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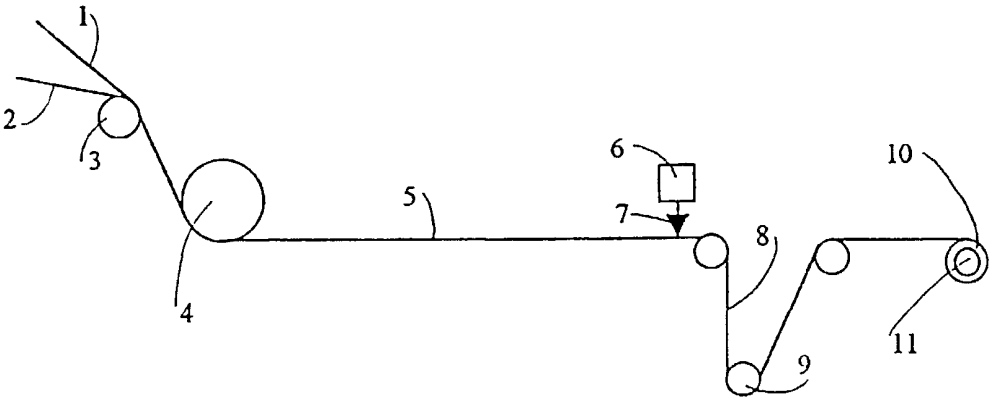
(54) Title: GRAPHIC TRANSFER LAMINATE



(57) Abstract: A process for the manufacture of a graphic transfer laminate (8) having a display layer (1, 21) and a carrier layer (2, 20) comprises the steps of laminating the layers by the application of tension, heat and pressure, and applying an adhesive layer (7, 23) to the laminate (8).

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GRAPHIC TRANSFER LAMINATE

FIELD OF THE INVENTION

This invention relates to laminates used for transferring graphics onto substrates such as fabrics. In this specification the term "graphic" includes 2D designs, lettering for example.

BACKGROUND TO THE INVENTION

It is well known in the art of applying graphics to fabrics (such as garments), that a graphic can be bonded to the fabric by coating one side of the graphic with an adhesive and applying it to the fabric material.

The adhesive can be activated by heat, pressure, solvents or other suitable means.

Various methods for applying graphics to fabrics are known. A problem with one known method is that because the graphics are bonded to the fabric one by one (in the case of a design comprising more than one graphic, such as numbers), it is difficult to align the graphics properly. The method is also time-consuming.

To overcome the mentioned problem it is known that a pigmented vinyl (e.g. PVC) graphic, can be transferred onto a substrate (e.g. a garment) by making use of a layered material. The material consists of an adhesive layer, a so-called display layer (which is the pigmented vinyl layer) and a carrier layer. The display

layer forms the centre of the laminate and is attached to the carrier layer either by adhesive or melt fusion of the carrier layer.

The method of applying the graphic to the substrate using the aforementioned material comprises the steps of first cutting the outlines of the graphic through the adhesive and display layers, but not through the carrier layer. The portions of the adhesive and display layers not forming part of the graphic are then peeled away from the carrier layer. This leaves only the graphic consisting of an adhesive and display layers laminated on the carrier layer.

At this point the sheet is turned upside down, leaving the carrier layer on top and the adhesive layer at the bottom. The sheet is laid down on the material and the adhesive is activated through the action of heat and pressure, causing the adhesive layer to bond with the material.

Once the adhesive layer has bonded with the fabric, the carrier layer is removed from the display layer. This leaves the display layer bonded to the fabric by the action of the adhesive layer. This is the type of process described by Liebe in US Patent 3,660,212.

The advantage of this system over the first mentioned is that the problem with alignment is overcome as the graphics are maintained relative to each other by their attachment to the carrier layer. Bonding all or several graphics at the same time to the material also saves time.

A problem with this method is the fact that for most of the commercially available laminates, the carrier and display are bonded to each other by the action of an adhesive layer. This means that the laminate then includes a first adhesive layer between the carrier and display layers) and a second adhesive layer (between the display layer and the material).

To enable the carrier layer to be removed, the first adhesive layer is selected to have lower adhesion than the second adhesive layer at the temperature of application to the material. The carrier layer can therefor only be removed from the display layer whilst it is still hot. These are known as hot peel laminates.

There have also been other attempts to create laminates consisting of adhesive, display and carrier layers. In US patent 5,441,785 this is effected by casting and

curing partially carboxylated PVC onto a carrier layer causing it to fuse with the carrier layer. This method also uses knife-spread casting to form the display layer on the carrier layer.

In this patent the use of partially carboxylated PVC is necessary to achieve a greater degree of adhesion between the carrier and display layers. In this method the adhesive layer is also bonded to the display layer by adhering the adhesive layer to the newly cured display layer while it's temperature is still greater than the melting point of the adhesive layer. It also provides that pressure sensitive or solvent activated adhesives can be applied to the display layer instead of the thermally activated adhesives.

Although these processes are affective, they are costly to utilise because of the knife spread casting method used in them.

OBJECT OF THE INVENTION

It is an object of this invention to provide a laminate suitable for the transfer of graphics to a substrate that at least partially alleviates some of the problems described above.

SUMMARY OF THE INVENTION

In accordance with this invention there is provided a process for the manufacturing of laminate for use in transferring a graphic onto a substrate and having a display layer and a carrier layer, the process comprising the steps of laminating a display layer and a carrier layer of suitable synthetic resin materials by subjecting the layers under tension to sufficient heat and pressure to adhere the layers together at a temperature below the softening of either layer and thereafter applying a suitable adhesive to the unlaminated surface of the display layer.

The invention also provides for the tension, heat and pressure to be applied by passing the layers together over at least one hot roller.

There is further provided for the adhesive layer to be applied by spraying, casting or laminating.

There is still further provided for the adhesive to be thermally activated or pressure sensitive or solvent activated or any combination of the above and having a bonding strength greater than that formed between the carrier and display layers.

There is also provided for the display layer to be formed from PVC and for the carrier layer to be formed from polyester and for the temperature applied to the display and carrier layers during lamination to be between 110°C and 149°C.

A further feature of the invention provides for at least one of the surfaces of the carrier layer to be matted, and for the matting to be done by scouring the surface with a scouring means.

There is further provided for the scouring means to be sandpaper or the like.

BRIEF DESCRIPTION OF THE DRAWING

Embodiments of the invention are described below by way of example and with reference to the accompanying drawings, in which:

FIG. 1 is a diagrammatic representation of a process for producing a laminate used for transferring a graphic onto a substrate.

FIG. 2 is an enlarged view of laminate comprising a polyester carrier layer and PVC display layer.

FIG. 3 is an enlarged view of a laminate comprising a polyester carrier layer, PVC display layer and thermally activated adhesive layer.

DETAILED DESCRIPTION WITH REFERENCE TO THE DRAWINGS

In this example of the invention a process of manufacturing a laminate is provided. The laminate is for use in the transfer of a PVC graphic to the fabric of a garment. Figure 1 shows a layout of the lamination process. PVC film (1) and polyester film (2) are fed over a heated roller (3). After having passed over the heated roller (3) the two films are then passed over a siliconised cold roller (4). The films (1, 2) are kept at a constant tension by the use of feed rolls (not shown).

The effect of the heat of the hot roller (3) and pressure caused by the tension in the films is to cause the two films to adhere to each other at a temperature below the softening temperature of either the PVC or the polyester.

The product formed is a laminate (5) of which greater detail is shown in Figure 2. The laminate consists of a carrier layer (20), which is the polyester film (2), and a display layer (21), which is the PVC film (1). The bond (22) between the carrier layer (20) and display layer (21) is semi-permanent. This means that the display layer (21) will adhere to the carrier layer (20) with enough strength to permit handling of the laminate, but not so much that it does not permit removal of the carrier layer (20) from the display layer (21) by what is known as "cold peeling". The force required for separating the carrier layer (20) and display layer (21) is about 1N force at operative temperatures.

After the lamination process, the laminate (5) is passed through a spraying station (6) where a hot melt adhesive (7) is sprayed on the display layer (21). The adhesive (7) bonds with the display layer (21).

The melting point of the adhesive (7) is around 110°C and that of the display layer (21) is around 180°C. The melting point of the carrier layer (20) is around 240°C. The adhesive (7) is heated to its melting point before spraying it on the display layer (21).

Finally, the three layer laminate (8) is coiled into a roll (10) using a suitable upcoiler (11). The process is run on a continuous basis by using an accumulator (9) between the spraying station (6) and upcoiler (11).

The three-layer laminate coil (10) is packed and is ready for use.

This use is effected generally in the conventional manner by placing the laminate on a surface with the adhesive (23) side facing upwards. Next the outlines of a graphic is cut through the adhesive (23) and display (21) layers, without cutting into the carrier layer (20). All of the adhesive (23) and display (21) layers falling outside the outlines of the cut graphic are then peeled away. This leaves only the cut graphic layer comprising the adhesive (23) and display (21) layers on the carrier (20) layer.

The laminate is then turned around, which leaves the carrier layer (20) on top. The adhesive layer (23) is then bonded to the fabric (not shown) by heat applied to the carrier layer to cause the temperature of the adhesive layer (23) to rise above its softening point but not to above the softening point of the display layer (21). This causes the adhesive layer (23) to bond the display layer (21) and material (not shown) to each other.

After the display layer (21) has bonded to the material (not shown) as described, the carrier layer (20) can be removed. It can be removed immediately, during the cooling down of the laminate or after the laminate has cooled down.

After removing the carrier layer (20), only the graphic is left bonded to the fabric.

It will be appreciated that this is only one embodiment of the invention and that there are other embodiments of a graphic transfer laminate falling within the scope of the invention.

It is, for example, possible to use different types of display layers (21) or carrier layers (20) besides the described PVC film (1) and polyester film (2). It is also possible to use different temperatures and tensions to accommodate the use of these other materials.

It is further possible to use an adhesive layer (23) that is activated by a mechanism other than temperature, such as pressure, solvents etc.

It is also possible to use polyester of which one surface has been matted for the carrier layer. The polyester is matted by sanding it with sandpaper. This gives the polyester a mat finish which appeals to some customers.

The adhesive (7) can also be applied in any convenient manner at the spraying station (6) and not only spraying. It can, for example, be applied using knife spread casting, lamination etc.

CLAIMS

1. A process for the manufacturing of laminate having a display layer and a carrier layer of suitable synthetic resin materials, comprising the steps of:

laminating the display layer and the carrier layer by subjecting the layers under tension to sufficient heat and pressure to cause the layers to adhere together at a temperature insufficient to cause softening of either layer;

and applying an adhesive to the unlaminated surface of the display layer.

2. A process as claimed in claim 1 in which the tension, heat and pressure is applied by passing the layers together over at least one hot roller.

3. A process as claimed in claim 1 in which the adhesive layer is applied to the unlaminated surface of the display layer by any one of the methods of spraying, casting or laminating.

4. A process as claimed in claim 1 in which the adhesive is any one or more of thermally activated, pressure sensitive, or solvent activated.

5. A process as claimed in claim 1 in which the adhesive has a bonding strength greater than the bond formed between the carrier and display layers.

6. A process as claimed in claim 1 in which the display layer is formed from PVC, the carrier layer is formed from polyester and the temperature applied to the display and carrier layers during lamination is between 110 $^{\circ}$C and 149 $^{\circ}$C.

7. A process as claimed in claim 1 comprising the further step of matting at least one of the surfaces of the carrier layer.

8. A process as claimed in claim 7 in which the matting is carried out by means of a scouring agent.

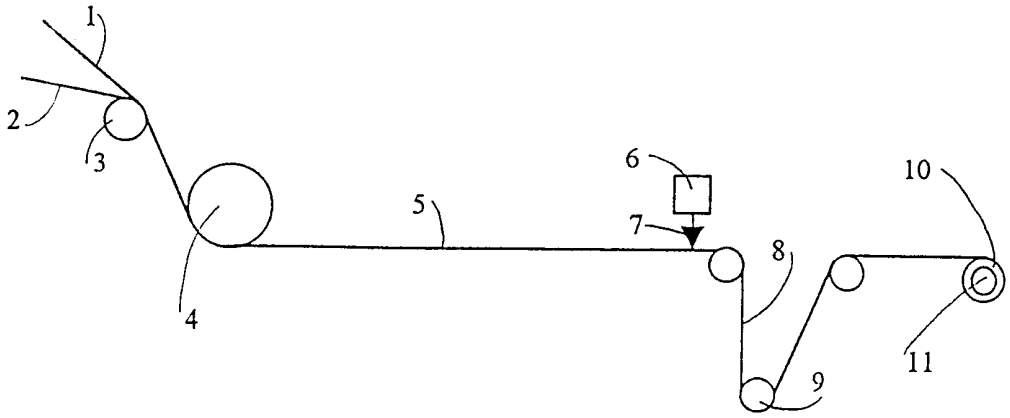

Figure 1

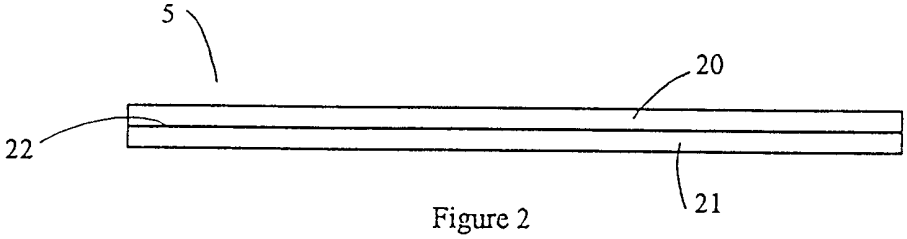

Figure 2

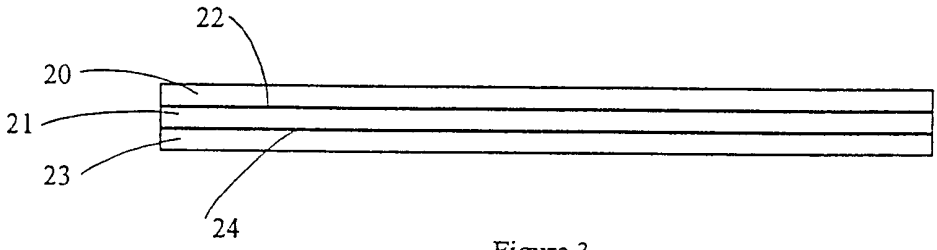

Figure 3

INTERNATIONAL SEARCH REPORT

Inte ional Application No
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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B32B7/06 B32B31/20

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)
IPC 7 B32B B44C

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 practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	US 4 767 654 A (RIGGSBEE JAMES H) 30 August 1988 (1988-08-30) column 2, line 66 -column 4, line 60 column 5, line 16 - line 26 column 5, line 58 -column 6, line 12 column 7, line 52 - line 68; figure 1	1,3-5 2
X	EP 0 569 921 A (DECORA INC) 18 November 1993 (1993-11-18) page 3, line 27 -page 4, line 53 page 6, line 26 - line 29; figure 1	1,3-7
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☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

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

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"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

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Date of the actual completion of the international search	Date of mailing of the international search report
27 February 2001	06/03/2001

Name and mailing address of the ISA	Authorized officer
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Information on patent family members

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