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Declarations under Rule 4.17:

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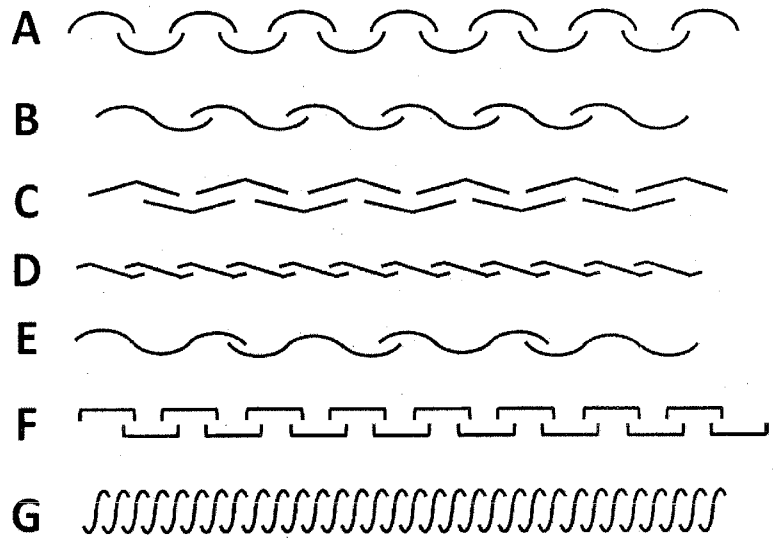
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(54) Title: PACKAGE MATERIAL COMPRISING A TEARING LINE

Figure 1



(57) Abstract: The present invention relates to a package material comprising at least one tearing line which comprises a number of perforation cuts characterized in that the continuous projection of the cutting line of each of the perforation cuts points- from each end of a perforation cut into a middle section of another perforation cut that is the immediate adjacent next perforation cut to that end within the tearing line. Particularly, the present invention pertains to a package material in the form of a chain of flexible sachets separated each by the tearing line for use of packaging a food product.

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PACKAGE MATERIAL COMPRISING A TEARING LINE

The present invention relates to a package material comprising a tearing line, such as for example flexible sachets which can be provided in a chained format of such sachets and comprise a tearing line between each of those sachets. The package material is suitable for packing food products.

Sachets connected in a chain format are widely used as a merchandising solution in emerging markets. The chained sachets are generally displayed in a retail outlet for consumers to decide on the number of sachets that they would like to purchase. Perforation patterns are used to separate the sachets and serve to guide the tear direction by hand. These patterns are generally straight in-line cuts, and allow the consumer to open the sachet without using special equipment such as scissors or other utensils.

The perforation patterns in existing sachets on the Market place in many countries present a problem in that the tear initiated to separate one or more sachets sometimes propagates into the next sachet. The inadvertently opened sachet then cannot be sold, since consumers will normally consider them opened or tampered. This causes unnecessary waste and cost to the retailer. There are many different perforation patterns existing in the market; however, there is no assurance that these provide good tear direction for sachets in a chain format.

US Patent No. 6,318,894 describes flexible bags or packages having a tearing line with perforations designed in a form of

hooks that allows for easy, quick straight line removal of a permanent seal and avoids undesirable cross-tearing of the package. The pattern is disclosed for use in a single package application and it is non-symmetrical, i.e. optimized for the tearing starting from one direction.

Other existing art describes perforation designs which allow consumers to tear open a package and access sachet contents, such as US Patent No. 5,445,454 and US Patent No. 5,934,809. However, the design of the tearing lines *per se* in those documents is very standard and not optimized to prevent propagation of a tear to leave his projected tearing line. In fact, tearing apart from the projected tearing line is not a problem in those prior art disclosures as the objective therein is to open a package completely for easy release of its content. Tearing away from the tearing line would still completely open those package materials.

There is therefore a continuing need in the industry for improved means to facilitate manual tear initiation and propagation for package material that provide a solution to better guide a tear in that package material along a tearing line with a reduced risk of having the tear propagating easily away from that projected tearing line, particularly when tearing un-carefully and/or when tearing from an angle of e.g. more than 30° away from that projected tearing line. This particularly applies to package material such as chains of sachets or pouches where the sachets or pouches are to be separated from the chain by tearing them off that chain without however having a tear propagating into one of the neighbouring sachets or pouches of that tearing line.

The object of the present invention is to improve the state of the art and to overcome at least some of the inconveniences described above. Particularly, an object of the present invention is to provide a package material having at least one tearing line with a perforation pattern of that tearing line that is able to self-correct a tear, e.g. in case of wrong tear direction, so as to avoid propagating the tear wrongly into the package material, e.g. a next adjacent sachet, by means solely of the geometry of the pattern of the perforation cuts of the tearing line.

The object of the present invention is achieved by the subject matter of the independent claims. The dependent claims further develop the idea of the present invention.

Accordingly, the present invention provides a package material comprising at least one tearing line which comprises a number of perforation cuts characterized in that the continuous projection of the cutting line of each of the perforation cuts points from each end of a perforation cut into a middle section of another perforation cut that is the immediate adjacent next perforation cut to that end within the tearing line.

The inventors surprisingly found that when designing the perforation cuts of a tearing line in such a way that the continuous projection of the cutting line of each perforation cut at the end of that perforation cut points into the direction of a middle section of another immediate next perforation cut, any unguided continuing tear of such a perforation cut will inevitably end up in a middle part of the next perforation cut. Thereby, the unguided tear will be stopped from further unguided propagation and will continue

its way guided again along the perforation cut of that next cut. Continuing to guide a tear in this way from a direct neighboring cut to a next direct neighboring cut all along the tearing line in a package material guaranties a proper, guided and safe tearing of that package material, e.g. by hand and by tearing from an angle away from the optimal tearing line, without a risk of unintentionally tearing into the package material besides the projected and perforated tearing line.

Brief Description of the Drawings

Figure 1: Examples of perforation patterns of the tearing line of the present invention.

Figure 2: Examples of perforation patterns of the tearing line of the present invention, with indicated continuous projections of the tears indicated by arrows.

Figure 3: Chain of sachets separated with a tearing line of the present invention.

Figure 4: Perforation pattern of the tearing lines of the samples tested in the Examples.

Figure 5: Schematic drawings of the set-up of the tearing test method as described in Example 1.

Detailed Description of the invention

The present invention pertains to a package material comprising at least one tearing line which comprises a number of perforation cuts characterized in that the continuous projection of the cutting line of each of the perforation cuts points from each end of a perforation cut into a middle section of another perforation cut that is the immediate adjacent next perforation cut to that first perforation cut and end within the tearing line.

A "tearing line" is a line of weakening running across a certain part of a package material, which is intended for the guided tear of that part of the package material. For example, a tearing line may run across the width of a string or chain of sachets, the sachets which are bound together one-by-one via a sealed edge which comprises the tearing line. Individual sachets can then be separated from the chain by tearing them off the chain.

A "perforation cut" is a cut, slit or impression in or through the package material. The cut or slit can be a perforation or incision through the entire package material as e.g. through a sealed edge area of package material comprising the combined walls of sachets or pouches in a packaged chain of such sachets. It can also be a partial incision or impression into the package material e.g. where the package material consists of several material layers. Thereby maybe only one or several layers are affected, but not all layers of the package material are necessarily perforated.

The perforations can be produced with a cutting blade or knife that has a cutting surface with multiple overlapping patterns that mirror the image of the perforations of the tearing line.

"Continuous projection" pertains to an extrapolated continuation of the cutting line and shape of an individual perforation cut.

The "cutting line" is the 2-dimensional profile, shape or form of an individual perforation cut, as it can be seen e.g. from the surface of a package material.

A "middle section" of a perforation cut is the section of the cutting line of a cut anywhere between the ends of such perforation cut.

An "immediate adjacent next perforation cut" pertains to a cut which is directly next to a first cut in question, i.e. leaving no further other cut in-between those two cuts.

The advantage of the present invention is that the geometry of the cutting lines of the perforation cuts all along the tearing line avoids cross-tearing of the package material away from its projected tearing line, when tearing the package material un-carefully or when tearing from an angle of e.g. more than 30° away from the projected tearing line.

The inventors identified a number of such geometries as outlined in Figure 1. These perforations can be of various designs including curved or linear cutting lines. The design of the perforations is such that the projection of either end of each perforation will meet the middle section of the next perforation pattern. This causes the tear to be guided from one perforation to the next, avoiding any cross-tear: see Figure 2.

Furthermore, the tear could be easily started from either end of the tearing line. The geometry of the perforation patterns of the tearing line of the present invention is symmetrical in design. As a result of the design of the perforation line in this invention, consumers will have the freedom to tear from either left or right vertical side edge of a package material, according to their individual preference, and not restricted by a specific tearing line pattern.

In a preferred embodiment, the tearing line of the present invention is composed of a number of perforation cuts aligned in at least two parallel planes. This can be seen e.g. in Figures 1A, 1C, 1E, 1F, 2A and 2B, where the tearing line is composed of two parallel planes. An advantage of this design is that it is fully symmetrical as to left and right ends, and hence performs equally well in preventing cross-tearing when being torn from either left or right, e.g. by a consumer.

The package material according to this embodiment comprises a tearing line wherein the particular perforation cut is not located within the same plane as its other immediate adjacent next perforation cuts. In this embodiment, the continuation of the tear at the end of a particular perforation cut falls into a middle section of the immediate adjacent next perforation cut which is located on the other opposite plane. Continuation of the tear at the end of this second perforation cut then brings the tear back to the first plane again when it is directed to the middle of this immediate adjacent next perforation cut of the second cut. In other words, the tear conducts a controlled cut through the package material in a guided zigzag through the perforation cuts of the tearing line between the two parallel planes of the perforation cuts.

In a preferred embodiment each perforation cut has two ends. This allows to best control the path of the tear through-out the tearing line, and does not provide the tear with any options to 'choose' or deviate from the optimal tearing path as selected by the design.

Preferably, all perforation cuts have the same 2-dimensional shape or profile, when looking to the surface of the package material. Although all perforation cuts have the same shape,

they are not all oriented and/or aligned in the same way along the tearing line, but can be translocated, rotated and/or inversed. The advantage lies mainly in the production of such specific cutting knives for making the perforations for these tearing lines in an industrial scale, as the basic cutting element of such knives remains the same. This facilitates on one hand production of such cutting knives and/or on the other hand the method of perforating tearing lines as certain cutting steps could be performed in series with a same cutting knife.

Preferably, the 2-dimensional shape or profile of the perforation cuts is a curved and non-angular shape. The advantage of having curved and non-angular shape cuts is that the risk of a tear tearing away from the pre-cut cutting line is reduced. An angle in a cutting line bears always the risk that un-careful tearing in e.g. an inappropriate angle may cause a tear to propagate in an uncontrolled way into the package material starting and initiating from that angle. This is avoided with perforation cutting lines having no angles or at least no sharp angles. Hence, preferably, the perforation cut of the present invention has a non-angular shape.

In an alternative embodiment, the perforation cut of the present invention has an angular shape wherein the angle is between 130° and 180°, more preferably where the angle is between 145° and 180°. The angle is defined as the 'small' angle between two sides and reaches from 0° to 180° maximum. Angles above 130°, or preferably above 145°, are less risky of initiating wrong cross-tears than smaller angles.

A further preferred embodiment pertains to the package material of the present invention, wherein one end of the perforation cut overlaps with one end of the other immediate adjacent next perforation cut. Thereby, the ends of the perforation cuts do not touch each other. But when looking from a vertical direction as to the tearing line, the ends of a perforation cut overlap on either side with the corresponding ends of their other respective immediate adjacent next perforation cut.

Preferably, the length of each perforation cut of the present invention is 1 - 15 mm long, more preferably 2 - 7 mm long, even more preferably 3 - 5 mm long.

A particular embodiment of the present invention is a package material comprising at least two compartments separated by the tearing line. Preferably, the package material comprises even more than two compartments and this in the form of a chain of compartments separated each by a tearing line of the present invention. In other words, the package material comprises more than two compartments in the form of a chain of compartments, wherein the compartments are each separated from a next compartment by the tearing line of the present invention. A schematic drawing of such a package material is shown in Figure 3. Sachets connected in a chain format are widely used as a merchandising solution in many emerging countries. The chained compartments or sachets are generally displayed in a retail outlet for consumers to decide on the number of sachets that they would like to purchase. The perforation is used to separate the sachets and serve to guide the tear direction by hand. The perforation patterns in existing sachets present a problem in that the tear initiated to separate one or more sachets sometimes propagates into the next sachet. The

inadvertently opened sachet then cannot be sold, since consumers will normally consider them opened or tampered. This causes unnecessary waste and cost to the retailer. Hence, the advantage of the present invention is that individual sachets can now be separated much more easily from such a merchandising chain without the risk of tearing involuntarily into one of the sachets when removing one or several of those sachets from a chain.

Preferably, the package material of the present invention comprises compartments that are flexible sachets or pouches. Typically, such package material is made of aluminum, polyester, polyethylene such as for example polyethylene terephthalate (PET), paper, cardboard, cellophane or a combination thereof.

Preferably, the package material of the present invention is for use of packaging a food product and/or a powdered product, which can be a powdered food product.

Those skilled in the art will understand that they can freely combine all features of the present invention disclosed herein. Further, features described for different embodiments of the present invention may be combined.
Further advantages and features of the present invention are apparent from the figures and examples.

Example 1: Test Method

The experiment to recreate a situation whereby a sachet is separated from a package chain of sachets at the tearing line when torn at an angle was setup as described below.

Tearing tests were performed with using as equipment an Instron Universal Tester. The perforation was torn for a small section of the package material and folded to aid the machine to grab the corner of the sachet to be torn off a package chain. The tearing angle was 45°, and the tearing speed was 300mm/min. The number of test samples per product/perforation was 6.

As for the test results: when the tearing path followed the perforation of the tearing line, it was considered good and defined as "Pass". On the other hand, when the tearing path deviated from the perforated tearing line, it was considered as a "Fail".

A schematic drawing of the test method is shown in Figure 5; A) shows a typical case of a "Fail", where the tear path propagates away from the perforated tearing line and into the packaged upper sachet, as indicated by an arrow; B) shows a typical case of a "Pass", where the tear path follows the predetermined and perforated tearing line all along the width of the package chain.

Example 2: Description of test samples

Sample 1:

Commercial package of a chain with sachets filled with a lyophilised coffee powder; Width of each sachet: 89mm
Packaging Format: 3 Side seal
Perforation pattern shown in Figure 4A

Sample 2:

Commercial package of a chain with sachets filled with a dried milk powder; Width of each sachet: 87mm
Packaging Format: Pillow back
Perforation pattern shown in Figure 4B

Sample 3:

Commercial package of a chain with sachets filled with a dried soup powder; Width of each sachet: 70mm

Packaging Format: Pillow back

Perforation pattern shown in Figure 4C

Sample 4:

Prototype package of a chain with empty sachets; Width of each sachet: 79mm

Packaging Format: Pillow back

Perforation pattern as of the present invention and shown in Figure 4D.

Example 3: Tearing Test Results

The samples as described in Example 2 were tested according to the method described in Example 1, and which is schematically shown in Figure 5. The tearing angle was at 45°.

The results of the tearing test were as follows:

Sample 1:	6 "Fails" out of 6 tested
Sample 2:	6 "Fails" out of 6 tested
Sample 3:	6 "Fails" out of 6 tested
Sample 4:	6 "Pass" out of 6 tested

From the results, it can be seen that the existing perforations in the market are a problem when the tearing direction is not along the perforation tearing line. In all those cases tested with a strong deviation of 45° from the optimal tearing angle, the tearing path eventually moved away from the perforated tearing line and propagated into one side of the next adjacent sachet. Thereby, that sachet was torn open and its content was released.

All tests with a package chain having a tearing line according to the present invention, as e.g. shown here for Sample 4, did withstand the tearing from an angle. The tears always strictly followed the perforated tearing line and never propagated away from it and into the side of one of the sachets.

The problem of tearing from an angle arises from the fact that the way consumers tear off sachets from a merchandised package chain in a shop is not well controllable. Tearing into a next sachet usually results in an unintentional opening of that sachet and produces unnecessary food wastage and extra costs, either to the shop owner or the consumer. The present invention solves this problem by providing a package chain of sachets separated by a perforated tearing line as presented here above.

Claims

1. A package material comprising at least one tearing line which comprises a number of perforation cuts characterized in that the continuous projection of the cutting line of each of the perforation cuts points from each end of a perforation cut into a middle section of another perforation cut that is the immediate adjacent next perforation cut to that end within the tearing line.

2. The package material according to claim 1, wherein the tearing line is composed of a number of perforation cuts aligned in at least two parallel planes.

3. The package material according to claim 2, wherein the perforation cut is not located within the same plane as the other immediate adjacent next perforation cuts.

4. The package material according to one of the claims 1 to 3, wherein each perforation cut has two ends.

5. The package material according to one of the claims 1 to 4, wherein each perforation cut has the same 2-dimensional shape.

6. The package material according to claim 5, wherein the 2-dimensional shape is a curved, non-angular shape.

7. The package material according to one of the claims 1 to 6, wherein one end of the perforation cut overlaps with one end of the other immediate adjacent next perforation cut.

8. The package material according to one of the claims 1 to 7, wherein the length of each perforation cut is 1 - 15 mm, preferably 2 - 7 mm, more preferably 3 - 5 mm.

9. The package material according to one of the claims 1 to 8, comprising at least two compartments separated by the tearing line.

10. The package material according to claim 9, comprising more than two compartments in the form of a chain of compartments separated each by the tearing line.

11. The package material according to claim 9 or 10, wherein the compartments are flexible sachets or pouches.

12. The package material according to one of the claims 1 to 11, made of aluminum, polyester, polyethylene, paper, cardboard, cellophane or a combination thereof.

13. The package material according to one of the claims 1 to 12 for use of packaging a food product.

14. The package material according to one of the claims 1 to 13 for use of packaging a powdered product.

Figure 1

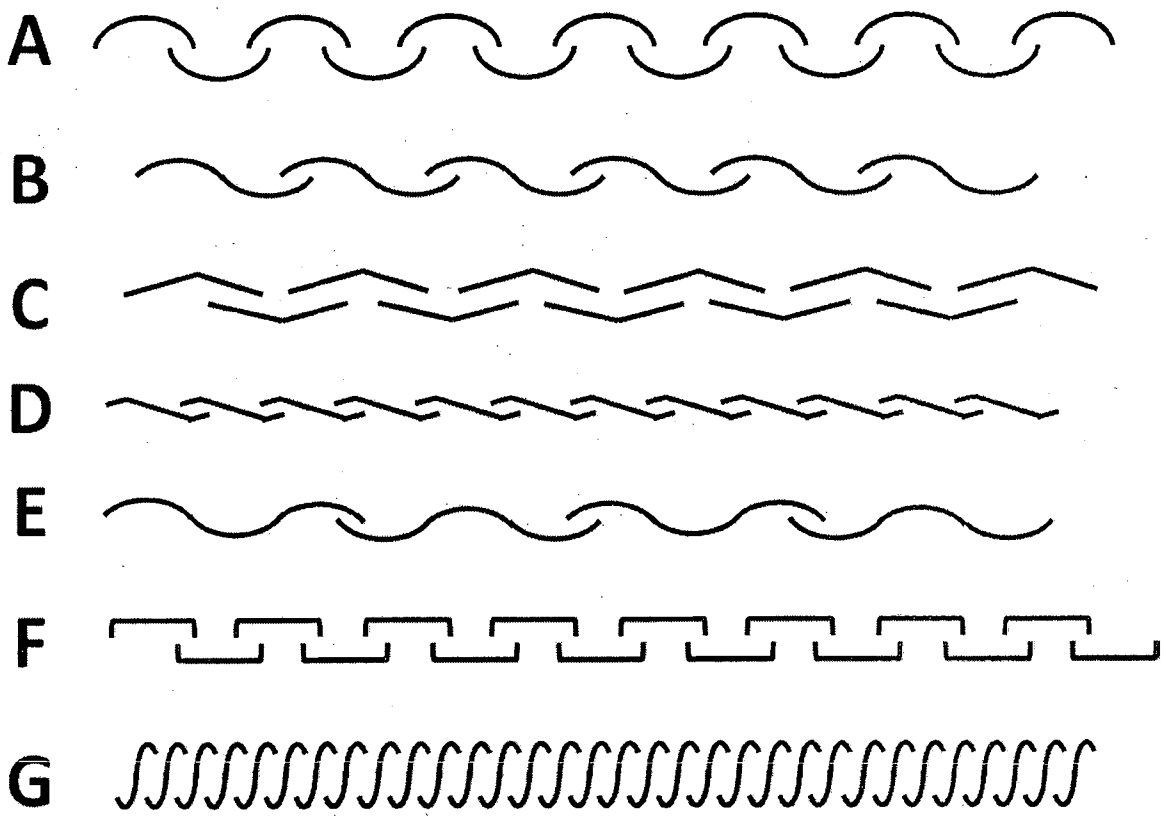


Figure 2

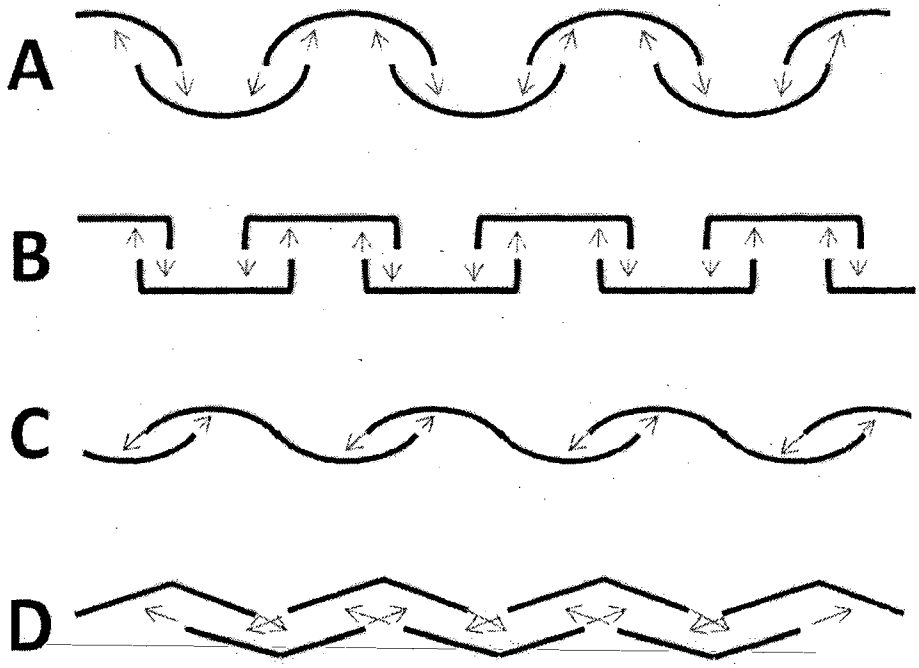


Figure 3

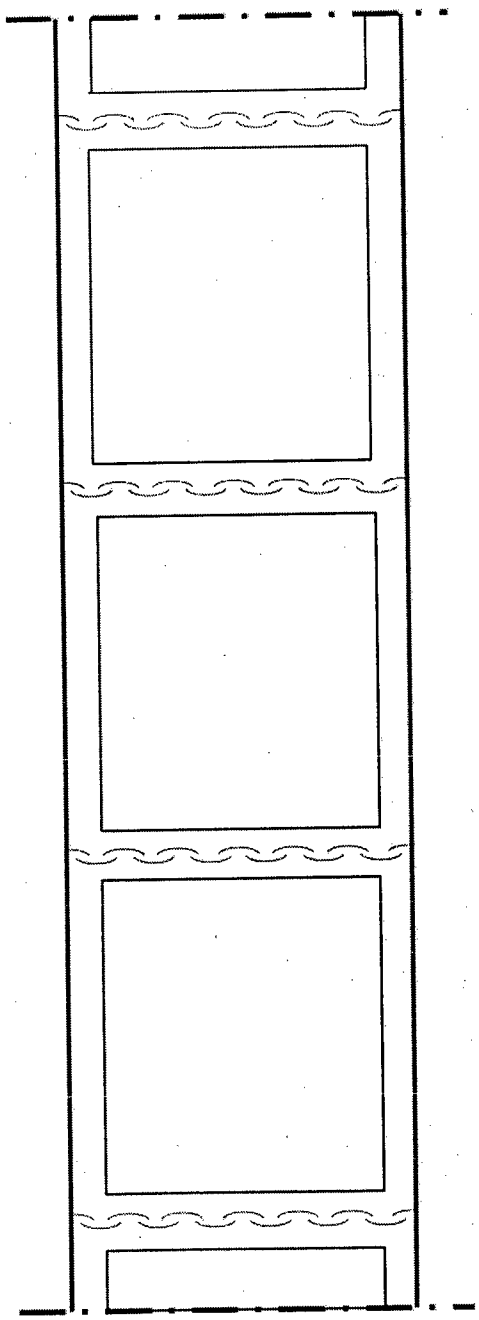


Figure 4

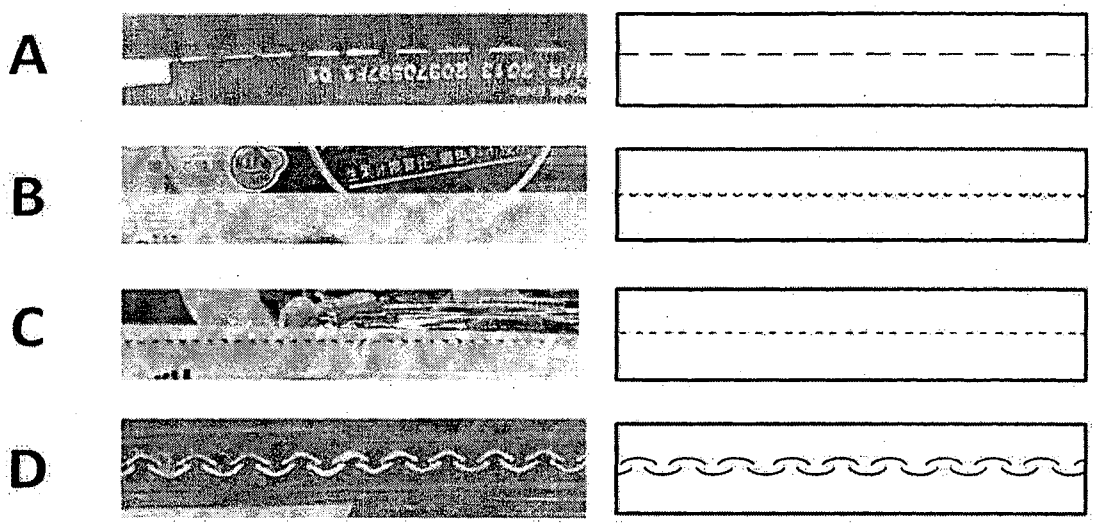
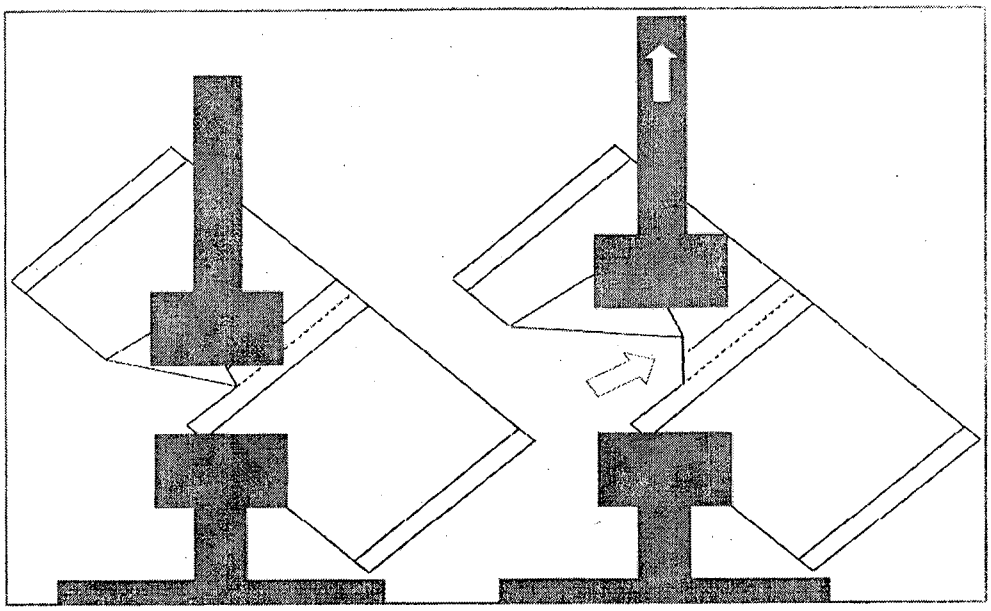
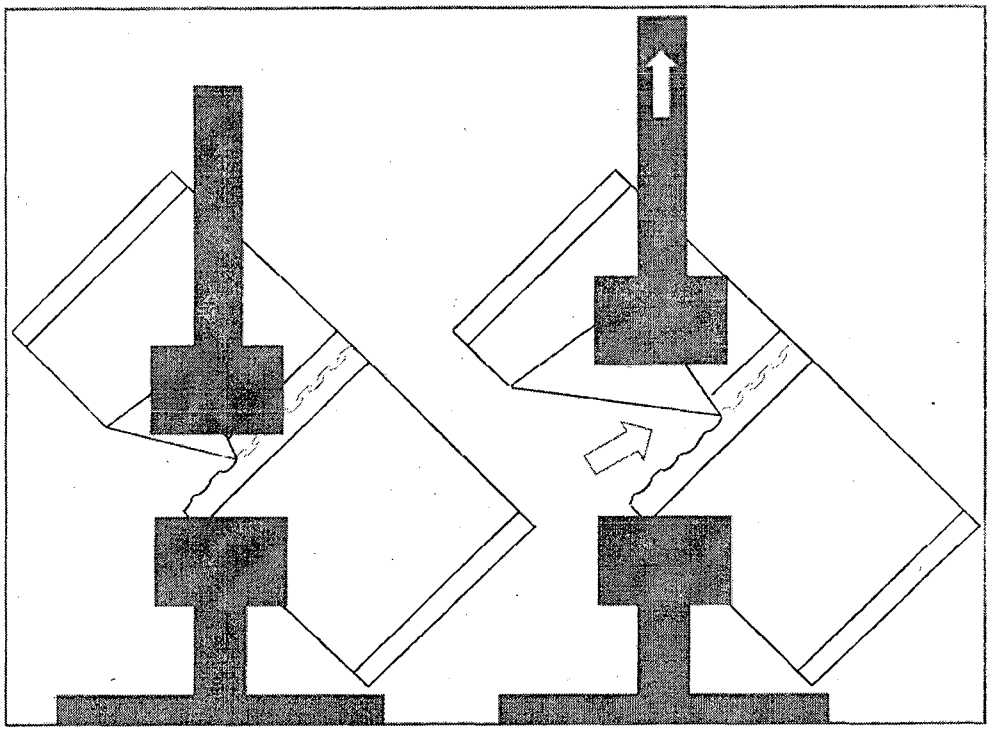


Figure 5

A



B



INTERNATIONAL SEARCH REPORT

International application No
PCT/SG2013/000248

A. CLASSIFICATION OF SUBJECT MATTER
INV. B65D75/42 B65D75/52
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)
B65D

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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X	US 2 285 542 A (TASKER HOMER G) 9 June 1942 (1942-06-09) page 1, column 1, lines 39-41 page 1, column 2, lines 42-45 figure 7 -----	1-5,7-14
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X	JP S61 144021 U (?) 5 September 1986 (1986-09-05) figure 3 -----	1,4-14
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[X] Further documents are listed in the continuation of Box C.

[X] 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

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Date of the actual completion of the international search	Date of mailing of the international search report
5 February 2014	12/02/2014

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Piolat, Olivier

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Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No
PCT/SG2013/000248

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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A	WO 2008/058389 A1 (LIQUI BOX CANADA INC [CA]; CHAPOUGNOT STEPHAN J [FR]) 22 May 2008 (2008-05-22) page 2, paragraph 4 page 2, paragraph 6 - page 3, paragraph 6 figures 4, 5 -----	1,8-14

2

INTERNATIONAL SEARCH REPORT

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