(51) International Patent Classification:
C09J 7/02 (2006.01)  C09F 3/10 (2006.01)

(52) International Classification:
C09J 7/04 (2006.01)

(21) International Application Number:
PCT/FI2013/0050861

(22) International Filing Date:
5 September 2013 (05.09.2013)

(25) Filing Language:
English

(26) Publication Language:
English

(30) Priority Data:
20125940  11 September 2012 (11.09.2012)  FI

(71) Applicant: UPM RAFLATAK OY [FI/FD; Tesomankatu 31, FI-33310 Tampere (FI)].

(72) Inventors: MITCHELL, Noel; Horather Str. 180A, 42111 Wuppertal (DE); LAINEN, Hannu; Peltovainionkatu 21 G 23, FI-33400 Tampere (FI).

(74) Agent: TAMPEREEN PATENTITITOIMISTO OY; Hermiankatu 1 B, FI-33720 Tampere (FI).


(54) Title: A LINERLESS LABEL

(57) Abstract: The invention relates to a linerless label web for labels comprising a face having a first surface and a second surface, and a non-tacky adhesive layer arranged on the second surface of the face having a static friction coefficient less than 0.8 against aluminium at room temperature. The invention also relates to use of the label web, to a method for attaching a label to an item, and to a combination of an item and a label. Preferably, the adhesive layer comprises ethylene vinyl acetate (EVA), styrene butadiene rubber and hydrocarbon resin and the face comprises a paper or oriented polypropylene film.

Fig. 2
A linerless label

Field of the Invention

The present invention relates to label webs, especially linerless label webs provided in roll form and labels produced thereof. The present invention also relates to a method for applying linerless labels to articles and to the use of linerless labels.

Background of the Invention

Labels can be adhered through an adhesive layer to objects in order to identify, to provide decoration and/or to display information about object to which it is attached. Referring to Fig. 1 conventional pressure-sensitive label web and label L produced thereof comprise a face material layer F having a tacky pressure sensitive adhesive PSA coating on one side of the face material and a release liner RL overlying the adhesive layer. The release liner is used in order to allow protect the adhesive layer prior to its use, and in order to prevent adherence to items which should not be labelled. When the label is to be used, the release liner is peeled off and discarded.

Summary of the Invention

It is an object to provide a release linerless label web and labels suitable for dispensing in an automated labelling lines. It is an object of the present invention to provide a linerless label used in labelling of articles, like glass or plastic bottles or other items. It is an further object to provide a method for attaching a label to an item.

According to a first aspect, a linerless label web for labels is provided. The web may comprise: a face having a first surface and a second surface, an adhesive layer arranged on the second surface of the face. The adhesive layer may be non-tacky at room temperature and may have a static friction coefficient less than 0.8 against aluminium at room temperature when measured according to standard ASTM D 1894.
According to a second aspect, a use of the linerless label web for labelling of an item is provided.

According to a third aspect, a combination of an item and a label attached to the item is provided. The label may comprise a face having a first surface and a second surface, and an adhesive layer arranged on the second surface of the face. The adhesive layer may be non-tacky at room temperature and may have a static friction coefficient less than 0.8 against aluminium at room temperature when measured according to standard ASTM D1894.

According to a fourth aspect, a method for attaching a label to an item is provided. The method comprising may comprise

- unwinding a label web comprising a face having a first surface and a second surface, an adhesive layer arranged on the second surface of the face, wherein the adhesive layer is non-tacky at room temperature and has a static friction coefficient less than 0.8 against aluminium at room temperature when measured according to standard ASTM D1894;
- cutting the label web so as to form individual label;
- activating at least part of the surface of the non-tacky adhesive layer to a tacky state; and
- attaching the label to the surface of the item when at least the surface of the adhesive layer is in the tacky state.

Further embodiments are presented in the dependent claims.

The non-tacky adhesive layer adhesive may be activatable from non-tacky state to a tacky state at a temperature between 90 and 150°C, preferably between 100 and 150°C.

The adhesive layer may comprise ethylene vinyl acetate (EVA), styrene butadiene rubber and hydrocarbon resin.

The face may comprise at least one a paper and oriented polypropylene film at the first surface.

The ratio of static friction coefficient of the non-tacky adhesive layer to face may be between 0.3 and 15, preferably between 1 and 4.
The first surface of the face may comprise a printed layer.

In the method attaching the label to an item, the surface of the non-tacky adhesive layer may be activated by exerting energy to the surface of the non-tacky adhesive layer. The energy may be provided by heating the surface of the adhesive layer to a temperature between 110 and 150°C.

Description of the Drawings

In the following, the invention will be explained by referring to the appending drawings, in which:

Fig. 1 shows, in a cross sectional view, a label web for labels comprising a release liner,

Fig. 2 shows, in a cross sectional view, a release linerless label web,

Fig. 3 shows, in a perspective view, a release linerless label web reeled to a roll,

Fig. 4 shows, in a top view, an arrangement for labelling,

Fig. 5 shows, in a perspective view, an arrangement for labelling,

Fig. 6 shows, in a top view, an arrangement for labelling,

Fig. 7 shows a label attached to an item,

Fig. 8 shows, in a cross sectional view, a label attached to an item.
Detailed Description of the Invention

Label webs or labels which are not provided to users with release liners over an adhesive layer are referred to as release linerless label webs or labels, also referred to as linerless label webs or linerless labels.

Elimination of release liners reduces the material costs of the labels but also avoids the disposal of the release liner after the application of the labels. Moreover, the exclusion of the liner decreases the thickness in a roll of labels and more labels can be provided per roll.

Referring to Fig. 2, a linerless label web WEB1 comprises a face 2 and an adhesive layer 6 on a second surface of the face 2. The face layer may also comprise graphical patterns, e.g. a printed layer in order to provide a visual effect or to provide information. The face may be printed on the first surface of the face opposite to the adhesive layer. Alternatively, the second side (reverse side) of the face may be printed so that the print layer is between the face layer 2 and the adhesive layer 6. Thanks to the reverse side printing of the face there will be no need for an additional over-lamination layer to protect the printing. It is also possible that the label web is unprinted.

The face surface(s) may comprise additional layer(s), for example adhesion promoting layer(s) between the face and adhesive and/or print layer. The face surface(s) may also be treated prior to application of other layer(s). For example, tie layer, top coat or over-laminate may be applied to the face for protection or to enhance the adhesion of ink and/or adhesive. Alternatively, face layer(s) i.e. adhesive and/or print receiving layer(s) may be surface treated by known methods in the art, such as flame treatment, corona treatment, plasma treatment in order to enhance, for example, adhesion.

During labelling process the individual labels 100 may be cut from the continuous linerless label web WEB1 prior to attaching one at the time to an item to be labelled. The labels may be cut by die-cutting, e.g. by using rotary cutter. Alternatively, the labels may be cut by using laser. Label face material may be either paper or plastic film or combination of these. Plastic labels, in contrast to paper labels, are increasingly preferred. The face may also be referred to as a substrate, a face film or a facestock layer.
Fig. 3 provides a perspective view of a continuous linerless label web supplied on a roll 102. Due to the non-tacky adhesive layer 6 the label web can be rolled without using a release liner to prevent the blocking of the web. A continuous label web may be cut during labelling in order to provide individual labels having a desired shape and size.

A face 2 of a label 100 may be a paper based, such as glassine or kraft paper, plastic film or a combination of these. The plastic film may comprise polymers, such as polyolefin, polyester, polystyrene, polyurethane, polyamide, poly(vinylchloride) or any combinations of these. Alternatively, the face may be biodegradable, such as lactic acid, starch or cellulose based. The polymer film may include homopolymers, copolymers or it may consists of a polymer blend. For example, the face may comprise mixtures of polyolefins, such as polyethylene (PE) and polypropylene (PP). In addition, the plastic film may comprise additives, such as pigments or inorganic fillers to provide, for example, a desired colour for the film (face). Additives may include, for example, titanium dioxide, calcium carbonate and blends thereof. The film may also comprise minor amounts of other additives and/or film modifiers, e.g. plasticisers, stabilizers, anti-static agents, slip/anti-block agents.

The face may consists of polypropylene film. It may be biaxially or monoaxially oriented. Alternatively non-oriented face films may be used. For example, the face may consist of a biaxially oriented polypropylene (BOPP) film. The face may be a monolayer. Alternatively, it may be a multilayer film comprising two or more layers. The multilayer film may be co-extruded or laminated. The thickness of individual layer in a multilayer structure may vary. In multilayer structure, e.g. three layer structure, the composition of different layers may also be varied. In other words, in a multilayer structure different layers may have e.g. different polymer compositions.

The plastic face may be clear or opaque/white. White/opaque face films may be e.g. cavitated. From the optical point of view, the high transparency of the face layer is preferred. Clear face is substantially transparent to visible light and it allows the objects beneath such layer, i.e. the bottle or its content, to be seen through such layer. The haze of the film may be less than 60%, preferably less than 50% or less than 30%, and most preferably equal or less
than 25%, when measured according to the standard ASTM D1003. In addition, the haze may be at least 1 or 10%. For example, the haze is between 1 and 60%, or preferably between 1 and 25% or between 1 and 10%. Alternatively, the haze may be between 2 and 5%. Opaque face film may have an opacity of at least 70%, at least 75%, or at least 80%, for example between 70 and 95% or between 70 and 80%. The face layer may have an overall thickness from 20 to 100 microns, preferably from 30 to 80 microns or from 30 to 50 microns. The thickness of individual plastic film layers in multilayer face structure may vary.

Referring to Fig. 8, the adhesive 6 provides adhesion i.e. adheres or bonds the label 100 to the surface $S_{1E}$ of an item ITE1. The adhesive layer 6 of the label should have a property of adhering i.e. tack (stickiness) in order to stick to an item during labelling process. Tack is the property of adhesive that allows the immediate formation of a bond on contact with another surface. The tackiness is needed at the point the label is attached to an item. The optimum adhesion between two materials depends on, for example, the wetting and surface energy of the materials. For the adhesive to wet the surface, the surface tension of the adhesive must be lower than or equal to the surface tension of the article to be labelled. If the surface tension of the adhesive is lower than the surface tension of the article it leads to good wetting and increased adhesion. Low surface energy materials, such as polyethylene and polypropylene, may be difficult to bond without special surface preparation. Their surface energy level may be from 30 to 32 dynes/cm.

By using tack-test, for example, an immediate adhesion (initial adhesion/strength of adherence) of the adhesive to the item, such as glass plate, may be measured. Tack is the force needed to separate the adhesive from the glass surface after a very short contact time. It may be used to indicate the adhesion (strength of adherence) in very fast dispensing lines.

According to an embodiment, the strength of adhesion may be at least 0.5 N/25mm, when measured using Finat test method 2 (FTM2) after activation at 95°C.
According to an embodiment, hot-melt adhesives are used in an adhesive layer 6 of label webs and labels provided thereof. They are solid thermoplastic adhesives melted during the labelling process. Subsequently they solidify on cooling and form strong bonds between materials. The adhesive layer is preferably solid, dry and non-tacky at normal room temperatures 25° prior to activation step during labelling process. Thus, it is not necessary to use a release liner to protect the adhesive.

The activation step may be performed by heating at least a part of the adhesive layer surface. The activation of the adhesive layer changes the non-tacky adhesive to a tacky adhesive. Tacky adhesive is capable of adhering to the surface of an item labelled. The activation step is carried out before the label is attached to a surface of an item. In other words, the hot-melt adhesive layer is at least partially in a molten state when the label is applied to the surface of an item. After activation of the adhesive layer the label is attachable with pressure to the surface of an item.

The hot-melt adhesive may be changed from a non-tacky state to a tacky state by heating at least the surface or at least part of the surface of the adhesive layer to a temperature, which is equal or higher than an activation temperature of the adhesive. The adhesive may be activated by heating using hot-air. Alternatively, any other method exerting energy to the adhesive layer so as to reach the activation temperature of the adhesive may be used. For example, infra-red radiation or laser may be used for activation. The activation temperature may be between 90 and 150°C, or between 95 and 140°C, preferably between 100 and 150°, or between 110 and 140°C. Once activated, the adhesive layer may remain tacky during a certain time period. Said time period is called as "open time" or "tack time". The open time may be between 0.2 and 10 seconds. For example, between 0.5 and 5 seconds or between 0.5 and 2 seconds. During labelling the label should be brought into contact with the item labeled within the open time of the adhesive.

In an embodiment, the adhesive may be a hot-melt adhesive comprising thermoplastic polymer composition so that the composition is non-tacky at the room temperature but activatable by heat to a tacky state. In particular, the adhesive may comprise copolymer of ethylene and vinyl acetate, ethylene vinyl acetate (EVA), styrene butadiene rubber and hydrocarbon
resin(s), such as hydrocarbon rosin or resin. The softening point of the adhesive may be between 60 and 70°C, for example 64°C. Viscosity of the adhesive may be 1900 mPas at 90°C and 1320 mPas at 100°C.

The adhesive layer 6 may be transparent, thus allowing its use in label applications where clear labels enabling objects to be visible beneath the label are preferred.

Adhesive layer 6 may be applied to the second surface of the face as a continuous coating covering 100% of the face surface. Alternatively, it may be applied discontinuously as spots or strips covering less than 100% of the second surface of the face. For example, the adhesive may cover between 10 to 90% of the total area of the second surface. Reduced amount of adhesive may reduce the overall label costs. It may also reduce the heating time needed for the activation of the adhesive. Reduced amount of adhesive may also reduce the risk of blocking of adhesive layers together during unwinding of the label web.

The hot-melt adhesive layer may be coated to the second surface of the face, for example, by using a curtain coating method. The adhesive may be in a molten state suitable for coating. After coating the adhesive turns into solid and non-tacky state. Subsequently, the label web comprising a face layer and an adhesive layer may be reeled to a roll.

Automatic labelling lines may be used for applying labels to items. Referring to Fig. 4 and Fig 5, label web roll 102 may be supplied to a labelling line 500. The labelling line 500 may comprise a horizontally orientated label web roll 102, an unwinding section comprising one or more cylindrical rolls, a cutting section, an activation section and an application section, unwinding section the label web WEB1 is unwind from the roll 102 through one or more cylindrical rolls. The unwinding section of a label web roll 102 may comprise several unwinding rolls, such as 210, 220, 230, 240, having axes AX1, AX2, A3 and AX4 respectively. Unwinding rolls may be rotating around axes. The number of unwinding rolls may vary. Before die-cutting section there exist feed rollers 251 and 252 having axes AX5 and AX6, respectively. The unwinding rolls and feed rollers should provide a proper tension for the web suitable for cutting into individual labels and application at the cutting point.
CUT1 and transfer to the vacuum drum VAC1. In automatic labelling lines continuous unwinding of the label web from the reel should be provided.

According to an example, proper tension of the web and easy feeding of the web through the roller se-up may be affected by a friction between the label web surface and the surface of the rolls. The surface of the unwinding roll in the labelling line may be stainless steel or anodized aluminium alloy. For example, the unwinding rolls have at least an anodized aluminium periphery. One of the feed rollers may have a rubber based periphery.

The non-tacky (not activated) hot melt adhesive layer of the web may have a static friction coefficient of less than 1.5 or less than 1.0, preferably less than 0.8 against aluminium at room temperature. For example, the static friction coefficient may be in the range of 0.3 - 1.5, preferably in the range of 0.3-0.8 against aluminium when measured according to standard ASTM D1894. Smaller friction coefficient is beneficial because it helps the feeding and unwinding the label web through the labelling line with correct label web tension without e.g. blocking of the web. The face material may have a static friction coefficient equal or smaller than the adhesive layer of the label web.

Static friction coefficient of paper face against aluminium may be equal or less than 0.5 or equal or less than 0.3, for example between 0.1 and 0.5 or between 0.1 and 0.3. Static friction coefficient of biaxially oriented polypropylene (BOPP) face film against aluminium may be less than 1, preferably less than 0.9 or less than 0.8, for example between 0.4 and 0.8 or between 0.5 and 0.7. The ratio of friction coefficient of non-tacky adhesive layer and face (FCadh/FCf) may be between 0.3 and 15, or between 0.5 and 10, preferably between 1 and 8 or between 1 and 4. Smaller ratio may be beneficial providing continuous unwinding and accurate labelling process.

According to an embodiment, the friction coefficient of the face surface may be in the range of 0.2-0.3, for example 0.25 when measured according to standard DIN EN ISO 8295.

According to an embodiment, a static friction coefficient of the hot-melt adhesive before activation against another non-activated hot-melt adhesive surface may be less than 5, preferably less than 3 or less than 2, preferably less than 1. For example, between 0.1 and 5, or between 0.1 and 2,
preferably between 0.1 and 1 or between 0.2 and 0.5. Smaller friction coefficient may be beneficial in order to prevent sticking of two adjacent adhesive layers together, for example during unwinding of the linerless label web in labelling process.

Referring to Fig. 4, in labelling line 500, there may be a distance between parallel unwinding rolls in direction SX, for example between rolls 220 and 240, providing a distance L2 between the label web surfaces passing on parallel to each other. There may also be a distance between sequential rolls L1, e.g. between rolls 210 and 220 in direction SY. During unwinding the adhesive surface and the face surface of the label web contacts the circumferential periphery of the rolls one after the other alternately. For example, the adhesive surface contacts the periphery of the first roll 210 and the face surface contacts the periphery of the roll second 220 etc. Thus, there is a section, between rolls 220, 230 and 240, where the adhesive surfaces of the label web are extending parallel to each other in the opposite direction. Moving direction of the web is presented with arrows. During unwinding the label web WEB1 exceeds with a velocity v1.

After unwinding section the labelling line may comprise a cutting section CUT1, wherein the label web WEB1 is cut so as to form individual separate labels having a desired shape and size. After cutting the individual labels proceed to the application section comprising rotating vacuum drum (applicator) VAC1, wherein the labels are activated in activation step HEAT1 so that the non-tacky adhesive layer becomes tacky. Subsequently individual label 100 is applied to the surface of an item ITE1. During application of the label 100 the activated adhesive layer comes in contact with the surface of the item and the label adheres to the item ITE1. The adherence of the label is increased during cooling of the adhesive, i.e. when the adhesive converts from the heated tacky state to a non-tacky state. In other words, the adhesive converts to non-tacky stage when the temperature of the adhesive is reduced below the activation temperature.

The labels comprising heat-activatable adhesive may be used for labelling of items of different shapes and materials, such as glass or plastic bottles or other containers. Labels may be used in wide variety of labelling applications and end-use areas, such as beverage labelling, food labelling, home and
personal care product labelling, and labelling of industrial products. The surface of the item may be plastic, glass, metal, or paper based. For example, the item may be polyethyleneterphtalate (PET) bottle.

Fig. 7 shows a combination of a label and an item, i.e. a label 100 attached to an item ITE1. Referring to Fig. 8, the heat activated adhesive 6 is in direct contact with the surface of the item SUE-

During unwinding of the label web roll, there may be a possibility that, for example, two adhesive surfaces of the label web come into contact with each other. Due to the any interference in the labelling line a self-adhering condition of the adhesive surfaces may exists preventing a continuous unwinding of the label web from the roll.

Referring to Fig. 5, due to the interference during the unwinding of the label web vibration may be provided to the web causing parallel web surfaces to move closer to each other in direction SX. For example, in a certain distance C1 the parallel web surfaces may have a distance in between less than L2. When near enough the parallel surfaces may stick to each other blocking the labelling line and prevent the continuous unwinding of the label web. Tendency for sticking of the label web is more likely in distances where adhesive layers of the web are moving parallel to each other. Thus, it may be beneficial that the linerless label web comprises an adhesive layer having a friction coefficient in non-activated state (non-tacky adhesive before activation) against surface of the same non-tacky adhesive less than 5, preferably less than 3, for example between 0.1 and 5, or between 0.1 and 2, preferably between 0.1 and 1 or between 0.2 and 0.5.

Interference during the unwinding may be caused by the friction between the surfaces of label web and unwinding roll. For example, stick-slip phenomenon may occur caused by a change in the force of friction due to the local warming up of a material, which increases the friction coefficient.

According to an embodiment, in order to provide continuous unwinding and feeding of a label laminate web during labelling process, a label web may have a non-tacky adhesive surface having a static friction coefficient of less than 1.5 or less than 1.0, preferably less than 0.8 against aluminium at room
temperature. For example, the static friction coefficient may be in the range of 0.3 - 1.5, preferably 0.3-0.8 against aluminium. In addition the face of the label web may have a static coefficient of friction value equal or less than the value of the adhesive. For example, the friction coefficient of the face may be less than 1, for example between 0.1-0.8.

The embodiments described above are only example embodiments of the invention and a person skilled in the art recognizes readily that they may be combined in various ways to generate further embodiments without deviating from the basic underlying invention.
Claims:

1. A linerless label web for labels, the web comprising: a face having a first surface and a second surface, an adhesive layer arranged on the second surface of the face, wherein the adhesive layer is non-tacky at room temperature and has a static friction coefficient less than 0.8 against aluminium at room temperature when measured according to standard ASTM D1894.

2. The linerless label web according to claim 1, wherein the non-tacky adhesive layer has a static coefficient of friction against same non-tacky adhesive layer less than 5 at room temperature when measured according to standard ASTM D1894.

3. The linerless label web according to claim 1 or 2, wherein the non-tacky adhesive layer adhesive is activatable from non-tacky state to a tacky state at a temperature between 90 and 150°C, preferably between 100 and 150°C.

4. The linerless label web according to any of the claims 1 to 3, wherein the adhesive layer comprises ethylene vinyl acetate (EVA), styrene butadiene rubber and hydrocarbon resin.

5. The linerless label web according to any of the claims 1 to 4, wherein the first surface of the face comprises a paper or oriented polypropylene film.

6. The linerless label web according to any of the claims 1 to 5, wherein the ratio of static friction coefficient of the non-tacky adhesive layer to face is between 0.3 and 15, preferably between 1 and 4.

7. The linerless label web according to any of the claims 1 to 6, wherein the first surface of the face comprises a printed layer.

8. A use of the linerless label web according to any of the claims 1 to 7 for labelling of an item.
9. A combination of an item and a label attached to the item, the label comprising a face having a first surface and a second surface, an adhesive layer arranged on the second surface of the face, wherein the adhesive layer is non-tacky at room temperature and has a static friction coefficient less than 0.8 against aluminium at room temperature when measured according to standard ASTM D1894.

10. A method for attaching a label to an item, the method comprising:
   - unwinding a label web comprising a face having a first surface and a second surface, an adhesive layer arranged on the second surface of the face, wherein the adhesive layer is non-tacky at room temperature and has a static friction coefficient less than 0.8 against aluminium at room temperature when measured according to standard ASTM D1894;
   - cutting the label web so as to form individual label;
   - activating at least part of the surface of the non-tacky adhesive layer to a tacky state; and
   - attaching the label to the surface of the item when at least the surface of the adhesive layer is in the tacky state.

11. The method according to claim 10, wherein the surface of the non-tacky adhesive layer is activated by exerting energy to the surface of the non-tacky adhesive layer.

12. The method according to claim 11, wherein the energy is provided by heating the surface of the adhesive layer to a temperature between 110 and 150°C.
Fig. 5
# International Search Report

**PCT/IB2013/050861**

## A. Classification of Subject Matter

<table>
<thead>
<tr>
<th>INV.</th>
<th>C09J7/02</th>
<th>C09J7/04</th>
<th>G09F3/10</th>
</tr>
</thead>
</table>

## B. Fields Searched

Minimum documentation searched (classification system followed by classification symbols)

- C09J
- G09F

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

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>US 4 389 450 A (SCHAEFER SUZANNE E ET AL) 21 June 1983 (1983-06-21) abstract col umn 1, line 35 - line 40; claims 1-3, 10-12; figure 1; examples 2-12; table e 1</td>
<td>1-7</td>
</tr>
<tr>
<td>X</td>
<td>WO 2006/053267 A1 (avery DENNISON CORP [US]; BLACKWELL CHRISTOPHER J [US]; K0VALCHUK JOHN) 18 May 2006 (2006-05-18) abstract; claims 1,4, 10-13, 17; figures; examples; table e 1</td>
<td>1-12</td>
</tr>
</tbody>
</table>

Further documents are listed in the continuation of Box C.

See patent family annex.

- "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

Date of the actual completion of the international search: 29 October 2013

Date of mailing of the international search report: 07/11/2013

Authorized officer: Mei er, Stefan
<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>wo 00/24838  AI (NASHUA CORP [US]) 4 May 2000 (2000-05-04) abstract page 2, line 13 - line 18 page 4, line 25 - page 5, line 7 page 10, line 11 - page 11, line 7 page 12, line 3 - line 6; claims 1,8; examples 2-5</td>
<td>1-12</td>
</tr>
<tr>
<td>A</td>
<td>&quot;STANDARD TEST METHOD FOR STATIC AND KINETIC COEFFICIENTS OF FRICTION OF PLASTIC FILM AND SHEETING&quot;, ASTM DESIGNATION, ASTM INTERNATIONAL, US, 1 January 2001 (2001-01-01), page 1, XP009061128, cited in the application</td>
<td>1,2,9,10</td>
</tr>
</tbody>
</table>

---

Form PCT/ISA/210 (continuation of second sheet) (April 2005)
<table>
<thead>
<tr>
<th>Patent document cited in search report</th>
<th>Publication date</th>
<th>Patent family member(s)</th>
<th>Publication date</th>
</tr>
</thead>
<tbody>
<tr>
<td>US 4389450</td>
<td>21-06-1983</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CN 101053004 A</td>
<td>10-10-2007</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EP 1829017 A I</td>
<td>05-09-2007</td>
</tr>
<tr>
<td></td>
<td></td>
<td>KR 20070085466 A</td>
<td>27-08-2007</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RU 2007121863 A</td>
<td>20-12-2008</td>
</tr>
<tr>
<td></td>
<td></td>
<td>US 2008280111 A I</td>
<td>13-11-2008</td>
</tr>
<tr>
<td></td>
<td></td>
<td>WO 2006053267 A I</td>
<td>18-05-2006</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CA 2316359 A I</td>
<td>04-05-2000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EP 1042420 A I</td>
<td>11-10-2000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>US 6210795 B I</td>
<td>03-04-2001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>WO 0024838 A I</td>
<td>04-05-2000</td>
</tr>
</tbody>
</table>