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(54) Title: PACKAGING LAMINATE

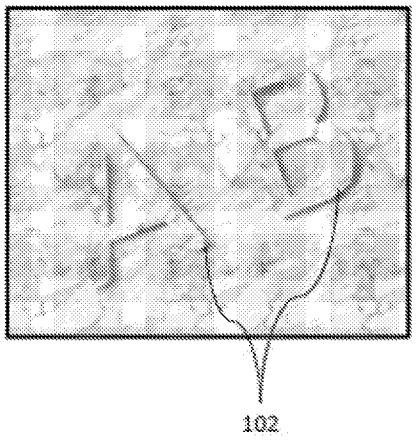

FIGURE 1

(57) Abstract: A laminate for packaging is provided. The laminate comprises at-least two films bonded together, at-least one of the films film having one or more impressions formed by a bonding medium such that the impression camouflages with the laminate and is visible on the laminate as a whole.

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[Continued on next page]

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— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *of inventorship (Rule 4.17(iv))*

Published:

— *with international search report (Art. 21(3))*

TITLE OF THE INVENTION

PACKAGING LAMINATE

FIELD OF THE INVENTION

[001] The invention relates to a laminate, more particularly to a laminated film, process and system for production thereof.

BACKGROUND OF THE INVENTION

[002] Flexible packaging solutions find application in beverage, food, consumer packaged goods and personal care products. With rising consumer needs and requirements, flexible packaging solutions continue to evolve. A persistent problem faced by brand-owners and businesses is counterfeiting whereby packaging, labelling, or any other significant feature of the packaging and the contents are copied. Counterfeit products not only gives rise to financial concerns but also causes health issues, particularly in food and pharmaceutical products.

[003] One known anti-counterfeit solution is to provide holograms on the packaging. Such holograms help a customer/consumer to identify a genuine product. However, the disadvantage with these is that they are copied by the counterfeiters with small unrecognizable changes in them and hence, the consumer is likely to easily get misled into believing that the product is genuine.

[004] Another anti-counterfeit solution is to provide an indicia in the packaging which is generally hidden/viewable on the inner layers of packaging. Hence such solution is viewable only after opening the packaging.

[005] In view of the above, there is a need to have anti-counterfeit measures built into the packaging laminates.

SUMMARY OF THE INVENTION

[006] Accordingly, the present invention in one aspect provides a laminate, comprising at-least two films bonded together; and one or more visual impressions masked with visual characteristics of the laminate.

[007] In another aspect, the present invention provides a process for forming a laminate, the process comprising the steps of providing a first film;

applying a bonding medium on the first film, the bonding medium applied such that the one or more pre-determined regions has differential amount of bonding medium applied compared to the rest of the bonding medium/area;

providing a second film; and bonding the second film with the first film to form the laminate, the bonding medium in each region with differential amount of bonding medium renders a visual impression on the laminate blended with visual characteristics of the laminate.

[008] In yet another aspect, the present invention provides a system for forming a laminate, the system comprising a first material source for providing a first film; an applicator for applying a bonding medium on the first film, the applicator having a first-type engraved pattern and a second-type engraved pattern for the bonding medium, the first-type engraved pattern having a differential depth compared to the second-type engraved pattern causing differential amount of bonding medium to be applied to the first film as compared to the bonding medium in the rest of the film; a second material source for providing a second film; and a lamination station having a pair of nip rollers, where the first film with bonding medium and the second film are superposed and bonded together by passing them through the nip rollers and the bonding medium in each region with differential amount of bonding medium renders a visual impression on the laminate masked with visual characteristics of the laminate.

BRIEF DESCRIPTION OF THE DRAWINGS

[009] Reference will be made to embodiments of the invention, examples of which may be illustrated in accompanying figures. These figures are intended to be illustrative, not limiting. Although the invention is generally described in context of these embodiments, it should be understood that it is not intended to limit the scope of the invention to these particular embodiments.

Figure 1 shows a laminate in accordance with an embodiment of the invention.

Figure 2 shows a system for forming the laminate in accordance with an embodiment of the invention.

Figure 3 shows a bonding medium application station in accordance with an embodiment of the invention.

Figure 4 shows a flow diagram of a process for forming the laminate in accordance with an embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[010] The present invention is directed towards a laminate which is visually attractive and includes anti-counterfeit features by providing a pattern/impression masked/camouflaged with the laminate which is easily visible to a consumer.

[011] Figure 1 shows a laminate 100 in accordance with an embodiment of the invention. The laminate comprises at-least two films bonded together, and one or more visual impressions 102. As shown in figure 1, the one or more visual impressions appear masked with visual characteristics of the film/laminate such that the visual impression camouflages with the laminate and is visible on the laminate as a whole. Visual characteristic means inherent visible or aesthetic features of the film/laminate which can include printed areas or non-printed areas or colored areas or transparent areas or opaque areas of the film/laminate. Accordingly, the visual impression visible on the laminate includes the visual characteristic of the laminate. For

example, if the laminate has a printed area, the visual impression will take its form along the printed area and mask with the printed area i.e. without use of any additional colors or inks, the impression is visible on the laminate, thereby providing a camouflage effect. Similarly, for a transparent area, the visual impression will take its form along the transparent area and mask with transparent area forming an impression without use of any additional colors or inks. The visual impression can be a text or a shape or a mark/brand or a pattern. In an embodiment of the invention, the one or more visual impressions are formed by a bonding medium bonding the films together. The bonding medium is an adhesive selected from a water based adhesive, solvent-based adhesive, solvent-less adhesive or any such types of adhesive. The bonding medium is applied on at-least one of the films for bonding the films together to form the laminate, wherein the bonding medium has one or more pre-determined regions. Each such pre-determined region of the bonding medium has a differential amount of bonding medium compared to the rest of the bonding medium/area. In an embodiment, each such region has less amount of bonding medium. The bonding medium in each such pre-determined region renders the visual impression on the film in shape corresponding to the pre-determined region and having visual characteristic of the film when the films are bonded. The films can be selected from any of, but not limited to a polyethylene terephthalate (PET) film, a biaxially oriented polypropylene (BOPP) film, a cast polypropylene (CPP) film, a poly ethylene (PE) film, a poly vinyl chloride (PVC) film, a nylon film, a pearlised BOPP film, a metallised PET film, a metallised CPP film, a white CPP film. All kinds of transparent or opaque films used in flexible packaging can be used.

[012] Referring to figure 2 which shows a system 200 for forming a laminate. The system comprising a first material supply source 210; a second material supply source 220; a bonding medium application station 230; a dryer 240 and a lamination station 250.

[013] The first material supply source is preferably a roll or a web of a first film. The first film can be selected from any of, but not limited to a polyethylene terephthalate (PET) film, a

biaxially oriented polypropylene (BOPP) film, a cast polypropylene (CPP) film, a poly ethylene (PE) film, a poly vinyl chloride (PVC) film, a nylon film, a pearlised BOPP film, a metallised PET film, a metallised CPP film, a white CPP film. All kinds of transparent or opaque films used in flexible packaging can be the first material supply source. In an embodiment of the invention, the film is printed on reverse or surface of the film by using a variety of printing processes like rotogravure, flexographic, offset, digital printing process etc. In case of unprinted films, they are straight away taken as a primary source.

[014] The second material supply source is preferably a roll or a web of a second film. The second film can be selected from any of, but not limited to a polyethylene terephthalate (PET) film, a biaxially oriented polypropylene (BOPP) film, a metallised biaxially oriented (MET-BOPP) film, a cast polypropylene (CPP) film, a poly ethylene (PE) film, a poly vinyl chloride (PVC) film, a nylon film, a pearlised BOPP film, a metallised PET film, a metallised CPP film, a white CPP film, an aluminum foil. .

[015] The first film from the first material supply source is unwound and passed though the bonding medium application station where bonding medium is applied to the first film to obtain a first film with bonding medium. The bonding medium application station includes an applicator 232, a counter roller 234 and a reservoir 236.

[016] The applicator is a cylinder configured to rotate around a central axis for applying bonding medium to the printed/unprinted film passing through the bonding medium application station.

[017] The counter roller positioned adjacent to the applicator ensures sufficient contact is maintained between the first film and the applicator.

[018] In an embodiment of the invention, the applicator is provided with one or more engraved patterns. In this regard, the applicator has a first-type engraved pattern and a second-type engraved pattern, wherein depth of the first-type engraved pattern and the second-type engraved pattern is different. In an embodiment, the first engraved pattern has less depth compared to the

second engraved pattern. The first engraved pattern can correspond to a text, a shape, a mark/brand, a pattern such as a design, a product certification mark, brand name, etc.

[019] The applicator as can be seen in the figure is positioned such that at-least a portion of circumference of the applicator is in contact with the reservoir containing the bonding medium. The bonding medium is an adhesive selected from a water based adhesive, solvent-based adhesive, solvent-less adhesive. As the applicator rotates, the circumference of the applicator including the first-type engraved pattern and the second-type engraved pattern picks-up bonding medium from the reservoir. Bonding medium is transferred from the roller to the first film as it is passed through the applicator and the counter roller. In an embodiment of the invention, due to difference in depth of the first-type engraved pattern and the second-type engraved pattern, the amount of bonding medium picked up by the engraved pattern is different i.e. bonding medium in first engraved pattern is less compared to second engraved pattern. Accordingly, the amount of bonding medium transferred from the first engraved pattern and the second engraved pattern of the roller is different. The difference in amount of bonding medium applied on the first film causes an impression to be formed on the first film. The impression corresponds to the engraved pattern of the cylinder.

[020] Furthermore, a doctor blade is provided adjacent to the applicator to remove excess bonding medium picked up by the applicator.

[021] Figure 3 shows a bonding medium application station 300 in accordance with an embodiment of the invention. The bonding medium application station shown in figure 2 includes a transfer roller 302, an applicator 304, a counter roller 306 and an reservoir 308.

[022] The transfer roller is an anilox cylinder configured to rotate around a central axis in the reservoir. The transfer roller as can be seen in figure 3 is positioned such that at-least a portion of circumference of the transfer roller is in contact with the reservoir. As the transfer roller rotates, the circumference of the transfer roller picks-up bonding medium from the reservoir containing bonding medium. The bonding medium is an adhesive selected from a water based adhesive,

solvent-based adhesive, solvent-less adhesive. Furthermore, a doctor blade is provided adjacent to the transfer roller to remove excess bonding medium picked up by the applicator.

[023] The applicator is provided adjacent to the transfer roller. The applicator is a plate comprising of plurality of images along its circumference. Each plate has one or more image areas - a first-type engraved pattern and a second-type engraved pattern, wherein depth of the first-type engraved pattern and the second-type engraved pattern is different.

[024] The counter roller is provided adjacent to the applicator and ensures sufficient contact is maintained between the first film and the applicator. As the applicator rotates, bonding medium is applied/transferred from the plate to the first film as it is passed through the applicator and the counter roller. In an embodiment of the invention, due to difference in depth of the first-type engraved pattern and the second-type engraved pattern, the amount of bonding medium picked up by the engraved pattern is different. Accordingly, the amount of bonding medium transferred from the first engraved pattern and the second engraved pattern of the plate is different. The difference in amount of bonding medium applied on the first film causes an impression to be formed on the first film. In an embodiment, the first engraved pattern has less depth compared to the second engraved pattern. The first engraved pattern can correspond to a text, a shape, a mark/brand, a pattern such as a design, a product certification mark, brand name, etc. The impression formed corresponds to the first engraved pattern on the plate.

[025] The first film with bonding medium is thereafter directed/passed (from the application station) to the lamination station. As shown in the figure, the first film with bonding medium is first passed through the drier before passing to the lamination station. The lamination station also receives the second film from the second material supply source. The first film with bonding medium and the second film are superposed and bonded together by passing them through an assembly of nip rollers 252.

[026] The lamination between the first and second films can be performed under heat and/or pressure. The bonding of the films causes the impressions to be more prominent through the first

film and/or the second film. The films exit the nip rollers as a single layer i.e. the final laminate. The final laminate will have impressions imparted by the first engraving pattern. In an embodiment, the impression created takes its form along the films and blends with the color i.e. without use of any additional colors or inks, the impression being visible on the laminate, thereby providing a camouflage effect.

[027] In an alternate embodiment, similar impressions can also be achieved on the inside of the laminated films which will be visible when the laminate is viewed from inside. In such a case the applicator 232 having a first type engraving pattern and second type engraving pattern will be used for bonding medium application between secondary supply source film and the sealant film.

[028] Depending on the type of film used as the laminating layer from second supply source, the laminated film coming out of the lamination station and already bearing the impression, may or may not have sealing properties. In case, it does not have sealing properties, then this film is further laminated to a sealant film mainly but not limited to, Polyethylene, Cast Poly Propylene, Bi axially oriented poly propylene, metallised bi-axially oriented poly propylene film, metalized cast poly propylene etc to obtain a final laminate specification. The final laminate is thereafter wound on a roll for storage and/or shipment. While figure 2 and 3, illustrate a set up for application station, various other set ups including an applicator with engraved patterns as discussed hereinbefore are well within the scope of the invention.

[029] Further, the system includes electronically or mechanically controlled drives for each of the stages illustrated in figure 1 and 2. These drives help in ensuring exact circumferential and lateral superimposition (registration) of the films from the primary and secondary supply source.

[030] Figure 4 shows a process for forming a laminate. The process may be carried out on the system discussed hereinbefore. The process begins at step 4A where a first film is provided. The first film is a printed or unprinted film but not limited to a polyethylene terephthalate (PET) film, a biaxially oriented polypropylene (BOPP) film, a cast polypropylene (CPP) film, a poly ethylene (PE) film, a poly vinyl chloride (PVC) film, a nylon film, a pearlised BOPP film, a

metallised PET film, a metallised CPP film, a white CPP film. All kinds of transparent or white opaque films used in flexible packaging can be the first film. In an embodiment of the invention, the film is reverse printed or surface printed by using a variety of printing processes like rotogravure, flexographic, offset, digital printing process etc. In case of unprinted films, they are straight away taken as a primary source.

[031] At step 4B, the bonding medium is applied to the first film to obtain a first film with bonding medium, wherein one or more pre-determined regions has differential amount of bonding medium applied compared to the bonding medium in rest of the film. The difference in amount of bonding medium applied on the film causes an impression to be formed on the first film. In an embodiment, the pre-determined regions have less amount of bonding medium applied compared to the bonding medium/area in the rest of film.

[032] At step 4C a second film is provided. The second film can be any of but not limited to, polyethylene terephthalate (PET) film, a biaxially oriented polypropylene (BOPP) film, a metallised biaxially oriented (MET-BOPP) film, a cast polypropylene (CPP) film, a poly ethylene (PE) film, a poly vinyl chloride (PVC) film, a nylon film, a pearlised BOPP film, a metallised PET film, a metallised CPP film, a white CPP film, an aluminum foil. etc. Thereafter the process proceeds to step 4D.

[033] At step 4D, the first film is laminated with the second film, wherein the first film with bonding medium and the second film are superposed and bonded together to form a laminate. In an alternate embodiment, bonding medium is applied in a differential amount to the second film and thereafter laminated with the first film. The lamination between the first and second films can be performed under heat and/or pressure. The bonding of the films causes the impressions to be more prominent through the final laminate of first film and the second film. In an embodiment, the impression created takes its form along the films and blends with the color i.e. without use of any additional colors or inks, the impression includes visual characteristics of the laminate and is visible on the laminate, thereby providing a camouflage effect. This final

laminate is wound on a roll for storage and/or shipment. Depending on the type of film used as the laminating layer from second supply source, the laminated film coming out of the lamination station and already bearing the impression, may or may not have sealing properties. In case, it does not have sealing properties, then this film is further laminated to a sealant film mainly but not limited to, Polyethylene, Cast Poly Propylene, Bi axially oriented poly propylene, metallised bi-axially oriented poly propylene film, metalized cast poly propylene etc to obtain a final laminate.

[034] Advantageously, the present invention provides a laminate with impressions representative of a text/design/mark/pattern masked with the laminate rendering an anti-counterfeit feature to the laminate.

[035] While the present invention has been described with respect to certain embodiments, it will be apparent to those skilled in the art that various changes and modification may be made without departing from the scope of the invention as defined in the following claims.

CLAIMS:

1. A laminate for packaging, the laminate comprising:

   at-least two films bonded together; and

   one or more visual impressions masked with visual characteristics of the laminate.

2. The laminate as claimed in claim 1, wherein a bonding medium is applied on at-least one of the films for bonding the films together to form the laminate, the bonding medium having one or more pre-determined regions, each such region of the bonding medium has a differential amount of bonding medium compared to the rest of the bonding medium/area, the bonding medium in each such region renders the visual impression on the film in shape corresponding to the pre-determined region and having visual characteristic of the film when the films are bonded.

3. The laminate as claimed in claim 1, wherein the laminate/films can be printed or non-printed or colored or transparent or translucent or opaque .

4. The laminate as claimed in claim 1, wherein the films can be selected from any of, but not limited to a polyethylene terephthalate (PET) film, a biaxially oriented polypropylene (BOPP) film, a cast polypropylene (CPP) film, a poly ethylene (PE) film, a poly vinyl chloride (PVC) film, a nylon film, a pearlised BOPP film, a metallised PET film, a metallised CPP film, a white CPP film, an aluminum foil.

5. The laminate as claimed in claim 1, wherein the films can be selected from any of but not limited to, a polyethylene film, a cast polypropylene film, a bi-axially oriented polypropylene film, a metallised bi-axially oriented poly propylene film, metalized cast poly propylene.

6. The laminate as claimed in claim 1, wherein the bonding medium is an adhesive selected from a water based adhesive, solvent-based adhesive, solvent-less adhesive, etc.

7. The laminate as claimed in claim 1, wherein each pre-determined region of the bonding medium has less amount of bonding medium compared to the rest of the bonding medium/area.

8. The laminate as claimed in claim 1, wherein each region/visual impression corresponds to a text or a shape or a mark/brand or a pattern.

9. A process for forming a laminate, the process comprising the steps of :

providing a first film;

applying a bonding medium on the first film, the bonding medium applied such that the one or more pre-determined regions has differential amount of bonding medium applied compared to the rest of the bonding medium/area;

providing a second film; and

bonding the second film with the first film to form the laminate, the bonding medium in each region with differential amount of bonding medium renders a visual impression on the laminate blended with visual characteristics of the laminate.

10. The process as claimed in claim 9, wherein the pre-determined regions has less amount of bonding medium applied compared to the rest of the bonding medium/area.

11. A system for forming a laminate, the system comprising:

a first material source for providing a first film;

an applicator for applying a bonding medium on the first film, the applicator having a first-type engraved pattern and a second-type engraved pattern for transferring the bonding medium, the first-type engraved pattern having a differential depth compared to the second-type engraved pattern such that differential amount of bonding medium is applied to the first film in one or more pre-determined regions as compared the bonding medium in the rest of the film;

a second material source for providing a second film; and

a lamination station having a pair of nip rollers, where the first film with and the second film are superposed and bonded together by passing them through the nip rollers and the bonding medium in each region with differential amount of bonding medium renders a visual impression on the laminate masked with visual characteristics of the laminate.

12. The system as claimed in claim 11, wherein the applicator is a rotating cylinder positioned adjacent to a reservoir containing bonding medium for picking up the bonding medium from the reservoir as the applicator rotates

13. The system as claimed in claim 11, wherein the first engraved pattern has less depth compared to the second-type engraved pattern.

14. The system as claimed in claim 11 or 13, wherein the first engraved pattern is a text, a shape, a mark/brand, a pattern.

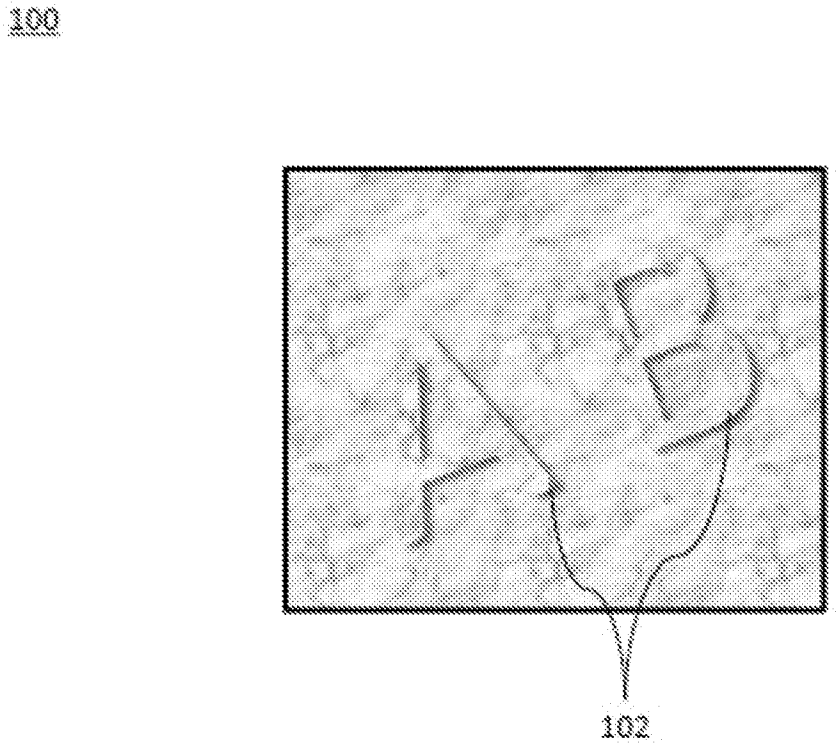

FIGURE 1

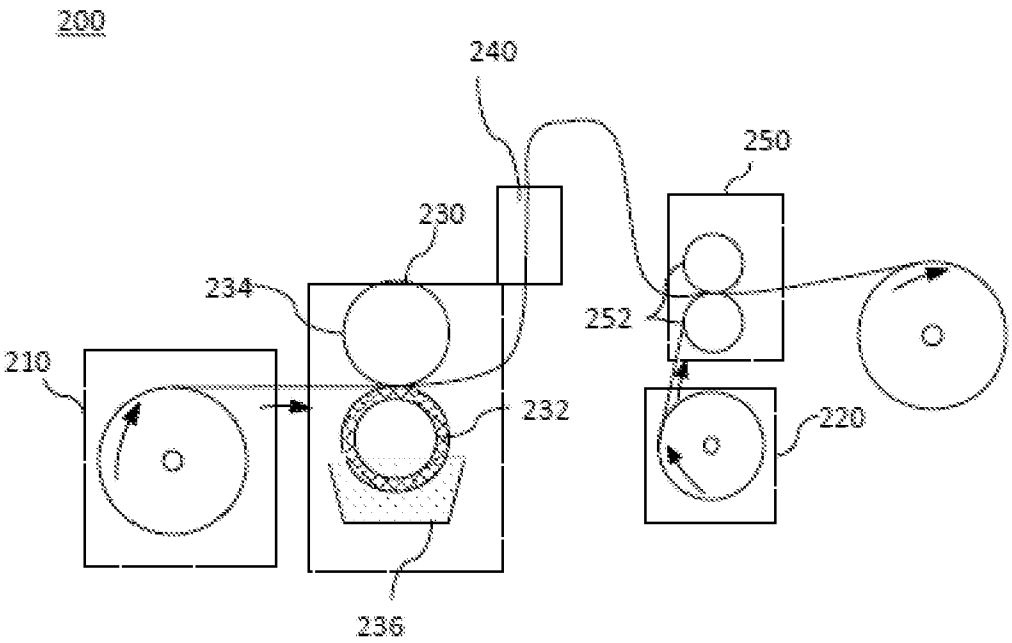

FIGURE 2

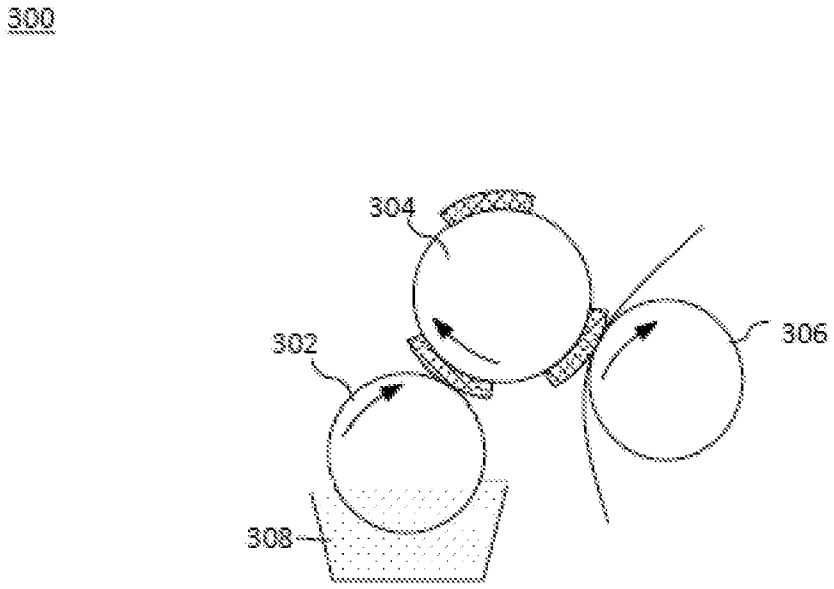

FIGURE 3

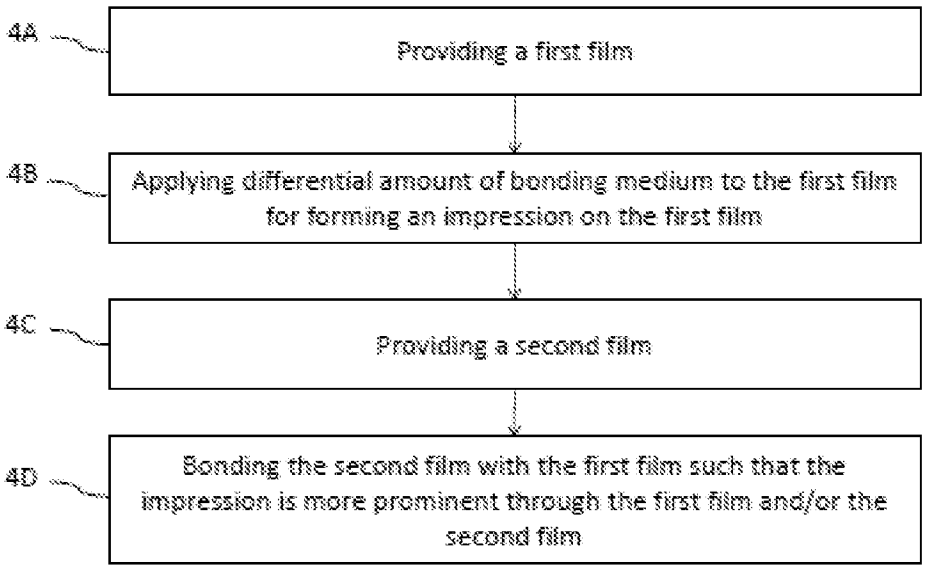
4A
Providing a first film
4B
Applying differential amount of bonding medium to the first film for forming an impression on the first film
4C
Providing a second film
4D
Bonding the second film with the first film such that the impression is more prominent through the first film and/or the second film

FIGURE 4

INTERNATIONAL SEARCH REPORT

International application No
PCT/IN2017/050434

A. CLASSIFICATION OF SUBJECT MATTER
INV. B32B7/12 B32B15/08 B32B15/20 B32B27/08 B32B27/30
B32B27/32 B32B27/36 B32B7/14
ADD.
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)
B32B

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)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2014/132268 A2 (BILCARE LTD [IN]) 4 September 2014 (2014-09-04) abstract; claims 1-20 pages 4,5,10	1-14
X	WO 2009/113094 A2 (ESSEL PROPACK LTD [IN]; BANERJEE MRINAL KANTI [IN]) 17 September 2009 (2009-09-17) abstract; claims 1-8	1-14
X	WO 2007/072499 A2 (PAPER PRODUCTS LTD [IN]; GUPTA SURESH VEDPRAKASH [IN]; RAIKAR JAIKUMAR) 28 June 2007 (2007-06-28) abstract; claims 1-12	1-14
X	WO 2005/120826 A1 (TETRA LAVAL HOLDINGS & FINANCE [CH]; HALL LINDA [SE]; OHLGREN SARA [SE) 22 December 2005 (2005-12-22) abstract; claims 1-21	1

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search	Date of mailing of the international search report
18 December 2017	02/01/2018

Name and mailing address of the ISA/	Authorized officer
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1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IN2017/050434

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2014132268 A2	04-09-2014	EP 2961806 A2	06-01-2016
		US 2016001952 A1	07-01-2016
		WO 2014132268 A2	04-09-2014
WO 2009113094 A2	17-09-2009	CN 202003147 U	05-10-2011
		WO 2009113094 A2	17-09-2009
WO 2007072499 A2	28-06-2007	AU 2006327568 A1	28-06-2007
		CA 2635837 A1	28-06-2007
		CN 101336162 A	31-12-2008
		EP 1976686 A2	08-10-2008
		KR 20080082667 A	11-09-2008
		NZ 569525 A	30-09-2010
		US 2009155509 A1	18-06-2009
		WO 2007072499 A2	28-06-2007
		ZA 200805766 B	29-04-2009
WO 2005120826 A1	22-12-2005	AR 049226 A1	05-07-2006
		BR PI0511644 A	02-01-2008
		CA 2569171 A1	22-12-2005
		CN 1960864 A	09-05-2007
		EP 1768842 A1	04-04-2007
		JP 2008502547 A	31-01-2008
		KR 20070036063 A	02-04-2007
		SE 0401508 A	15-12-2005
		US 2008308564 A1	18-12-2008
		WO 2005120826 A1	22-12-2005
		ZA 200609970 B	29-10-2008