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Declarations under Rule 4.17:

- of inventorship (Rule 4.17(iv))

(54) Title: METHOD OF LAMINATING MULTILAYER STRUCTURE USED IN MAKING OF CREDIT AND GIFT CARDS

(57) Abstract: The invention provides a free flowing copolymer between disparate plastic layers to thermally balance between the two differently expanding/contracting materials. The "primer" layer or "thermal balance layer" fully encapsulates the PET layer and can absorb the difference between the internal PET layer with any layer bonded to the encapsulated PET without cracking, bending or pitting and can "reset" into position when the heating/cooling has ended to make planar plastic core sheets for products such as credit cards, gift cards and the like.



WO 2017/201182 A1

5 METHOD OF LAMINATING MULTILAYER STRUCTURE USED IN MAKING
OF CREDIT AND GIFT CARDS

CROSS REFERENCE TO RELATED APPLICATIONS

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[001] This application claims the benefit of U.S. Provisional Application 62/336,756, filed 5/17/2016, entitled A METHOD OF LAMINATING FIVE LAYERS TOGETHER IN A ROLL-TO-ROLL PROCESS TO MAKE A PRE-LAMINATION THAT MAY BE USED IN THE MAKING OF CREDIT AND GIFT CARDS, which is incorporated herein by
15 reference. This application also claims the benefit of U.S. Provisional Application 62483490, filed 4/10/2016, entitled A METHOD OF LAMINATING FIVE LAYERS TOGETHER IN A ROLL-TO-ROLL PROCESS TO MAKE A PRE-LAMINATION THAT MAY BE USED IN THE MAKING OF CREDIT AND GIFT CARDS AND NON-SYMMETRICAL VARIATIONS THEREOF, which is also incorporated herein by
20 reference.

BACKGROUND OF THE INVENTION

1. FIELD OF THE INVENTION

5 **[002]** The present application relates to a method of making credit cards, gift cards and the like.

2. DESCRIPTION OF THE PRIOR ART

10 **[003]** The current provision for creating the roll-to-roll lamination (PreLAM) consists of multiple layers designed for the manufacture of credit and gift cards among other types. The current market is being supplied by a PreLAM that limits the card manufacturer to use what is called a balanced (i.e., a front to back “Mirror Image”) structure. This is the traditional method construction:

15

PVC (“polyvinyl chloride”) front - clear
PVC core – printed front and back
PVC back sheet - clear

20 **[004]** Because there are currently multiple types of polymers used in order to incorporate holograms, silver mirror, among other special effects in the cards, the cards are built as shown below in a symmetrical design to prevent induction of manufacturing flaws:

[005] Design A (front of card)

PVC – clear front cover
PET (“Polyethylene terephthalate”) – decorative, metalized, hologram, etc.. over-printed front design
PVC – split core

[006] Design B (back of card)

5

PVC – split core
PET – clear over printed back design
PVC – clear bottom cover

[007] The two symmetric pieces are then assembled together (i.e., A+B) to make the card.

10 **CURRENT DESIGN**

[008] The current invention uses a different construction which was not previously possible to produce in a reliable, cost effective manner.

:

PVC – clear front sheet
copolymer
PET – decorative, metalized, hologram, etc.. over-printed front design
copolymer
PVC – split core

15

[009] This new design has shown through testing and qualification stage shows that there is no need to have a full “Design B,” since the copolymer layer of the current invention allows for the PET and PVC (“polyvinyl chloride”) layers to move independently (i.e., contract or expand independent of each other during heating and cooling) of each other during the thermal press process allowing for a more traditional method of just using the simplified construction for the back of the card:

PVC core – printed back design
PVC – clear bottom cover

[010] None of the previous inventions and patents, taken either singly or in combination, is seen to describe the instant invention as claimed.

SUMMARY OF THE INVENTION

[011] Accordingly, it is a principal object of a preferred embodiment of the invention to provide a design for a credit card, gift card or other multilayer product having two dissimilar materials bonded together.

[012] It is another object of the invention to provide a card having a non-mirror image front to back construction by utilizing only a single PET layer sandwiched between two PVC layers.

[013] It is a further object of the invention to utilize a copolymer such as a thermoplastic such as Ethylene Ethyl Acrylate Copolymer ("EEA") between two disparate layers to allow the layers to move independently of each other during production while still forming a planar/non-distorted card.

[014] Still another object of the invention is to provide a flexible polymer between two adjacent layers to allow the polymer to prevent distortion between the two adjacent layers as they thermally expand or contract during production of a credit card, gift card or other object.

[015] It is an object of the invention to provide improved elements and arrangements thereof in an apparatus for the purposes described which is inexpensive, dependable and fully effective in accomplishing its intended purposes.

[016] These and other objects of the present invention will be readily apparent upon review of the following detailed description of the invention and the accompanying drawings. These objects of the present invention are not exhaustive and are not to be construed as limiting

the scope of the claimed invention. Further, it must be understood that no one embodiment of the present invention need include all of the aforementioned objects of the present invention. Rather, a given embodiment may include one or none of the aforementioned objects. Accordingly, these objects are not to be used to limit the scope of the claims of the present invention.

5

BRIEF DESCRIPTION OF THE DRAWINGS

[017] Fig. 1 is a diagrammatic view of a credit card according to the present invention.

[018] Fig. 2 is a diagrammatic view of the decorative structure of the credit card according
5 to the present invention.

[019] Fig. 3 is a flow diagram showing a process of making a product according to the
present invention.

[020] Fig. 4 is a flow diagram showing a process for further processing the product of the
flow diagram of Fig. 3.

10 **[021]** Figs. 5-7 show stresses and bending introduced by relative differences in parts of a
product during processing.

[022] Similar reference characters denote corresponding features consistently throughout
the attached drawings.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT(s)

[023] The present invention is to a method of manufacturing using Dynamic Thermal Balancing (DTB) to produce a credit card, gift card, key card (collectively “magnetic stripe card” or “layered plastic card”) or other layered plastic object. For simplicity, we will describe the construction of a single credit card, but one skilled in the art would recognize that the production process could be used to form other objects in a planar card shape or for use in building non-planar objects such as a plastic cup.

[024] DTB is a technology that allows dissimilar material types to be thermally laminated together and maintain flatness, appearance, and functionality. It is based on the concept of matching the coefficient of thermal expansions (CTE) of the dissimilar materials with tie layers that can flow but stabilize giving the needed end properties and thereby significantly reduce the amount of rejected product.

[025] Current credit cards are produced as the combination of a number of layers. Each layer has its own purpose, whether to provide support, protection or receive indicia or other components. Currently to maintain the credit card in a planar shape, each layer of the card needs to be symmetric to the other layers so that each layer expands or contracts identically with the other layers to prevent bending (see Figures 5-7) or pitting or other flaws that will result in a high rejection rate of the produced cards. When each layer is similar, there is less stress or relative movement between the layers, reducing errors in the cards. However, being limited to symmetric layers reduces the flexibility in constructing a card with the desired characteristics in the most efficient manner. For example, the current method may require

additional non-essential layers in the card to ensure that each part of the card expands and contracts in conjunction with the others.

[026] For example, current cards require the use of a matched front and back (“mirrored”) structures to prevent “orange peel” (pitting or tiny cracking on the surface) but mainly to prevent the resulting product from becoming non-planar. If the two structures being joined in the hydraulic press are too dissimilar, they may expand and contract at different rates causing the two surfaces to destroy the desired flatness of the product. Figures 5-7 show an illustration of this concept where stresses and bending are introduced into a product by having a relative variation in expansion or contraction rates of different parts of a product.

In Figure 5, the left structure 510 is joined to the right structure 514 by an adhesive 512 or the like in a hydraulic press or by similar method. If the left side expands relative to the right structure, this can cause bending stress or pitting of the surfaces. Since typically one of the right and left structure is transparent, this pitting may be visible and give an “orange peel” look to the product.

[027] By providing a free flowing copolymer between the layers that can thermally balance between the two expanding/contracting materials, the “primer” layer or “thermal balance layer” can absorb the difference between the two without cracking, bending or pitting and can “reset” into position when the heating/cooling has ended. The thermal balance layer also physically isolate the layers from each other.

[028] Currently, the market is being supplied by a PreLAM that limits the card manufacturer to use what is called a balanced (i.e., a front to back “Mirror Image”) structure. Because there are currently multiple types of polymers used in order to

incorporate holograms, silver mirror, among other special effects in the cards, the cards are built as shown below in a symmetrical design to prevent induction of manufacturing flaws and reduce the final product rejection rate:

[029] Design A (front of card)

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PVC – clear front cover
PET – decorative, metalized, hologram, etc., over-printed front design
PVC – split core

[030] Design B (back of card)

PVC – split core
PET – clear over printed back design
PVC – clear bottom cover

10 **[031]** The two symmetric pieces are then assembled together (i.e., A+B) to make the card.

CURRENT DESIGN

15 **[032]** The current invention uses a different construction which was not previously possible to produce in a reliable, cost effective manner. Instead of having a matched composite back and front structure, the present invention has a front, back and middle structure separated by a copolymer. See Fig. 1.

20 **[033]** In process, a roll 10 of Polyethylene terephthalate (“PET”) consists of the semicrystalline material. The material can be transparent or opaque and white depending on its structure and particle size. The roll has a decorative layer applied 12 to the PET. This can be metal, aluminum, a hologram, logo, brushed metal, vapor

deposition metal layer, etc. The decorative layer can applied in a way (such as vapor deposition) in such an amount to appear as a complete metal layer, but with microscopic gaps to prevent the layer from blocking ("reflecting") the antenna from transmitting or receiving a signal through the metal layer ("attenuation of the antenna
5 signal"). This increases the effective range of the card for use a proximity device instead of having to swipe or insert a chipped card having an antenna. Presently cards manufactured with a metal layer over the antenna suffer the drawback that the antenna signal is so attenuated that it cannot effectively be used as a proximity payment method.

[034] Once the decorative layer is applied to the PET core, a Copolymer is applied 16 to one surface of the decorated PET core. This application is preferably achieved by an extrusion process, but is not limited to such. The copolymer is preferably Ethylene Ethyl Acrylate ("EEA") because it is a thermal plastic and is malleable enough to move and flow with different expansion and contraction rate products on either side of the EEA. The EEA acts as a primer or thermal barrier to provide a buffer between the plastics on
15 either side of the EEA and not transfer any movement forces from one side to the other during heating or cooling of the product. This isolation of the two opposite sides of the EEA around the PET also prevents pitting by "filling in" any voids as the product cools again so that looking through a clear PVC section, no roughness is seen.

[035] Preferably, the PET is encapsulated in to layers of EEA, each layer having a
20 width of about .5 to 6 mm, and more preferably about 1 mm in thickness. EEA is a copolymer in a matrix of ethylene and is preferably provided as 15% EEA and 85% LDPE ("Low density Polyethylene"). However, any copolymers of ethylene may be used. Additionally, other polyolefins may also be used such as polypropylene.

Additionally, but less preferred, EAA ("Ethylene Acrylic Acid") or EVA ("d ethylene vinyl
25 acetate") could be substituted in for the EEA. An important feature of the thermal barrier is that it Bonds to polar substrates, to metals, to ester groups, to vinyl groups, etc. In this way, the PET layer could be different material such as metal that directly incorporates the decorative layer since the EEA will bond directly to metal.

[036] After the EEA is applied, a cooling drum 18 cools the decorated PET structure. The process is then repeated by applying an EEA layer 20 to the opposite side of the PET structure and then cooling it with a cooling drum 22.

[037] An adhesive layer 24 is then applied to the decorative structure. The decorative structure is then laminated 26 to a clear PVC layer through a laminating dip section and wound into a roll 28. This is the PreLam roll that is supplied to a card manufacture. It is important to note that the use of EEA as the isolation layers allows the shipment of the PreLam roll as a roll. Currently, the preLam must be sent as sheet to prevent the sheet from curling ("roll set") when ready to be cut into cards. The softer isolation layer allows the cards to more easily go from the roll form to the flat planar form required for the cards.

FINISHING OF THE CARD BY CARD MANUFACTURER

[038] Referring now to figure 4. The preLam roll is shipped 40 to a card manufacture. This raw stock has the decorative layer and a clear PVC layer. It is ready to be individualized and cut into cards with the name of the card holder, the number of the account, and banking information, etc.

[039] To accomplish this, the graphics and text are printed to the top of the card 42. The card may then be dye cut to provide an area to receive a chip 44. The back of the card is then printed to a second "back" PVC core sheet 46.

[040] The layers used in constructing the cards are then collated 48. This preferably includes a) a clear PVC covers sheet; b) a printed top of the card PreLam; c) an antenna and/or chip; d) a printed back card core later (PVC); e) a clear PVC coversheet.

[041] The layers are then compressed in a hydraulic press 50. Here the heat caused in the pressing causes the flow stabilizing copolymer such as EEA to act to isolate the printed back core layer and the PET decorated structure from each other so that the card remains planar ("flat") and the translucent layers are clear and unclouded. The thermoplastic copolymer serves this function as described above. The thermoplastic

copolymer absorbs any relative changes of the PVC and PET layer and remains flat and intact after hydraulic pressing.

[042] The cards are then cut into individual cards 52 and embossed to cause raised letter or the like on the card with the name of the card holder and account numbers, etc.

5 The card may also have a magnetic strip and any logs or holograms applied.

[043] This new design has been shown through testing and qualification stage shows that there is no need to have a full "Design B," since the copolymer layer of the current invention allows for the PET and PVC layers to move independently (i.e., contract or expand independent of each other during heating and cooling) of each other during the thermal press process allowing for a more traditional method of just using the simplified construction for the back of the card:

10

PVC core – printed back design
PVC – clear bottom cover

[044] As shown in Figure 2, the decorated PET layer 13,15 (including any decaoration) is fully encapsulated by the EEA thermal plastic barrier 11,17. The EEA encapsulated decorative core 14 (Fig. 1) is then adhesively coated 12,16 and laminated to one or more PVC layers 10,18 to form the PreLam. By fully isolating the PET in the ethylene copolymer, the variation in expansion and contraction of the PVC layer(s) and the PET is fully absorbed and compensated by the EEA isolating layers. This prevents the difference in the layers from exerting stresses or other forces on the PreLam that would cause it to curl, pit or bend.

15

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[045] One skilled in the art would appreciate that the concept of a thermoplastic coplanar isolation layer between two dissimilar plastic layers could be used in the construction of objects other than cards. For example, the sheets could be rolled to make a tube or a cup, such as a printed logo cup for a football stadium cup with a team's logo, etc.

25

[046] While this invention has been described as having a preferred design, it is understood that it is capable of further modifications, uses and/or adaptations of the invention following in general the principle of the invention and including such departures from the present disclosure as come within the known or customary practice
5 in the art to which the invention pertains and as maybe applied to the central features hereinbefore set forth, and fall within the scope of the invention and the limits of the appended claims. It is therefore to be understood that the present invention is not limited to the sole embodiment described above, but encompasses any and all embodiments within the scope of the following claims.

CLAIMS

I claim:

- 5 1. A method of making plastic sheets from two or more different layers, comprising:
providing a first sheet of material;
encapsulating the first sheet of material in between a first layer of copolymer of
ethylene on a front of the first sheet and a second layer of copolymer of ethylene on
a back of the first sheet;
10 laminating the encapsulated first sheet to a second sheet of material;
hydraulically compressing the first sheet and the second sheet together;
wherein at least one of the first and second layers of copolymer of ethylene prevents
the first sheet from contacting the second sheet.
- 15 2. The method according to claim 1, wherein the first sheet is made of polyethylene
terephthalate ("PET").
3. The method according to claim 2, wherein the second sheet is made of polyvinyl
chloride ("PVC").
4. The method according to claim 3, wherein the copolymer of ethylene is made of
Ethylene Ethyl Acrylate Copolymer ("EEA").
- 20 5. The method according to claim 3, wherein the copolymer of ethylene is a
thermoplastic.
6. The method according to claim 1, wherein the first sheet is made of metal.

7. A method of making plastic, multilayered cards from two or more different layers, comprising:

providing a first sheet of polyethylene terephthalate;

providing a first sheet of polyvinyl chloride;

5 encapsulating the first sheet in between a first layer of copolymer of ethylene on a front of the first sheet and a second layer of copolymer of ethylene on a back of the first sheet;

hydraulically compressing the first sheet to a second sheet to bond the sheets together;

10 wherein at least one of the first and second layers of copolymer of ethylene prevents the first sheet from contacting the second sheet to isolate the first sheet from the second sheet.

8. A layered plastic card comprising:

 a first sheet of metal or plastic, said first sheet having a front and back;

15 a decorative layer applied to said first sheet front side;

 a first layer of a copolymer of ethylene applied on the front of the first sheet and decorative layer and a second layer of a copolymer of ethylene applied on the back of the first sheet to form a decorative core;

 a first core layer made of plastic adhesively bonded to said decorative core,

20 where said copolymer of ethylene thermally and physically isolates said decorative layer from said first core layer to prevent bending of the layered plastic card during heating and cooling of the first sheet and the first core layer during

manufacture due to relative contraction and expansion of the first core layer and the first sheet.

9. The layered plastic card of claim 8, further comprising raised lettering on said plastic card.

5 10. The layered plastic card of claim 8, further comprising a magnetic strip.

11. The layered plastic card of claim 8, further comprising a second transparent plastic cover on an opposite side of said decorative core from said first core layer.

12. The layered plastic card of claim 8, further comprising a credit card chip.

10 13. The layered plastic card of claim 8, further comprising a credit card chip and proximity antenna in communication with said credit card chip.

14. The layered plastic card of claim 8, wherein said copolymer of ethylene is a thermoplastic Ethylene Ethyl Acrylate Copolymer.

15. The layered plastic card of claim 8, wherein said first core layer is made of polyvinyl chloride.

15 16. The layered plastic card of claim 8, wherein the decorative layer includes at least a metal layer.

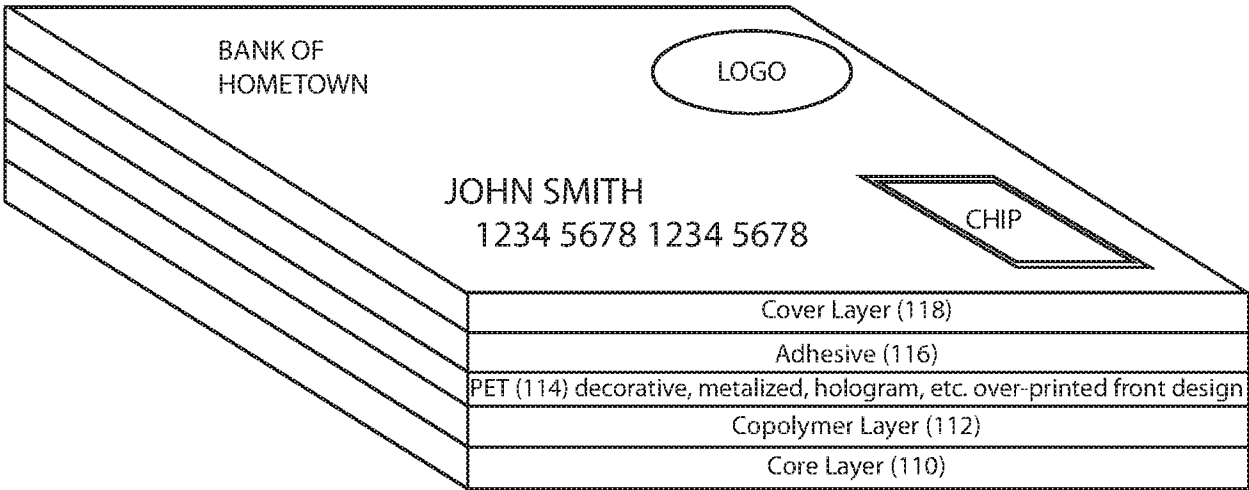


FIG. 1

EEA Thermoplastic Polymer (112)
Decorative Layer (113)
Core Layer (PET, PC, PLA, etc.) (115)
EEA Thermoplastic Polymer (116)

FIG. 2

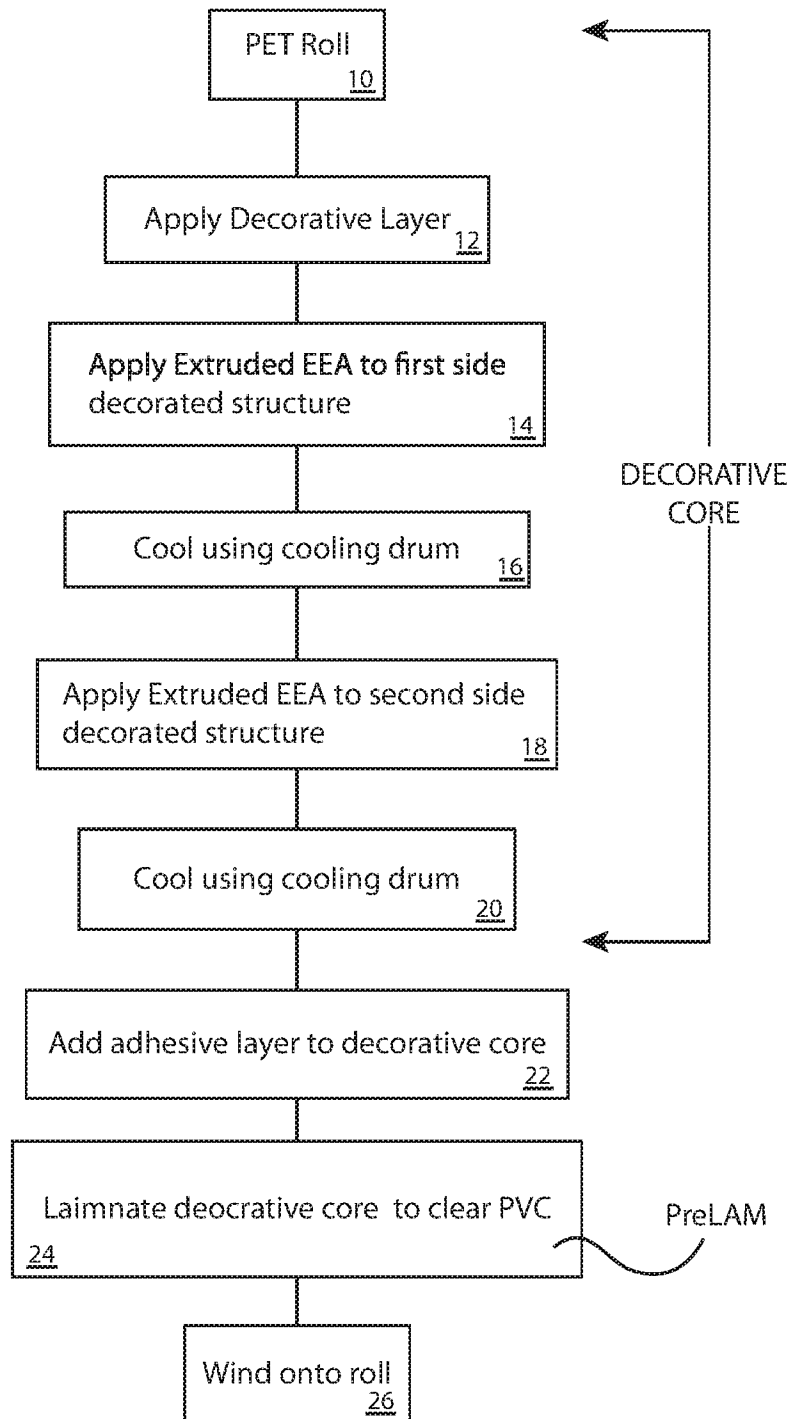


FIG. 3

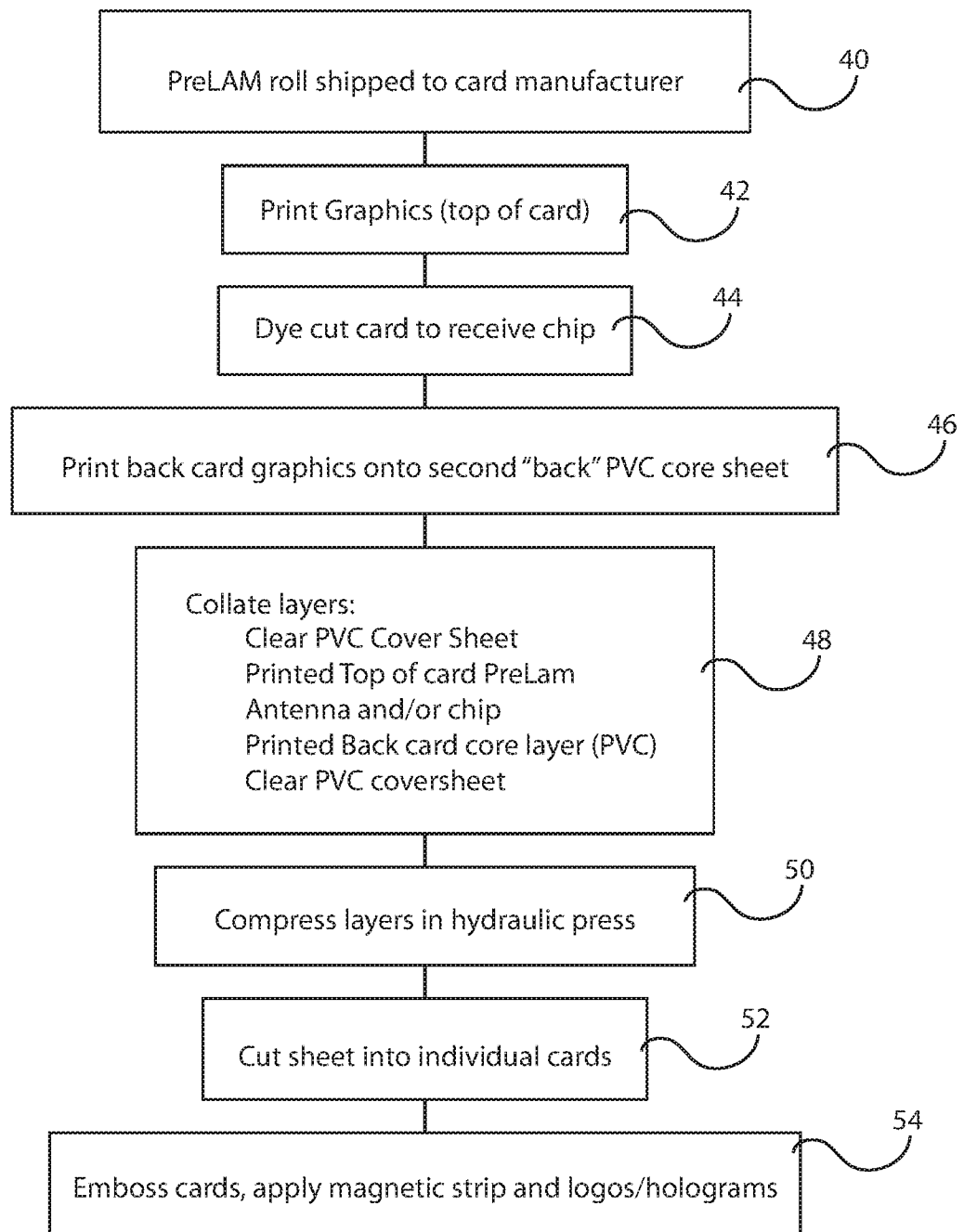
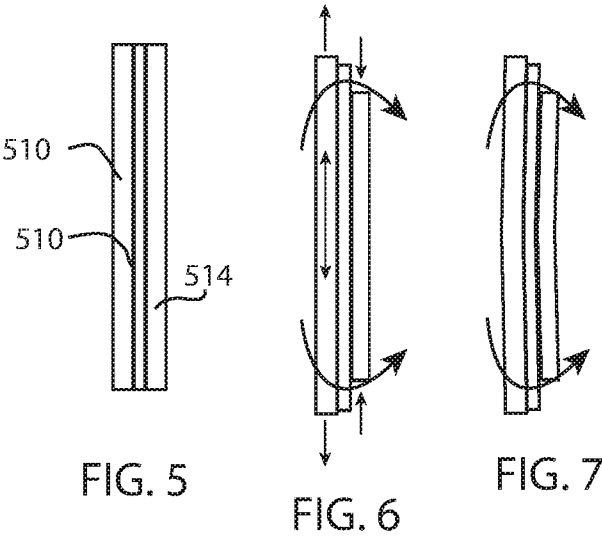


FIG. 4



INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 17/33136

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:
This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group 1: Claims 1-7, drawn to a method of making a layered plastic structure comprising hydraulically compressing a first sheet and a second sheet together.

Group 2: Claims 8-16, drawn to a layered plastic card comprising a decorative layer applied to a first sheet front side; wherein a layer of copolymer of ethylene thermally and physically isolates other layers to prevent bending of the layered plastic card during heating and cooling of the layers during manufacture due to relative contraction and expansion.

- Please see extra sheet for continuation -

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 additional fees, this Authority did not invite payment of additional fees.
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

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 17/33136

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - B32B 27/00; B32B 38/00; B42D 15/10 (2017.01)

CPC - B42D 2033/00; B42D 2033/30; B42D 2033/10; B42D 25/00; B42D 25/40; B42D 25/45; B32B 2367/00; B32B 2327/06; B32B 37/10; B32B 27/00; B32B 38/00; B32B 27/36; B32B 27/304; B29C 66/712; B29C 66/45; B32B 37/14

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)

See Search History Document

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

See Search History Document

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

See Search History Document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 6,764,014 B2 (LASCH et al.) 20 July 2004 (20.07.2004) col 14, ln 37-41; col 14, ln 58-67; col 15, ln 1-5; Fig. 7I	1-7
Y	US 6,644,552 B1 (HERSLOW) 11 November 2003 (11.11.2003) col 1, ln 5-7; col 2, ln 43-48; col 3, ln 7-15; col 4, ln 42-44; col 8, ln 59-62	1-7
Y	US 8,025,239 B2 (LABREC et al.) 27 September 2011 (27.09.2011) col 10, ln 21-26; col 14, ln 7-18; Fig. 4	4
Y	US 8,079,514 B2 (LASCH et al.) 20 December 2011 (20.12.2011) col 3, ln 46-63; col 7, ln 6-7	6
A	US 4,897,533 A (LYSZCZARZ) 30 January 1990 (30.01.1990) col 1, ln 12-29; col 3, ln 35-56; col 5, ln 40-43	1-7
A	US 5,543,466 A (NORMAN) 06 August 1996 (06.08.1996) col 1, ln 12-17, 40-67; col 2, ln 1-3; col 11, ln 67; col 12, ln 1-9	1-7
A	US 4,557,963 A (CAINES) 10 December 1985 (10.12.1985) entire document	1-7

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

"O" document referring to an oral disclosure, use, exhibition or other means

"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

21 September 2017

Date of mailing of the international search report

12 OCT 2017

Name and mailing address of the ISA/US

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Authorized officer:

Lee W. Young

PCT Helpdesk: 571-272-4300
PCT OSP: 571-272-7774

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 17/33136

Continuation of:

Box NO III. Observations where unity of invention is lacking

The inventions listed as Groups I and II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

Special Technical Features

Group II does not require a method of making a layered plastic structure comprising hydraulically compressing a first sheet and a second sheet together, as required by Group I.

Group I does not require a layered plastic card comprising a decorative layer applied to a first sheet front side; wherein a layer of copolymer of ethylene thermally and physically isolates other layers to prevent bending of the layered plastic card during heating and cooling of the layers during manufacture due to relative contraction and expansion, as required by Group II.

Shared Common Features

Groups I and II share the technical feature of a layered plastic structure comprising a first sheet of material and a second sheet of material, the first sheet of material having a first layer and second layer of copolymer of ethylene applied on a front and back of the first sheet, and a second sheet of material bonded to the copolymer applied first sheet, wherein the copolymer of ethylene prevents the first sheet from contacting the second sheet. However, this shared technical feature does not represent a contribution over prior art, because the shared technical feature is disclosed by US 4,557,963 A (Caines). Caines teaches a layered plastic structure (col 2, ln 23-33; col 3, ln 1-4; Fig. 2; laminated multilayer structure comprising polyester and plastic films) comprising a first sheet of material (col 2, ln 26-30; core sheet formed of polyester sheet) and a second sheet of material (col 2, ln 28-30; outer overlay films), the first sheet of material having a first layer and second layer of copolymer of ethylene applied on a front and back of the first sheet (col 2, ln 26-33; Fig 2; layer of adhesive between film and sheet; col 3, ln 23-25; adhesive materials include ethylene/vinyl acetate copolymers; col 3, ln 31-33; adhesive applied to surface of the polyester sheet prior to lamination with overlay film; col 3, ln 37-41; laminating core sheet between the adhesive coated surfaces of two layers of overlay film), and the second sheet of material bonded to the copolymer applied first sheet (col 2, ln 26-33; overlay films are laminated to polyester sheet), wherein the copolymer of ethylene prevents the first sheet from contacting the second sheet (col 3, ln 41-42; Fig. 2; thickness of adhesive layer between the core sheet and overlay film).

As the common technical features were known in the art at the time of the invention, these cannot be considered a special technical feature that would otherwise unify the groups.

Groups I and II therefore lack unity under PCT Rule 13 because they do not share a same or corresponding special technical feature.