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(54) **METHOD FOR SUBLIMATIC PRINTING AND PRODUCT PRINTED WITH SUCH METHOD**

(57) The invention concerns a method for sublimatic printing comprising the steps of

- providing a graphic subject 10, a sheet of transfer paper 12, a siliconized sheet 14 and a backing 16;
- printing with sublimatic inks the graphic subject on the sheet of transfer paper;
- coupling the sheet of transfer paper to the siliconized sheet;
- applying a pressure and a first temperature for trans-

ferring the graphic subject from the sheet of transfer paper to the siliconized sheet;

- coupling the siliconized sheet to the backing; and
- applying pressure and a second temperature lower than the first for transferring the graphic subject from the siliconized sheet to the backing, so as to obtain the printed product 22.

The invention further concerns a product printed with such method.

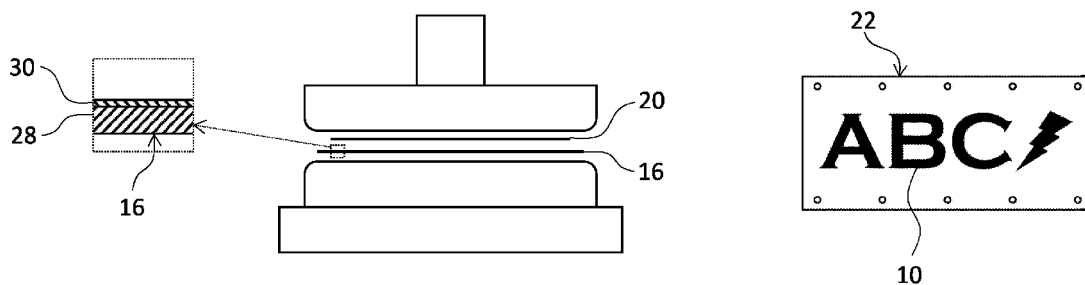


Fig. 3

Description

TECHNICAL FIELD

[0001] The present invention refers to the field of sublimatic printing or thermoprinting by sublimation, and in particular to sublimatic printing on media that may be compostable or possibly biodegradable.

BACKGROUND

[0002] Sublimatic printing, also known as printing or thermoprinting by sublimation, is used mainly for the decoration of polymeric materials and synthetic fabrics, typically in polyester fibre. This printing methodology is widely appreciated because it guarantees a high quality of the finished product, allowing the reproduction of even very complex graphic subjects, such as for example photographic images, in a very accurate and defined way.

[0003] The process envisages a first step in which the desired graphic subject is printed, with a special water-based sublimatic ink, on a temporary paper medium called *transfer paper*. Printing consists in depositing the graphic subject on the transfer paper, which graphic subject is reversed specularly with respect to the appearance it must assume on the finished product. This step is completed with traditional tools, such as for example a common print plotter.

[0004] In a second step, the printed sheet of transfer paper is coupled to the definitive medium, so that the inks rest on the surface where the reproduction of the graphic subject is wished. Pressure and heat for a time between 30 and 180 seconds are then applied to the transfer sheet and the definitive medium. The pressure makes the two surfaces adhere evenly, while the heat transfers the graphic subject from the transfer paper to the definitive medium. More in detail, the applied temperature, which can vary from 180°C to 220°C, sublimates the inks that from the solid phase in which they are present on the transfer paper, pass to the gas phase and then expand and penetrate the superficial layers of the definitive medium where they return to the solid phase. In this way the graphic subject is transferred with great precision forming a permanent and indelible image on the definitive medium.

[0005] This system is particularly appreciated in the field of sportswear, promotional products, furniture, promotional items and large format prints, for example intended for communication campaigns such as flags, banners, and the like.

[0006] Printing by sublimation, albeit widely used and appreciated, is not without disadvantages. As stated above, the definitive media currently used must be polymeric materials, such as for example synthetic fabrics. These materials are often not recyclable and certainly are neither compostable nor biodegradable. They therefore need proper disposal, which entails costs and criticalities. Of course, this problem is rather limited if a single

object to be disposed of is taken into consideration, but it is greatly amplified if, for example, an entire communication campaign comes to an end and therefore all the printed materials must be disposed of. In this regard, consider, for example, an important sporting event, such as a cycling race, for which many large-format prints are produced, such as promotional banners intended to be visible for several hundred metres along the route. At the end of the sporting event, which may last only a few hours, the function of such banners is often over and they must be disposed of.

[0007] The need is therefore felt for an improved sublimatic printing method which allows the use of definitive media that cannot be used with the sublimatic printing methods of known type, which are recyclable and/or which have little or no environmental impact.

OBJECTS AND SUMMARY OF THE INVENTION

[0008] An object of the present invention is to overcome the drawbacks of the prior art.

[0009] In particular, a task of the present invention is to provide a sublimatic printing method that can use definitive media that cannot be used with the sublimatic printing methods of known type. For example, that it can use definitive media that are recyclable or having minimal or no environmental impact, even in the case of incorrect disposal.

[0010] Furthermore, a task of the present invention is to provide a sublimatic printing method that guarantees performance and results similar to or better than the methods of the prior art.

[0011] Yet, a task of the present invention is to provide a sublimatic printing method which is simple to implement and which does not entail significant cost burdens with respect to the methods of the prior art.

[0012] Finally, a task of the present invention is to provide a product printed by sublimation having minimal or no environmental impact.

[0013] These and other objects and tasks of the present invention are achieved by a sublimatic printing method and by a printed product in accordance with the appended claims, which form an integral part of the present disclosure.

[0014] In accordance with a first aspect, the invention concerns a sublimatic printing method comprising the steps of:

- providing a graphic subject;
- providing a sheet of transfer paper;
- providing a siliconized sheet comprising at least one silicone-based superficial layer;
- providing a backing;
- printing with sublimatic inks the graphic subject on

the sheet of transfer paper in the predefined orientation;

- coupling the sheet of transfer paper to the siliconized sheet, such that the graphic subject rests on the silicone-based layer;
- applying a pressure and a first temperature, suitable for transferring the graphic subject from the sheet of transfer paper to the siliconized sheet;
- coupling the siliconized sheet to the backing such that the graphic subject rests on the backing; and
- applying a pressure and a second temperature lower than the first temperature, suitable for transferring the graphic subject from the siliconized sheet to the backing.

[0015] Thanks to the particular succession of steps, the method of the invention makes it possible to use backings that cannot be used in sublimatic printing processes of known type.

[0016] Preferably the step of applying a pressure and a first temperature, suitable for transferring the graphic subject from the sheet of transfer paper to the siliconized sheet, comprises the step of applying a first temperature of about $200 \pm 20^\circ\text{C}$.

[0017] This step ensures the optimal transfer of the graphic subject and can be carried out with the equipment traditionally used in sublimatic printing processes of known type.

[0018] Preferably the step of applying a pressure and a second temperature, suitable for transferring the graphic subject from the siliconized sheet to the backing, comprises the step of applying a second temperature of about $150 \pm 10^\circ\text{C}$.

[0019] This second temperature allows the use of backings which, at the temperatures commonly used in sublimatic printing processes of known type, soften or melt. For example, it allows the use of polypropylene or Mater-Bi or PLA backings.

[0020] In accordance with some embodiments of the invention, the graphic subject has an own predefined correct orientation. In this case the method preferably comprises the steps of:

- providing a graphic subject with a predefined correct orientation;
- printing the graphic subject on the sheet of transfer paper in the correct orientation;
- transferring the graphic subject from the sheet of transfer paper to the siliconized sheet, in the orientation mirrored with respect to the correct one; and
- transferring the graphic subject from the siliconized

sheet to the backing, in the correct orientation.

[0021] These steps allow the graphic subject to appear on the printed product in its predefined correct orientation.

[0022] In some embodiments, the backing is made of polypropylene (PP).

[0023] Such embodiments allow to limit the environmental impact because polypropylene is recyclable.

[0024] In some embodiments, the backing is compostable.

[0025] In some embodiments, the backing is biodegradable.

[0026] In some embodiments, the backing is of plant origin.

[0027] Such embodiments allow the use of backings with minimal or no environmental impact.

[0028] In some embodiments the compostable backing comprises a superficial layer suitable for receiving printing.

[0029] This option allows providing backings made by the union of different layers, such that their characteristics and costs can be optimized.

[0030] Advantageously, the superficial layer suitable for receiving printing is made of a compostable, possibly biodegradable, polymer. Preferably such polymer is for example Mater-Bi or PLA.

[0031] In accordance with a second aspect, the invention concerns a printed product comprising a superficial layer suitable for receiving printing, and wherein the superficial layer suitable for receiving printing:

- comprises a graphic subject consisting of sublimatic inks transferred by sublimation; and
- is made of a compostable, possibly biodegradable, polymer.

[0032] Preferably the compostable, possibly biodegradable, polymer, is based on polybutylene adipate terephthalate (PBAT) and starch (polymer called Mater-Bi) or based on polylactic acid (PLA).

[0033] This printed product cannot be obtained by sublimatic printing processes of known type, and therefore allows a greater degree of freedom for the user.

[0034] In some embodiments of the invention, the entire printed product is compostable. In some embodiments of the invention, the entire printed product is biodegradable.

[0035] This allows minimising or eliminating the environmental impact of the printed product, even if it were dispersed or disposed of incorrectly.

[0036] Further features and tasks of the present invention will be more evident from the description hereinbelow.

BRIEF DESCRIPTION OF THE DRAWINGS

[0037] The invention is described hereinbelow with reference to certain examples provided by way of non-limiting example and illustrated in the accompanying drawings. These drawings illustrate different aspects and embodiments of the present invention and reference numerals illustrating structures, components, materials and/or similar elements in different figures are indicated by similar reference numerals, where appropriate.

Figure 1 schematically shows a step of the method of the invention;

Figure 2 schematically shows another step of the method of the invention; and

Figure 3 schematically shows a further step of the method of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0038] While the invention is susceptible to various modifications and alternative constructions, certain preferred embodiments are shown in the drawings and are described hereinbelow in detail. It must in any case be understood that there is no intention to limit the invention to the specific embodiment illustrated, but, on the contrary, the invention intends covering all the modifications, alternative and equivalent constructions that fall within the scope of the invention as defined in the claims.

[0039] The use of "for example", "etc.", "or" indicates non-exclusive alternatives without limitation, unless otherwise indicated. The use of "includes" means "includes, but not limited to" unless otherwise indicated.

[0040] Within the scope of the present discussion, the terms "compostable", "compostability" and the like are understood in accordance with UNI-EN 13432:2002 standard. With regard to the terms "biodegradable", "biodegradability" and the like, there is currently no unique standard recognized by national or supranational bodies, with the sole exception of UNI EN ISO 14851:2019 standard relating to polymers and plastics. Therefore, the concept of biodegradability is understood below in an intuitive manner and represents a more stringent requirement than that of compostability. In other words, in the context of the present discussion it is considered that a product or a compostable material can also be biodegradable, depending on the definition adopted. Conversely, within the scope of the present discussion a biodegradable product or material is certainly compostable.

[0041] An improved sublimatic printing method in accordance with the invention is described below. The method comprises the steps of:

- providing a graphic subject 10;
- providing a sheet of transfer paper 12;

- providing a siliconized sheet 14 comprising at least one silicone-based superficial layer;
- providing a backing 16;
- printing with sublimatic inks the graphic subject 10 on the sheet of transfer paper 12, so as to obtain a first intermediate product 18;
- coupling the sheet of transfer paper 12 to the siliconized sheet 14, such that the graphic subject 10 rests on the silicone-based layer;
- applying a pressure and a first temperature, suitable for transferring the graphic subject 10 from the sheet of transfer paper 12 to the siliconized sheet 14, so as to obtain a second intermediate product 20;
- coupling the siliconized sheet 14 to the backing 16, such that the graphic subject 10 rests on the backing 16; and
- applying a pressure and a second temperature lower than the first temperature, suitable for transferring the graphic subject 10 from the siliconized sheet 14 to the backing 16, so as to obtain the printed product 22.

[0042] As the skilled person can well understand, some of the steps and some of the devices and materials used in the method of the invention are similar or the same as analogous steps and analogous devices and materials used in the sublimatic printing methods of the prior art. By way of example, although some preferred backings 16 are described below, the method of the invention may use any backing 16 used in the sublimatic printing methods of the prior art.

[0043] The sublimatic inks used in the method of the invention may be the same as those commonly used in sublimatic printing methods of known type. These inks are water-based and, following specific lab tests commissioned by the Applicant, have been found to be compostable.

[0044] For example, sublimatic inks suitable for use in the method of the invention are those produced by KHAN DIGITAL Inks from Shanghai - China and marketed under the name DIGISTAR HI-PRO by JK GROUP S.p.A. from Novedrate (CO) - Italy.

[0045] The transfer paper 12 used in the method of the invention may be the same one commonly used in sublimatic printing methods of known type. Said transfer paper 12, in a manner known per se, is configured to receive printing of the graphic subject 10, obtained with sublimatic inks by means of a conventional printing device, such as for example a plotter 24. The transfer paper 12 is further configured to firmly retain the sublimatic inks during handling and possible storage of the first intermediate product 18. Finally, the transfer paper 12 is configured

to release the sublimatic inks under the action of heat, so as to allow the transfer of the sublimatic inks, and thus of the graphic subject 10.

[0046] A transfer paper 12 suitable for use in the method of the invention may for example have one or more of the following features, wherein reference regulations are given between brackets:

- Grammage: $65 \pm 3 \text{ g/m}^2$ (ISO 536);
- Thickness: $100 \pm 5 \text{ }\mu\text{m}$ (ISO 534);
- Brightness R457: $86 \pm 2\%$ (ISO 2470);
- Water absorption Cobb 60: $30 \pm 5 \text{ g/m}^2$ (ISO 535);
- Air permeance (porosity): $835 \pm 101 \text{ ml/min}$ (ISO 5636-3).

[0047] For example, a transfer paper 12 suitable for use in the method of the invention is the paper marketed under the name THIN65 by ATEC S.r.l. from Lallio (BG) - Italy.

[0048] Moreover, the step of printing the graphic subject 10 on the sheet of transfer paper 12 may be carried out by means of a printing device of known type, for example by means of a plotter 24 or inkjet printer. Such printing devices are commonly used in sublimatic printing processes of known type for printing with sublimatic inks the graphic subject 10 on the sheet of transfer paper 12, so as to obtain an intermediate product.

[0049] As the skilled person can well understand, two successive intermediate products 18, 20 and two sublimation transfer steps are used in the method of the invention. In particular, the method comprises:

- A first sublimation transfer step which envisages applying a pressure and a first temperature for transferring the graphic subject 10 from the first intermediate product 18 (sheet of transfer paper 12) to the siliconized sheet 14, so as to obtain a second intermediate product 20.
- A second sublimation transfer step which envisages applying a pressure and a second temperature for transferring the graphic subject 10 from the second intermediate product 20 (siliconized sheet 14) to the backing 16, so as to obtain the printed product 22.

[0050] Such sublimation transfer steps can be carried out with conventional equipment, commonly used in sublimatic printing processes of known type. For example, such steps may be carried out by means of hot platen presses 26 or by means of heated calender or heated roller presses. The hot platen presses 26 are suitable for obtaining intermediate products 18, 20 or printed products 22 having a flat development that can be included within the area of the press platens. The heated roller

calender is suitable for obtaining intermediate products 18, 20 or printed products 22 having a continuous flat development of a priori indefinite length.

[0051] The pressure values and the application times used in the two sublimation transfer steps are those commonly used in sublimatic printing processes of known type. With regard to the temperature values, however, a more detailed discussion is given below.

[0052] In some embodiments, the graphic subject 10 has an own predefined correct orientation. For example, if the graphic subject 10 comprises a writing and/or the photographic image of a truly existing subject, the correct orientation is uniquely defined in relation to the left-right direction. Since the orientation of the graphic subject 10 is reversed specularly at each contact transfer passage, the method of the invention may advantageously envisage the following steps:

- providing a graphic subject 10 having a predefined correct orientation;
- printing the graphic subject 10 on the sheet of transfer paper 12 in the correct orientation;
- transferring the graphic subject 10 from the sheet of transfer paper 12 to the siliconized sheet 14, in the orientation mirrored with respect to the correct one; and
- transferring the graphic subject 10 from the siliconized sheet 14 to the backing 16, in the correct orientation.

[0053] The method of the invention, unlike known methods, also envisages the use of a siliconized sheet 14. Such siliconized sheet 14 may for example comprise a support layer, for example in paper or in polyethylene terephthalate (PET), on which a silicone coating layer is applied. For example, in the method of the invention, the siliconized sheet 14 may consist of siliconized paper, known per se. The paper intended to receive the silicone layer is preferably coated paper, i.e. treated so as to increase its smoothness. Such treatment, in itself widely known, envisages the deposition of an additional coating, hence the term coated paper, obtained with one or more materials selected from: kaolinite, calcium carbonate, bentonite or talc. Siliconized paper and siliconized PET are commonly used in industry, for example as a non-stick medium for handling, transporting and storing labels, graphic decorations and self-adhesive tapes, or for other industrial products characterised by their own surface adhesiveness or stickiness.

[0054] A siliconized sheet 14 suitable for use in the method of the invention may for example be obtained from a siliconized paper having one or more of the following characteristics, wherein reference regulations are given between brackets:

- Grammage: $100 \pm 6 \text{ g/m}^2$ (ISO 536);
- Thickness: $96 \pm 8 \text{ }\mu\text{m}$ (ISO 534);
- Tensile load: $\geq 75 \text{ N/15mm}$ (MD DIN EN 1924-2);
 $\geq 50 \text{ N/15mm}$ (CD DIN EN 1924-2);
- Smoothness upper side $\geq 300 \text{ s}$ (DIN 53 107-A);
lower side $\geq 20 \text{ s}$ (DIN 53 107-A);
- Detachment: $30 \pm 15 \text{ cN/25mm}$ TESA TAPE A 7475 (FINAT 10);
- Moisture content: $4.2 \pm 1\%$ (DIN EN 20 287).

[0055] A siliconized paper suitable for use in the method of the invention is for example the paper marketed under the code MPT100M100 by MA S.r.l. from Sozzigalli di Soliera (MO) - Italy.

[0056] As mentioned, in general the method of the invention comprises the step of providing a backing 16, which backing 16 may be of any type known per se in the field of sublimatic printing.

[0057] In accordance with some embodiments of the invention, the method of the invention comprises the step of providing a backing 16 comprising at least one layer of polypropylene (PP) or of a compostable polymer, such as for example Mater-Bi or polylactic acid (PLA). The layer of polypropylene or of compostable polymer is suitable for receiving printing.

[0058] In accordance with some embodiments of the invention, the method of the invention comprises the step of providing a compostable backing 16.

[0059] In accordance with some embodiments of the invention, the method of the invention comprises the step of providing a biodegradable backing 16.

[0060] In accordance with some embodiments of the invention, the method of the invention comprises the step of providing a backing 16 of plant origin.

[0061] In accordance with some embodiments of the invention, the compostable, possibly biodegradable, backing 16 comprises a structural layer 28 and a superficial layer 30 suitable for receiving printing.

[0062] In accordance with some embodiments, the structural layer 28 may be flexible, for example made of organic or natural fibres. The structural layer 28 may for example be obtained with a fabric, a non-woven fabric or a mat of organic or natural fibres.

[0063] The structural layer 28 may be made using one or more of the following fibres: bamboo, hemp, flax, silk, cotton, cellulose, viscose, raffia, jute, or kenaf. Other fibres suitable for making all or part of the structural layer 28 are those obtained from fruit processing waste (such as apples, oranges or bananas), or still those marketed by Lenzing AG from Lenzing, Austria, under the trade name TENCEL® and which can be obtained from eucalyptus (in this case also called Lyocell®) or from beech (also called Modal®).

[0064] In accordance with some embodiments, the structural layer 28 may be rigid or semi-rigid, for example made of cardboard, cork or wood. For example, the structural layer 28 may comprise a panel made of natural wood, laminated wood or plywood, or still pressed wood fibres, chips or flakes.

[0065] The superficial layer 30 suitable for receiving printing may be made with a compostable, possibly biodegradable, polymer. For example, the superficial layer 30 may be made with a material based on polybutylene adipate terephthalate (PBAT) and starch. A polymer suitable for such use is for example produced and marketed under the name Mater-Bi by Novamont S.p.A. from Novara - Italy.

[0066] The structural layer 28 allows the compostable backing 16 as a whole to obtain adequate mechanical stiffness and strength characteristics while limiting the amount of compostable polymer needed. This limits the overall costs of the compostable backing 16.

[0067] In accordance with other embodiments, the compostable backing 16 is monolithic, solely formed by a compostable, possibly biodegradable, polymer, suitable for receiving printing. Preferably, such polymer is of the type described above, for example Mater-Bi or PLA.

[0068] As pointed out above, the experimental tests carried out by the Applicant highlighted the need to use two successive intermediate products 18, 20, the first one (indicated with 18) obtained by printing the graphic subject 10 on the transfer paper 12 and the second one (indicated with 20) obtained by sublimation transfer of the graphic subject 10 from the first intermediate product 18 on the siliconized sheet 14.

[0069] This apparent complication results from the impossibility of using a single intermediate product obtained by direct printing, neither on the transfer paper 12 nor on the siliconized sheet 14.

[0070] In fact, direct printing on the siliconized sheet 14 is not possible due to the fact that the intrinsic characteristics of such medium do not allow the sublimatic inks to dry properly. Consequently, by direct printing on the siliconized sheet 14, an extremely delicate intermediate product would be obtained on which the graphic subject 10 risks being ruined by any accidental contact. Such an occurrence would degrade the quality of the printed product 22 unacceptably.

[0071] Furthermore, it emerged that the conventional intermediate product, obtained by printing on transfer paper 12, cannot be used to transfer by sublimation the graphic subject 10 directly onto a backing 16 of polypropylene or compostable polymer of the type described above. In fact, the sublimation transfer process of known type implies the application of a temperature of about 200°C . At this temperature the polypropylene and the compostable polymers considered herein soften or melt, and cause the definitive adhesion of the intermediate product to the backing 16, making it impossible to obtain the desired printed product 22.

[0072] For these reasons, in the method of the inven-

tion, two successive intermediate products 18, 20 and the two sublimation transfer steps described above are used.

[0073] Preferably, the first sublimation transfer step envisages the application of a first temperature of about $200 \pm 20^\circ\text{C}$. Preferably such application takes place for a time between 30 and 180 seconds. Such parameters are those commonly adopted in sublimatic printing processes of known type.

[0074] Preferably, the second sublimation transfer step envisages the application of a second temperature of about $150 \pm 10^\circ\text{C}$. Preferably such application takes place for a time between 30 and 180 seconds. The second temperature of about $150 \pm 10^\circ\text{C}$, much lower than that commonly applied, does not cause the polypropylene or the compostable polymer to melt, and allows the correct transfer of the graphic subject 10 and thus the printed product 22 to be obtained.

[0075] In accordance with a second aspect, the invention also concerns the printed product 22 obtained with the method described above. In particular, the invention concerns a printed product 22 comprising a superficial layer 30 suitable for receiving printing and wherein the superficial layer 30 suitable for receiving printing:

- comprises a graphic subject 10 consisting of sublimatic inks transferred by sublimation; and
- is made of a compostable, possibly biodegradable, polymer based on polybutylene adipate terephthalate (PBAT) and starch or based on polylactic acid (PLA).

[0076] Advantageously, the printed product 22 of the invention is entirely compostable, possibly biodegradable. These and other technical features of the printed product 22 of the invention can be unambiguously deduced from the description of the method described above.

[0077] In particular, in some embodiments, the printed product 22 comprises a backing 16 comprising at least one polypropylene (PP) layer.

[0078] In other embodiments, the printed product 22 comprises a compostable, possibly biodegradable, backing 16.

[0079] In other embodiments, the printed product 22 comprises a backing 16 of plant origin.

[0080] Advantageously the compostable backing 16 may comprise a structural layer 28 and a superficial layer 30 suitable for receiving printing.

[0081] The structural layer 28 may be flexible, for example made of organic or natural fibres such as for example cotton, flax, hemp, viscose, bamboo, cellulose or the like. The structural layer 28 may for example be obtained with a fabric, a non-woven fabric or a mat of organic or natural fibres.

[0082] Alternatively, the structural layer 28 may be rigid or semi-rigid, for example made of cardboard or wood.

In particular, the structural layer 28 may comprise a panel made of natural wood, laminated wood or plywood, or still pressed wood fibres, chips or flakes.

[0083] The superficial layer 30 suitable for receiving printing may be made with a compostable, possibly biodegradable, polymer. For example, the superficial layer 30 may be made with a material based on polybutylene adipate terephthalate (PBAT) and starch. A polymer suitable for such use is for example produced and marketed under the name Mater-Bi by Novamont S.p.A. from Novara - Italy. Still by way of example, the superficial layer 30 may be made with polylactic acid (PLA).

[0084] In accordance with other embodiments, the compostable backing 16 may be monolithic, solely formed by a compostable polymer, suitable for receiving printing. Preferably, such polymer is of the type described above, for example Mater-Bi or PLA.

[0085] As the skilled person can well understand, the present invention overcomes the drawbacks of the prior art.

[0086] In particular, the present invention provides a sublimatic printing method which can use definitive media which cannot be used with sublimatic printing methods of known type. For example, it can use definitive media with minimal or no environmental impact, even in the case of incorrect disposal.

[0087] In addition, the present invention provides a sublimatic printing method that guarantees performance and results similar to or better than the methods of the prior art.

[0088] Moreover, the present invention provides a sublimatic printing method of simple realization and which does not entail significant cost burdens with respect to the methods of the prior art.

[0089] Finally, the present invention provides a product 22 printed by sublimation having minimal or no environmental impact.

[0090] The invention thus conceived is susceptible to several modifications and variations, all falling within the scope of the inventive concept.

[0091] The technical features described by way of example with reference to a specific embodiment may be adopted in other embodiments.

[0092] Moreover, all the details can be replaced by other technically equivalent elements. In practice, the materials used, as well as the contingent shapes and sizes, can be whatever according to the requirements without for this reason departing from the scope of protection of the following claims.

Claims

1. Method for sublimatic printing, comprising the steps of:

- providing a graphic subject (10);
- providing a sheet of transfer paper (12);

- providing a siliconized sheet (14) comprising at least one silicone-based superficial layer;
 - providing a backing (16);
 - printing with sublimatic inks the graphic subject (10) on the sheet of transfer paper (12), so as to obtain a first intermediate product (18);
 - coupling the sheet of transfer paper (12) to the siliconized sheet (14), such that the graphic subject (10) rests on the silicone-based layer;
 - applying a pressure and a first temperature suitable for transferring the graphic subject (10) from the sheet of transfer paper (12) to the siliconized sheet (14), so as to obtain a second intermediate product (20);
 - coupling the siliconized sheet (14) to the backing (16), such that the graphic subject (10) rests on the backing (16); and
 - applying a pressure and a second temperature lower than the first temperature, suitable for transferring the graphic subject (10) from the siliconized sheet (14) to the backing (16), so as to obtain the printed product (22).
2. Method according to claim 1, wherein the step of applying a pressure and a first temperature, suitable for transferring the graphic subject (10) from the sheet of transfer paper (12) to the siliconized sheet (14), comprises the step of applying a first temperature of about $200 \pm 20^\circ\text{C}$.
3. Method according to claim 1 or 2, wherein the step of applying a pressure and a second temperature lower than the first temperature, suitable for transferring the graphic subject (10) from the siliconized sheet (14) to the backing (16), comprises the step of applying a second temperature of about $150 \pm 10^\circ\text{C}$.
4. Method according to one or more of the preceding claims, wherein the graphic subject (10) has an own predefined correct orientation, and further comprising the steps of:
- providing a graphic subject (10) having a predefined correct orientation;
 - printing the graphic subject (10) on the sheet of transfer paper (12) in the correct orientation;
 - transferring the graphic subject (10) from the sheet of transfer paper (12) to the siliconized sheet (14), in the orientation mirrored with respect to the correct one; and
 - transferring the graphic subject (10) from the siliconized sheet (14) to the backing (16), in the correct orientation.
5. Method according to one or more of the preceding claims, further comprising the step of providing a backing (16) of polypropylene (PP).
6. Method according to one or more of claims 1 to 4, further comprising the step of providing a backing (16) that is compostable, or of plant origin, possibly biodegradable, having a superficial layer (30) suitable for receiving printing.
7. Method according to the preceding claim, wherein the superficial layer (30) suitable for receiving printing is made of a compostable, possibly biodegradable, polymer.
8. Printed product (22) comprising a superficial layer (30) suitable for receiving printing and wherein the superficial layer (30) suitable for receiving printing:
- comprises a graphic subject (10) consisting of sublimatic inks transferred by sublimation; and
 - is made of a compostable, possibly biodegradable, polymer based on polybutylene adipate terephthalate (PBAT) and starch or based on polylactic acid (PLA).
9. Printed product (22) according to claim 8, wherein the entire product is compostable, possibly biodegradable.

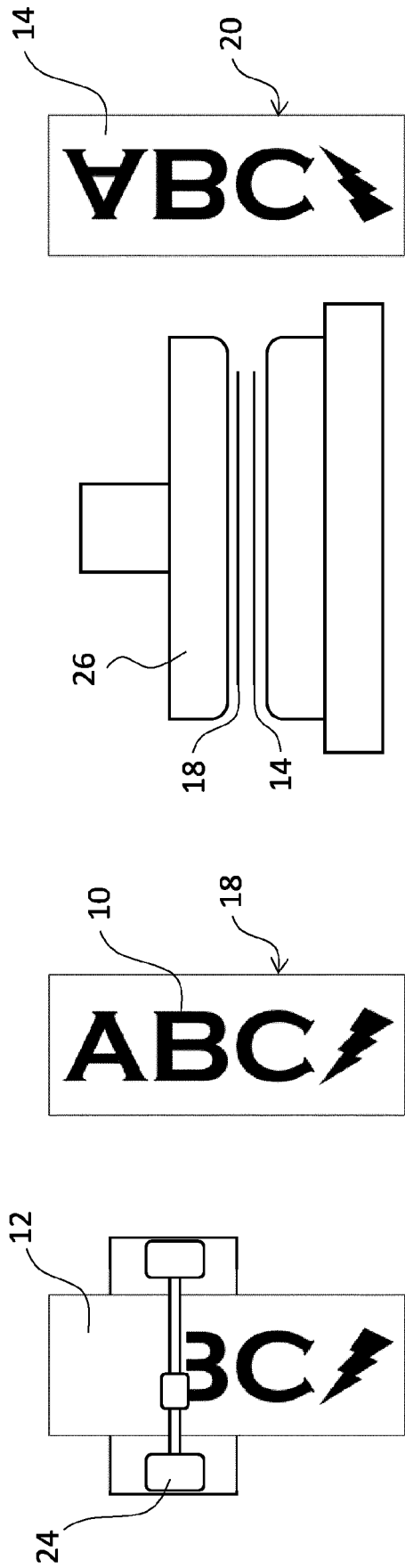


Fig. 1

Fig. 2

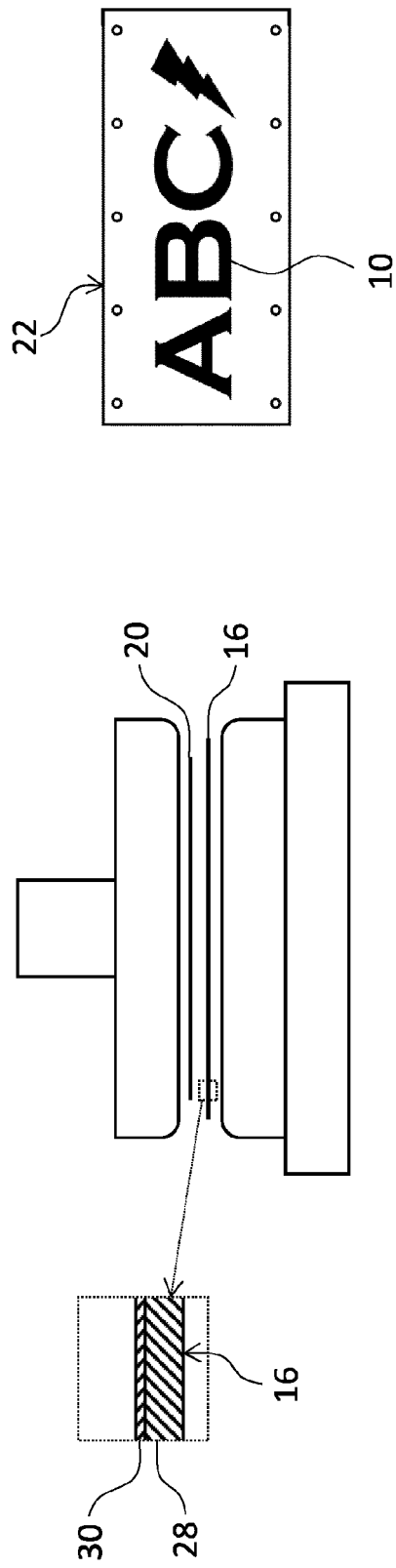


Fig. 3



EUROPEAN SEARCH REPORT

Application Number

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Place of search Munich		Date of completion of the search 31 May 2023	Examiner Pulver, Michael
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

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