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Published:
— *with international search report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: IMAGE CARRYING SHEET

(57) Abstract: An image carrying sheet including: a substrate laminated between rigid layers, the substrate having an image formed by sublimation. The layers are preferably formed of glass or perspex.

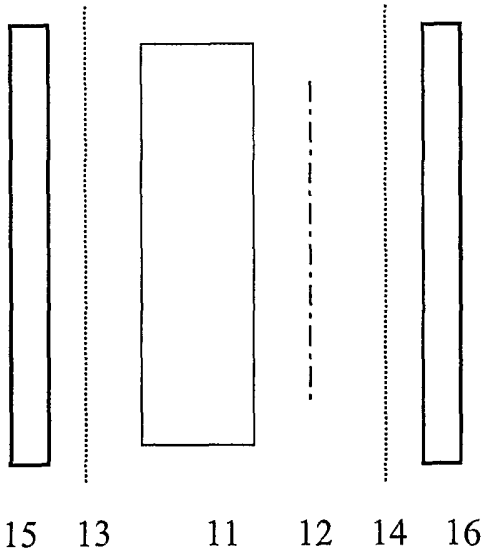

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IMAGE CARRYING SHEET

Field of the Invention

This invention relates to the production of a sheet with an image that is visible from one or both sides of the sheet, such as laminated glass. The image may take the form of a pattern, artistic work, written indicia or any other visually discernible form. The invention also relates to a sheet with an image.

Background

Laminated glass has many applications as a construction material. It can for example be used to form windows, walls, doors and screens. It can also be used for the construction of articles such as coffee tables, and other small articles of furniture. Laminated glass is specified or desired in a number of applications as a result its inherent safety characteristics compared to normal glass sheets. Laminated glass is typically formed by joining two sheets of glass using a polyvinyl butyral interlayer. The production process normally involves placing the interlayer between the two sheets of glass, applying heat to soften the interlayer and then passing the sheets through nip rollers that squeeze the glass sheets into contact with the softened interlayer. A further step involves the treatment of the laminate so formed in an autoclave to complete the bonding process.

In many applications it is desirable to provide some form of image on the laminated glass. The image can be for the purposes of decoration or can serve a functional purpose by partially or completely obscuring the view through the laminated glass sheet. Hitherto attempts to produce laminated glass with images have presented serious practical problems. One way that an image has been formed on laminated glass is by screen printing onto the finished laminated sheet. This is a cumbersome process and limits the images that can be produced both in colour and detail. For example a multi-colour image requires a printing step for

each colour. Additionally the images can only be formed on discrete panels and for practical purposes this means that the images cannot be formed in a regular manner so that the panels can be subsequently arbitrarily cut.

Other attempts have been made to place images within laminated glass. These have taken the form of introducing an additional layer of some type that carries the image into the glass laminate. This approach has the disadvantage of directly interfering with the strength of the bond formed between the glass sheets. This is because the image carrying material results in a reduction in available area for bonding.

It is an object of this invention to provide an image carrying sheet and a method of producing an image carrying sheet that will overcome, or at least ameliorate, the foregoing disadvantages.

Summary of the Invention

In accordance with the invention, there is provided an image carrying sheet including:

a substrate laminated between rigid layers, the substrate having an image formed by sublimation.

In another aspect, there is provided a substrate for use in the above image carrying sheet, including an image formed on the substrate by sublimation.

In another aspect, there is provided a method of producing a substrate including:

providing an image, formed of sublimation dye, on a transfer medium;

placing the transfer medium in contact with a substrate;

applying heat and pressure to the substrate and transfer medium whereby the dye from the transfer medium sublimes into a vapour and transfers from the medium to the substrate.

In another aspect, there is provided a method of forming an image carrying sheet, including:

placing the substrate over a first one of the rigid layers;

positioning a second one of the rigid layers over the substrate; and

laminating the layers and substrate together.

In another aspect, the present invention is an image carrying sheet including a substrate with an image, the image formed by sublimating at least one dye from a transfer medium to the substrate wherein the formed image does not significantly decrease the bonding ability of the image carrying sheet.

Preferably, the image carrying sheet further includes a first sheet bonded to the substrate. More preferably, the image on the substrate can be viewed through the first sheet.

In one embodiment, the first sheet is glass, acrylic, perspex or polycarbonate. Preferably, the substrate is an interlayer. Even more preferably, the substrate is polyvinyl butyral, polyurethane, ethylene vinyl acetate or ionoplast.

In another embodiment, the substrate is polyester, polypropylene, polyethylenetelephthalate (PET), polybutylene tetephthalate (PBT), acrylics, polymethylacrylate, polymethacrylimide (PMI), polycarbonate, stryeneacrylicnitryl, K-resin (stryenic block copolymer) polyethersulphone, polysulphone, clarified

polypropylene, vinyl, polystyrene, polyvinyl butyrate, polyacrylate, cellulose acetate or cellulose acetate/butyrate.

In another embodiment, the substrate includes a coating of polyester, polypropylene, polyethylenetelephthalate (PET), polybutylene tetephthalate (PBT), acrylics, polymethylacrylate, polymethacrylimide (PMI), polycarbonate, stryeneacrylicnitryl, K-resin (stryenic block copolymer) polyethersulphone, polysulphone, clarified polypropylene, vinyl, polystyrene, polyvinyl butyrate, polyacrylate, cellulose acetate or cellulose acetate/butyrate.

Preferably, the substrate is a holographic foil.

Detailed Description of the Invention

The invention will now be further described, by way of example only, with reference to the accompanying drawings and examples.

Figure 1 – A schematic diagram of a substrate, arranged for application of a sublimation process according to one embodiment of the invention.

Figure 2 – A schematic diagram of layers of an image carrying sheet, arranged for application of the sublimation process according to another embodiment of the invention.

Figure 3 – A schematic diagram of the layers of an image carrying sheet, arranged for application of the sublimation process according to another embodiment of the invention.

Referring to Figure 1, an image is formed on a substrate 2 by sublimating dyes on an image transfer medium 3 such as paper. As the substrate 2 softens during the sublimation process, this sheet is supported on each side by two supporting sheets 1, 5. A sheet of heat resistant film 4 is also provided so that the supporting sheet 5 can be easily removed after the sublimation process.

The sublimation process uses heat and pressure to transfer an image from the transfer medium 3 to the substrate 2. The transfer medium 3 is removed from the substrate 2 after the sublimation process. The sublimation process uses a controlled atmosphere with a controllable pressure and temperature. In one embodiment, the sublimation process is undertaken in an autoclave. It is preferable that when using an autoclave that the substrate 2, transfer medium 3, heat resistant film 4 and supporting sheets 1, 5 form a layered sandwich and are in a vacuum. This could be formed by packing the layered sandwich in a vacuum bag and creating a vacuum within the bag.

In this figure, the support layer 1 is a layer of the finished product, for example a rigid layer of glass or perspex and is bonded to the substrate 2 during the sublimation process. The support sheet 1 supports the image carrying sheet 2 and allows it to be handled and/or treated with minimal relative movement between the image carrying sheet 2 and the support sheet 1 during the process of forming the image. Some of the processes suitable for forming the image require the sheet to be moved through a processing line which includes, for example, a nip roller, at a consistent rate to prevent "banding and misses" in the printing. Additionally, many of the processes suitable for forming the image on the substrate 2 involve the use of heat. The substrate can be an interlayer that is very heat sensitive and typically loses much of its mechanical strength at temperatures of 60°C and above. The use of a support sheet 1 allows the interlayer to be handled and/or treated in systems involving the use of heat without unacceptable stretching or damage.

The heat resistant film 4 is provided to assist the removal of the support sheet 5. The support sheet 5 does not soften, during the sublimation process, so as to provide additional support to the substrate 2, for example PMMA, polycarbonate or glass.

Referring to Figure 2, an image is formed on a substrate 11 by sublimating dyes from an image transfer medium 12 such as paper. As the image carrying sheet 11 softens during the sublimation process, this sheet is supported on each side by two supporting sheets 15, 16. A sheet of heat resistant film 13, 14 is also provided so that the supporting sheets 15, 16 can be easily removed after the sublimation process.

In contrast with the image receiving sheet of Figure 1, the substrate 11 is not bonded to another sheet during the sublimation process. The substrate 11 may therefore represent the final image carrying sheet product, for example a sheet of acrylic, or an intermediate layer of a final product, which will then be bonded to other sheets in further processes. Both supporting sheets 15, 16 are removed after the sublimation process.

Referring to Figure 3, an image is formed on a substrate 22 by sublimating dyes on an image transfer medium 23 such as paper. An interlayer sheet 21 of the final image carrying sheet product is also attached. As the image carrying sheet 22 and sheet 21 soften during the sublimation process, these sheets are supported on each side by two supporting sheets 26, 27. A sheet of heat resistant film 24, 25 is also provided so that the supporting sheets 26, 27 can be easily removed after the sublimation process.

As with Figure 1, the substrate 22 such as a polyurethane interlayer and the sheet 21 such as acrylic are bonded together during the sublimation process. Both supporting sheets 26, 27 are removed after the sublimation process. The sheet 21 and substrate 22 becomes part of the final product.

Additional sheets may also be applied after the sublimation process to form a laminate of acrylic, polyurethane interlayer, polyurethane interlayer and acrylic. These can be applied by a laminating these layers or using an autoclave to bond the sheets together.

Additionally, it is preferable that the image is allowed to cure on the substrate before the image carrying sheet is used in further processing such as glass lamination. Depending upon ambient temperatures a curing period of up to 24 hours or more has been found to be beneficial in some cases.

In figures 1 and 3, it is desirable that the image is allowed to cure on the substrate 2, 22 with at least some of the supporting sheets remaining attached. The bonding of the sheet 1, 21, such as a transparent sheet, is therfore enhanced. Depending upon ambient temperatures a curing period of up to 24 hours or more has been found to be beneficial in some cases.

In these figures, the substrate can be formed as an interlayer of any appropriate type, for example polyvinyl butyral, polyurethane, ethylene vinyl acetate or ionoplast. For example the image can be printed on interlayers that are substantially transparent once laminated between two sheets that are at least semi transparent. Alternatively, interlayers that are designed to be opaque or partially opaque through for example colouring can be used. Interlayers of any thickness otherwise appropriate for the laminating of glass can be used. Commonly available interlayers are in multiples of 0.38mm in thickness.

Alternatively, the substrate could be any appropriate material, for example a polymer which may include polyester, polypropylene, polyethylenetelephthalate (PET), polybutylene tetephthalate (PBT), acrylics, polymethylacrylate, polymethacrylimide (PMI), polycarbonate, stryeneacrylicnitryl, K-resin (stryenic block copolymer) polyethersulphone, polysulphone, clarified polypropylene, vinyl, polystyrene, polyvinyl butyrate, polyacrylate, cellulose acetate, cellulose acetate/butyrate. The substrate could also be any suitable material such as a holographic foil with a coating of one or more of the above.

Further, the sheet 1, 11, 21 could be any appropriate material, for example glass,

acrylic, perspex or polycarbonate. These may be fully transparent or only partially transparent and could include tinting. These sheets may also include a textured finish in the end product. This can include having a textured finish on a non heat softening support sheet so that when heated, for example during the sublimation process, the heat softening material may substantially conform to the textured finish of the non heat softening support sheet. Additionally these sheets may also include coatings for their protection, coatings to assist in the joining process or coatings to assist the reception of an image.

Adhesion promoting coatings are generally polyester based such as Resydrol Van 6113W/42WALG, manufactured by Solutia. Other coatings are aliphatic polyurethane dispersions such as Daotan™ VTW 1233, manufactured by Solutia or Permathane RU41-347, manufactured by Stahl.

The sublimation dye may not be as fade resistant, particularly in outdoor applications, as other dyes. It may be that an UV absorbing additive be incorporated into the adhesion promoting coating. Examples of suitable UV absorbing compounds include hexadecyl 3,5-di-tert-butyl-4-hydroxy-benzoate, available as Cyasorb UV-2908; 2-hydroxy-4-(octyloxy)benzophenone, available as Cyasorb UV531; 2-(2'-hydroxy-5'-methylphenyl)benzotriazole, available as Tinuvin 900 from Ciba Geigy Corporation; 2-(3', 5'-di-tert-butyl-2'-hydroxyphenyl)-5-chlorobenzotriazole, available as Tinuvin 327 from Ciba Geigy Corporation; 2-(4-benzoyl-3-hydroxyphenoxy)ethylacrylate (available as Cyasorb UV-416) and poly(2-(4-benzoyl-3-hydroxyphenoxy)ethylacrylate) (available as Cyasorb UV-2126).

The use of a sublimation process to form the image on the substrate has been found to not interfere with the bonding ability of the image carrying sheet and other sheets to an unacceptable extent. In laminated glass produced by this method, the dye sublimes into the molecular structure of the substrate during the sublimation process, as the specific volume of the substrate material increases,

and on cooling back below a plastic softening temperature the image becomes locked into place. As the surface remains substantially the same, the bonding ability of the interlayer is not greatly affected. This is in contrast for example to acrylic based carriers for pigments which tend to pool and reticulate on the surface of the interlayer. The pooling results in a region of the interlayer that cannot bond to the adjacent glass sheets and thus prevents a successful laminated glass being formed. However, it may be desirable in some situations due to the processing or materials to provide a second interlayer to achieve the desired bonding. Such a process would involve further processing to form a laminate of glass, interlayer with image, interlayer and glass.

Accordingly, some of the possible advantages of this invention include:

the formation of a high quality image within transparent rigid layers or plies;

the quality of the image formed in this way is superior to that obtained by other printing methods (e.g. screenprinting, flexographic printing);

since no liquid inks are applied to the polymer substrate there are no associated problems such as a mismatch in surface tension leading to poor wetting, the need to corona-treat the plastic, the need for solvent evaporation, negative interactions between the plastic film and the ink solvents;

the image can be effectively encapsulated between transparent plies and is thus protected from abrasion, marring and scratching. Additionally the image is protected from damage from cleaning chemicals.

Example 1

The image is printed using a sublimation dye, such as Digistar PES available from

Lechler S.p.A., to a transfer medium, such as Jetcol HTR® 4000 paper manufactured by Coldenhove Papier. The printed image on the transfer medium is then placed onto the interlayer and a layer of glass. As the glass is non heat softening no further support is required. A heat resistant film, for example Dartek® nylon film made by DuPont, is then placed on the other side to the transfer medium and a second layer of glass is used and forming a sandwich with the two layers of glass on the outside. This sandwich is schematically shown in Figure 1 and is then vacuum packed and transferred to an autoclave which typically operates at a temperature of 135°C at a pressure of 11.5 bar. The heat and pressure of the autoclave transfers the image from the transfer medium to the interlayer by sublimation of the dye.

After the sublimation process has been undertaken the second layer of glass, heat resistant film and transfer medium is removed. The glass and interlayer may be returned to a controlled environment to recondition the interlayer. A second interlayer is applied to the interlayer with the image and another glass layer sandwiches the two interlayers. This sandwich is moved through an oven operating at a temperature of approximately 200°C before passing between nip rollers exerting a pressure of around 10 bar. This results in both the interlayers softening and bonding the two sheets of glass together. The nip rollers ensure that there is no entrapped air in the laminated sheet. The laminated sheets so formed are then transferred to an autoclave which typically operates at a temperature of 135°C at a pressure of 11.5 bar. They are typically autoclaved for around 3.5 hours.

Samples of laminated sheet were prepared in accordance with the above described example using a 0.38mm thick PVB R11 polyvinyl butyral interlayer produced by Solutia Australia Pty Ltd. The glass sheets were 3mm thick.

Example 2

The image is printed to the transfer medium as in Example 1.

The transfer medium is placed onto a heat softening sheet, in this example an acrylic sheet. A heat resistant film, for example Dartek® nylon film made by DuPont, is then placed on either side. A non heat softening sheet is then placed on either side of the heat resistant film creating a sandwich. This sandwich is schematically shown in Figure 2 and is then vacuum packed transferred to an autoclave which typically operates at a temperature of 135°C at a pressure of 11.5 bar. The heat and pressure of the autoclave transfers the image from the transfer medium to the interlayer by sublimation of the dye.

After the sublimation process all additional layers are separated leaving the heat softening sheet with the image.

Example 3

A laminated sheet with polyurethane interlayer and acrylic sheets was prepared in a similar manner to Example 1. The only difference being the acrylic sheets were supported during both stages by a non heat softening support sheet such as glass with a heat resistant film between the acrylic sheet and the support sheet. This sandwich is schematically shown in Figure 3.

Example 4

The image is printed to the transfer medium as in Example 1.

The transfer medium is placed onto a holographic foil having a polyester film on the surface which it contacts. A heat resistant film, for example Dartek® nylon film made by DuPont, is then placed on either side. A non heat softening sheet is then placed on either side of the heat resistant film creating a sandwich. This sandwich is then vacuum packed transferred to an autoclave which typically operates at a

temperature of 135°C at a pressure of 11.5 bar. The heat and pressure of the autoclave transfers the image from the transfer medium to the interlayer by sublimation of the dye.

After the sublimation process all additional layers are separated leaving the holographic foil with an image. This imaged foil is then adhered to acrylic, glass or similar material using double sided adhesive tape or similar material. This laminate is then nip rolled and a self adhesive vinyl backing is applied so as to protect the holographic foil.

The foregoing describes only certain embodiments of the invention and modifications can be made without departing from the scope of the invention.

Claims:

1. An image carrying sheet including:

a substrate laminated between rigid layers, the substrate having an image formed by sublimation.

2. An image carrying sheet as claimed in claim 1, wherein the rigid layers are transparent.

3. An image carrying sheet as claimed in claim 1, wherein the rigid layers are formed of glass.

4. An image carrying sheet as claimed in claim 1, wherein the rigid layers are formed of polymeric material.

5. An image carrying sheet as claimed in claim 1, further including an interlayer either side of the substrate.

6. An image carrying sheet as claimed in claim 1, wherein the substrate is provided with an adhesion-promoting coating.

7. A substrate for use in the image carrying sheet of claim 1, including an image formed by sublimation.

8. A method of producing a substrate including:

providing an image, formed of sublimation dye, on a transfer medium;

placing the transfer medium in contact with a substrate;

applying heat and pressure to the substrate and transfer medium whereby the dye from the transfer medium sublimes into a vapour and transfers from the medium to the substrate.

9. A method as claimed in claim 8, wherein the substrate is softened during application of the heat and pressure and the dye sublimes into the molecular structure of the polymer such that, upon cooling, the image becomes fixed in the substrate.

10. A method as claimed in claim 9, wherein the substrate is coated with an adhesion-promoting coating.

11. A method of producing a substrate according to claim 8 further including the step of supporting the substrate during the sublimation process by at least one support sheet.

12. A method of producing a substrate according to claim 11 wherein the substrate is supported during the sublimation process by two support sheets, the sheets being arranged on each side of the substrate to sandwich the substrate.

13. A method of producing a substrate according to any one of claims 8 to 12, further including the step of coating the substrate on at least one surface with an image receiving layer.

14. A method of producing a substrate according to any one of claims 8 to 13 wherein sublimating the at least one dye is achieved using an autoclave.

15. A method of forming an image carrying sheet, as claimed in claim 1, including:

placing the substrate over a first one of the rigid layers;

positioning a second one of the rigid layers over the substrate; and

laminating the layers and substrate together.

16. A method as claimed in claim 15, further including placing an interlayer between the substrate and each of the rigid layers prior to lamination.

17. An image carrying sheet including a substrate with an image, the image formed by sublimating at least one dye from a transfer medium to the substrate.

18. An image carrying sheet according to claim 17 further including a first sheet bonded to the substrate.

19. An image carrying sheet according to claim 18 wherein the image on the substrate can be viewed through the first sheet.

20. An image carrying sheet according claim 18 or 19, wherein the first sheet is bonded to one side of the substrate and a second sheet is bonded to another side of the substrate.

21. An image carrying sheet according to claim 18, 19 or 20 wherein the first sheet is glass, acrylic, perspex or polycarbonate.

22. An image carrying sheet according to claim 21, wherein the substrate is an interlayer.

23. An image carrying sheet according to claim 22 wherein the substrate is polyvinyl butyral, polyurethane, ethylene vinyl acetate or ionoplast.

24. An image carrying sheet according to any one of claims 17 to 21, wherein the substrate is polyester, polypropylene, polyethylenetelephthalate (PET), polybutylene tetephthalate (PBT), acrylics, polymethylacrylate, polymethacrylimide (PMI), polycarbonate, stryeneacrylicnitryl, K-resin (stryenic block copolymer) polyethersulphone, polysulphone, clarified polypropylene, vinyl, polystyrene, polyvinyl butyrate, polyacrylate, cellulose acetate, cellulose acetate/butyrate or a holographic foil.

25. An image carrying sheet according to any one of claims 17 to 21, wherein the image carrying sheet includes a coating of polyester, polypropylene, polyethylenetelephthalate (PET), polybutylene tetephthalate (PBT), acrylics, polymethylacrylate, polymethacrylimide (PMI), polycarbonate,

stryeneacrylicnitryl, K-resin (stryenic block copolymer) polyethersulphone, polysulphone, clarified polypropylene, vinyl, polystyrene, polyvinyl butyrate, polyacrylate, cellulose acetate or cellulose acetate/butyrate.

26. An image carrying sheet according to claim 25, wherein the image carrying sheet includes a holographic foil.

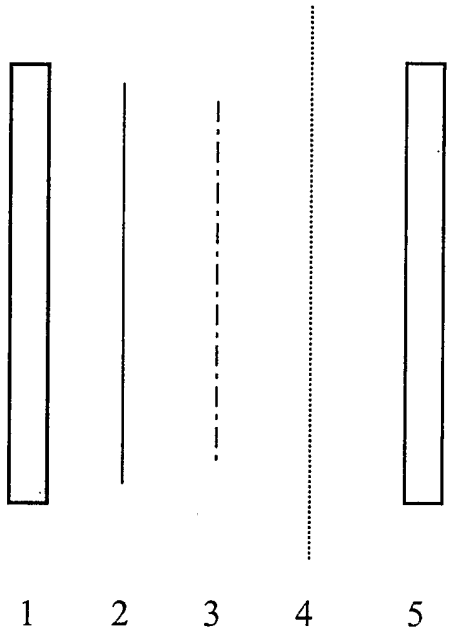

Figure 1

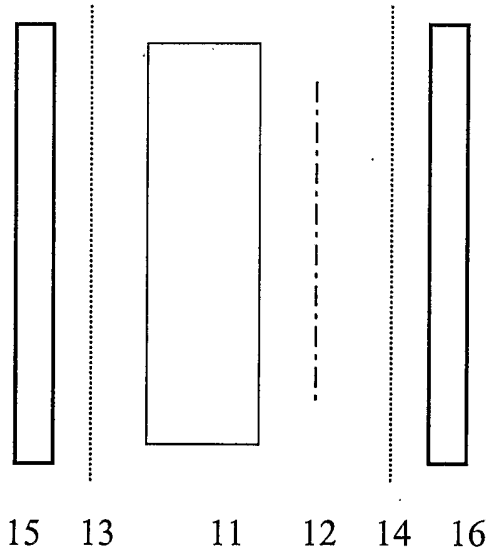

Figure 2

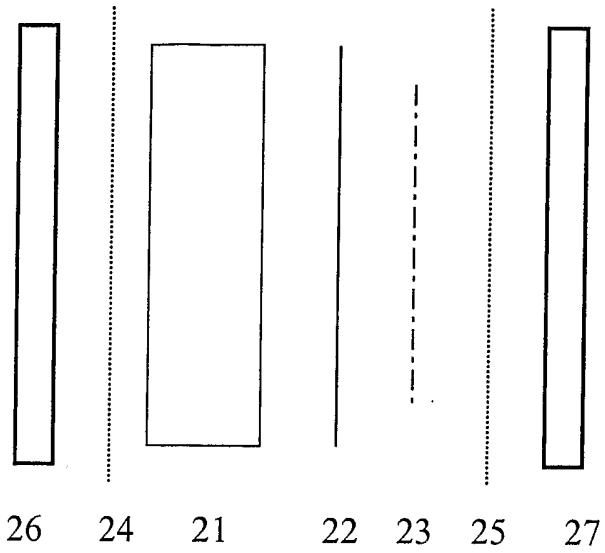

Figure 3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2004/000626

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. [7]: B32B 17/10, C03C 27/12, B41M 5/035

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
DWPI: B32B 17/10, 27/-, 31/-, 33/-, C03C 27/12, B41M 5/035, 7/00, B44C 1/17 and keywords: sublim+, imag+, laminat+, perspex and similar terms

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1129844 A (BREVET 2000 HOLDING SA) 5 September 2001 Abstract and claims	1-7, 15-16, 20-26
X	US 4173672 A (MANNHEIM) 6 November 1979 Abstract, column 1 lines 44-53, column 2 lines 21-35, column 3 lines 43-44, column 4 lines 24-33	1-3, 5-7, 15-16, 20-26
X	US 5364479 A (BOATTINI et al) 15 November 1994 Abstract, column 2 lines 48-53, column 3 lines 10-30, column 4 lines 1-3	1-3, 7, 15, 20-24
X	FR 2639631 A (SIV SOC ITALIANA VETRO) 1 June 1990 Abstract	1-3, 7, 15, 20-21, 23-24

[X] Further documents are listed in the continuation of Box C [X] See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
2 July 2004	15 JUL 2004
Name and mailing address of the ISA/AU	Authorized officer
AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	**M. BREMERS** Telephone No : (02) 6283 2052

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2004/000626

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Derwent Abstract Accession No. 2003-451471/43, class A97, G05 JP 2002307639 A (SHINETSU POLYMER KK) 23 October 2002 Abstract	1-2, 4, 7, 15, 20-22

INTERNATIONAL SEARCH REPORT

International application No.
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Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

See Extra Sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.: 1-7, 15, 16, and 20-26 (when appended to claim 20 onwards)

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2004/000626

Supplemental Box
(To be used when the space in any of Boxes I to VIII is not sufficient)

Continuation of Box No: III

The international application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept. In coming to this conclusion the International Searching Authority has found that there are different inventions as follows:

1. Claims 1-7, 15, 16, and 20-26 (when appended to claim 20) are directed to an image carrying sheet comprising a substrate having an image formed by sublimation laminated between two rigid layers. It is considered that a substrate having an image formed by sublimation laminated between two rigid layers comprises a first "special technical feature".

2. Claims 8-14, 17-19 and 20-26 (when not appended to claim 20) are directed to a substrate having an image formed by sublimation and a method for producing such a substrate. It is considered that a substrate having an image formed by sublimation comprises a second special technical feature.

These groups are not so linked as to form a single general inventive concept, that is, they do not have any common inventive features, which define a contribution over the prior art. The common concept linking together these groups of claims is a substrate having an image formed by sublimation. However this concept is not novel in the light of:
(a) AU 200154478 A (BAYER CORP.) 24 January 2002, see claim 1 steps (I) and (ii)
(b) EP 811505 A (SEB SA) 10 December 1997, see the abstract.
Therefore these claims lack unity a posteriori.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/AU2004/000626

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
EP	1129844						
US	4173672	AU	39569/78	BE	870120	BR	7805785
		CA	1125642	CH	636558	DE	2837768
		ES	473139	FI	782720	FR	2401881
		GB	2004500	JP	54099179	MX	148804
		NL	7809053	SE	7809103		
US	5364479	CA	2053150	EP	0480892		
FR	2639631	BE	1003435	ES	2036148		
JP	2002307639						

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

END OF ANNEX