/dye/paint within the card is used, the card can be used as part of an electrical circuit or a switch to cause a short circuit to, say, light up a bulb or open a door (i.e. as a key card).

Another embodiment of the invention is to print either some or all of the document with white ink/dye etc. This will stop photocopying, as no photocopier can print white.

Two other ways of printing in white are:-

1. To cut out shapes/letters/numbers etc. from the paper that has more than 10 μm (microns) of silica and to transfer this silica to the laminate, by the normal means of this invention, then on final lamination, this white print will remain.

2. To have a design/words/numbers etc. placed in the coating or rather on the coating of the paper at the time of manufacture, i.e. the first coating of less than 5 μm (microns) is applied, then, when dry, a second coating is applied using rollers that will leave the design required etc. proud of the first coating. This second coating will have to be thick enough to give a total thickness (of the two coats) of 10 μm (microns) or more.

2a. Using method 1, a coloured design, printed around this resulting white design can then be used with the intention that the colour bleeds into the design within a given period.

It has been found that the "watermark" cannot be photocopied either.

If an overhead transparency is made by photocopying one of the invention's documents - given that any white print or "watermark" will not be present - and then placed on an overhead projector, the image will show on the screen. None of the invention's prints will show up clearly on the screen; so this too could be used as a security check.

It has also been found that if two layers of plastic are printed with the same details, but adhered together, slightly off-set, that a blurred print results, but if the card is tilted to one side, the prints line up and can be easily read.

Going further with this, two identical prints can be made and laminated off-set, so that when viewed straight on, the whole print appears as a black card, until the card is viewed at an angle.

Claims

1. A process for printing a plastics film, comprising printing a colourant onto a layer of particulate or colloidal material, which material is releasably bound to a backing; transferring the colourant onto a first plastics film by placing the first plastics film over the printed layer and subjecting the plastics film and printed layer to a substantially constant heat, and removing the backing characterised in that the particulate or colloidal material has a particle size of from 5 to 0.006 μm (microns).

2. A process according to claim 1, wherein a second plastics film is bonded to the first plastics film to encapsulate the colourant and the particulate or colloidal material.

3. A process according to claim 1 or 2, wherein the particulate or colloidal material is silica.

4. A process according to any preceding claim, wherein the backing is parchment paper.

5. A process according to any preceding claim, wherein the layer comprises 4 to 8 g/m^2 or 8 to 20 g/m^2 of particulate or colloidal material.

6. A process according to any preceding claim for producing a document having a colourant which substantially does not bleed, comprising

printing the colourant onto a layer of particulate or colloidal material, which layer is releasably bound to a back-

ing;
transferring the colourant onto a first plastics film by placing the plastics film over the printed layer and subjecting the plastics film and printed layer to a substantially constant heat;
removing the backing and laminating a second plastics film to the first plastics film at a temperature at or above 177°C (350°F).

7. A process according to any of claims 1 to 5, for producing a document having a colourant which bleeds after a period of time, comprising

printing the colourant onto a layer of particulate or colloidal material, which layer is releasably bound to a backing;
transferring the colourant onto a first plastics film by placing the plastics film over the printed layer and subjecting the plastics film and printed layer to a substantially constant heat;
removing the backing and exposing the layer of particulate or colloidal material to an atmosphere of above 40% humidity; and
laminating a second plastics film to the first plastics film at a temperature below 177°C (350°F).

8. A process according to any preceding claim, wherein a U.V. sensitive or U.V. reflective material is inserted between first and second laminated plastics film.

9. A process according to any preceding claim, wherein one or more fibre optic fibres are inserted between the first and second plastics films.

10. A document obtainable by a process according to any of claims 1 to 9, wherein the first plastics film is laminated to a second plastics film to encapsulate the colourant and the layer of particulate or colloidal material.

11. A document according to claim 10, wherein a U.V. sensitive material, U.V. reflective material and/or one or more fibre optic fibres are encapsulated between the first and second plastics films.

12. A document according to claim 11, wherein the one or more fibre optics are etched.

13. A document according to any of claims 10, 11 or 12, wherein at least one of the plastics films comprises an embossed portion.

14. A document according to any of claims 10 to 13, wherein the document is a label and comprises a portion having a removable hologram and an adhesive overlying the hologram.

15. A document according to any of claims 10 to 14, wherein the document comprises at least one region of weakness where the document can be manually torn to expose the silica to the atmosphere.

16. A document as claimed in any of claims 10 to 15 which further comprises a mark akin to a watermark.

Patentansprüche

1. Verfahren zum Drucken auf Kunststoffolie, umfassend die folgenden Schritte: Drucken eines Färbemittels auf eine Schicht aus Partikel- oder Kolloidmaterial, wobei das Material lösbar mit einem Träger verbunden ist, Übertragen des Färbemittels auf eine erste Kunststoffolie, indem die erste Kunststoffolie über die bedruckte Schicht gelegt wird und die Kunststoffolie und die bedruckte Schicht einer im wesentlichen konstanten Hitze ausgesetzt werden, und Entfernen des Trägers, dadurch gekennzeichnet, daß das Partikel- oder Kolloidmaterial eine Partikelgröße zwischen 5 und 0,006 µm (Mikron) aufweist.

2. Verfahren nach Anspruch 1, bei dem eine zweite Kunststoffolie mit der ersten Kunststoffolie verbunden wird, um das Färbemittel und das Partikel- oder Kolloidmaterial zu verkapseln.

3. Verfahren nach Anspruch 1 oder 2, bei dem das Partikel- oder Kolloidmaterial Silika ist.

4. Verfahren nach einem der vorherigen Ansprüche, bei dem der Träger Pergamentpapier ist.

5. Verfahren nach einem der vorherigen Ansprüche, bei dem die Schicht 4 bis 8 g/m^2 oder 8 bis 20 g/m^2 an Partikel-

oder Kolloidmaterial umfaßt.

6. Verfahren nach einem der vorherigen Ansprüche zum Herstellen eines Dokumentes, das ein Färbemittel aufweist, das im wesentlichen nicht verläuft, umfassend die folgenden Schritte:

Drucken des Färbemittels auf eine Schicht aus Partikel- oder Kolloidmaterial, wobei die Schicht lösbar mit einem Träger verbunden ist;
Übertragen des Färbemittels auf eine erste Kunststoffolie, indem die Kunststoffolie über die bedruckte Schicht gelegt wird und die Kunststoffolie und die bedruckte Schicht einer im wesentlichen konstanten Hitze ausgesetzt werden;
Entfernen des Trägers und Laminieren einer zweiten Kunststoffolie auf die erste Kunststoffolie bei einer Temperatur von oder über 177°C (350°F).

7. Verfahren nach einem der Ansprüche 1 bis 5 zum Herstellen eines Dokumentes, das ein Färbemittel aufweist, das nach einem Zeitraum verläuft, umfassend die folgenden Schritte:

Drucken des Färbemittels auf eine Schicht aus Partikel- oder Kolloidmaterial, wobei die Schicht lösbar mit einem Träger verbunden ist;
Übertragen des Färbemittels auf eine erste Kunststoffolie, indem die Kunststoffolie über die bedruckte Schicht gelegt wird und die Kunststoffolie und die bedruckte Schicht einer im wesentlichen konstanten Hitze ausgesetzt werden;
Entfernen des Trägers und Aussetzen der Schicht aus Partikel- oder Kolloidmaterial einer Atmosphäre von über 40% Feuchtigkeit; und
Laminieren einer zweiten Kunststoffolie auf die erste Kunststoffolie bei einer Temperatur unter 177°C (350°F).

8. Verfahren nach einem der vorherigen Ansprüche, bei dem ein UV-empfindliches oder UV-reflektierendes Material zwischen der ersten und der zweiten laminierten Kunststoffolie eingefügt wird.

9. Verfahren nach einem der vorherigen Ansprüche, bei dem eine oder mehrere Lichtleitfasern zwischen der ersten und der zweiten Kunststoffolie eingefügt werden.

10. Dokument, das mit einem Verfahren nach einem der Ansprüche 1 bis 9 herstellbar ist, bei dem die erste Kunststoffolie auf eine zweite Kunststoffolie laminiert wird, um das Färbemittel und die Schicht aus Partikel- oder Kolloidmaterial zu verkapseln.

11. Dokument nach Anspruch 10, bei dem ein UV-empfindliches Material, UV-reflektierendes Material und/oder eine oder mehrere Lichtleitfasern zwischen der ersten und der zweiten Kunststoffolie verkapselt werden.

12. Dokument nach Anspruch 11, bei dem die eine oder mehreren Lichtleitfasern geätzt sind.

13. Dokument nach einem der Ansprüche 10, 11 oder 12, bei dem wenigstens eine der Kunststoffolien einen geprägten Abschnitt aufweist.

14. Dokument nach einem der Ansprüche 10 bis 13, bei dem das Dokument ein Etikett ist und einen Abschnitt mit einem entfernbaren Hologramm und einem auf dem Hologramm liegenden Klebstoff aufweist.

15. Dokument nach einem der Ansprüche 10 bis 14, bei dem das Dokument wenigstens eine Schwachstelle umfaßt, an der das Dokument manuell durchgerissen werden kann, um das Silika der Atmosphäre auszusetzen.

16. Dokument nach einem der Ansprüche 10 bis 15, das weiterhin ein Zeichen aufweist, das einem Wasserzeichen ähnlich ist.

Revendications

1. Procédé d'impression d'un film plastique, comprenant l'impression d'un colorant sur une couche de matériau particulaire ou colloïdal, ledit matériau étant lié de manière détachable à un support ; le transfert du colorant sur un premier film plastique en plaçant le premier film plastique sur la couche imprimée et en soumettant le film plastique et la couche imprimée à une chaleur sensiblement constante, et le retrait du support, caractérisé en ce que le matériau particulaire ou colloïdal a une taille de particules comprise entre 5 et 0,006 µm (micromètres).

2. Procédé selon la revendication 1, dans lequel un deuxième film plastique est lié au premier film plastique afin d'encapsuler le colorant et le matériau particulaire ou colloïdal.

3. Procédé selon la revendication 1 ou 2, dans lequel le matériau particulaire ou colloïdal est la silice.

4. Procédé selon l'une quelconque des revendications précédentes, dans lequel le support est du papier parcheminé.

5. Procédé selon l'une quelconque des revendications précédentes, dans lequel la couche comprend 4 à 8 g/m^2 ou 8 à 20 g/m^2 de matériau particulaire ou colloïdal.

6. Procédé selon l'une quelconque des revendications précédentes, pour produire un document ayant un colorant qui ne coule sensiblement pas, comprenant

l'impression du colorant sur une couche de matériau particulaire ou colloïdal, ladite couche étant liée de manière détachable à un support ;
le transfert du colorant sur un premier film plastique en plaçant le film plastique sur la couche imprimée et en soumettant le film plastique et la couche imprimée à une chaleur sensiblement constante ;
le retrait du support et la stratification d'un deuxième film plastique sur le premier film plastique à une température supérieure ou égale à 177°C (350°F).

7. Procédé selon l'une quelconque des revendications 1 à 5, pour produire un document ayant un colorant qui coule après un certain laps de temps, comprenant

l'impression du colorant sur une couche de matériau particulaire ou colloïdal, ladite couche étant liée de manière détachable à un support ;
le transfert du colorant sur un premier film plastique en plaçant le film plastique sur la couche imprimée et en soumettant le film plastique et la couche imprimée à une chaleur sensiblement constante ;
le retrait du support et l'exposition de la couche de matériau particulaire ou colloïdal à une atmosphère ayant une humidité relative supérieure à 40 % ; et
la stratification d'un deuxième film plastique sur le premier film plastique à une température inférieure à 177°C (350°F).

8. Procédé selon l'une quelconque des revendications précédentes, dans lequel un matériau sensible aux ultraviolets ou réfléchissant les ultraviolets est intercalé entre les premier et deuxième films plastiques stratifiés.

9. Procédé selon l'une quelconque des revendications précédentes, dans lequel une ou plusieurs fibres optiques sont intercalées entre le premier et le deuxième film plastique.

10. Document pouvant être obtenu par un procédé selon l'une quelconque des revendications 1 à 9, dans lequel le premier film plastique est stratifié sur un deuxième film plastique afin d'encapsuler le colorant et la couche de matériau particulaire ou colloïdal.

11. Document selon la revendication 10, dans lequel un matériau sensible aux ultraviolets, un matériau réfléchissant les ultraviolets et/ou une ou plusieurs fibres optiques sont encapsulés entre le premier et le deuxième film plastique.

12. Document selon la revendication 11, dans lequel la ou les multiples fibres optiques sont gravées.

13. Document selon l'une quelconque des revendications 10, 11 ou 12, dans lequel au moins un des films plastiques comprend une partie gauffrée.

14. Document selon l'une quelconque des revendications 10 à 13, dans lequel le document est une étiquette et comprend une partie ayant un hologramme détachable et un adhésif recouvrant l'hologramme.

15. Document selon l'une quelconque des revendications 10 à 14, dans lequel le document comprend au moins une zone de faiblesse où le document peut être déchiré manuellement afin d'exposer la silice à l'atmosphère.

16. Document selon l'une quelconque des revendications 10 à 15, qui comprend en outre une marque ressemblant à un filigrane.