(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 345 591 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
20.07.2011 Bulletin 2011/29

(51) Int Cl.:
B65D 5/36 *(2006.01)*

(21) Application number: **10150816.6**

(22) Date of filing: **15.01.2010**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK SM TR
Designated Extension States:
AL BA RS

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(54) Foldable container box with retracting bottom part

(57) A blank (100) for a three-dimensional container box which is flat-foldable and has an automatically folding bottom part, comprising a horizontal row of four side panels (8) and a horizontal row of four bottom panels (9) adjacent to the side panels, the side panels being foldable with respect to the bottom panels over a horizontal fold line (11), and the individual side panels being foldable with respect to each other over parallel vertical fold lines (10), the individual bottom panels are foldable with respect to each other over cornering fold lines (12), and wherein two neighbouring bottom panels share one cornering fold line by which they form a pair of retractable cornering bottom panels in the three-dimensional container box. Method of forming said box from a blank, and a three-dimensional container box which is flat foldable and has a retractable bottom part.

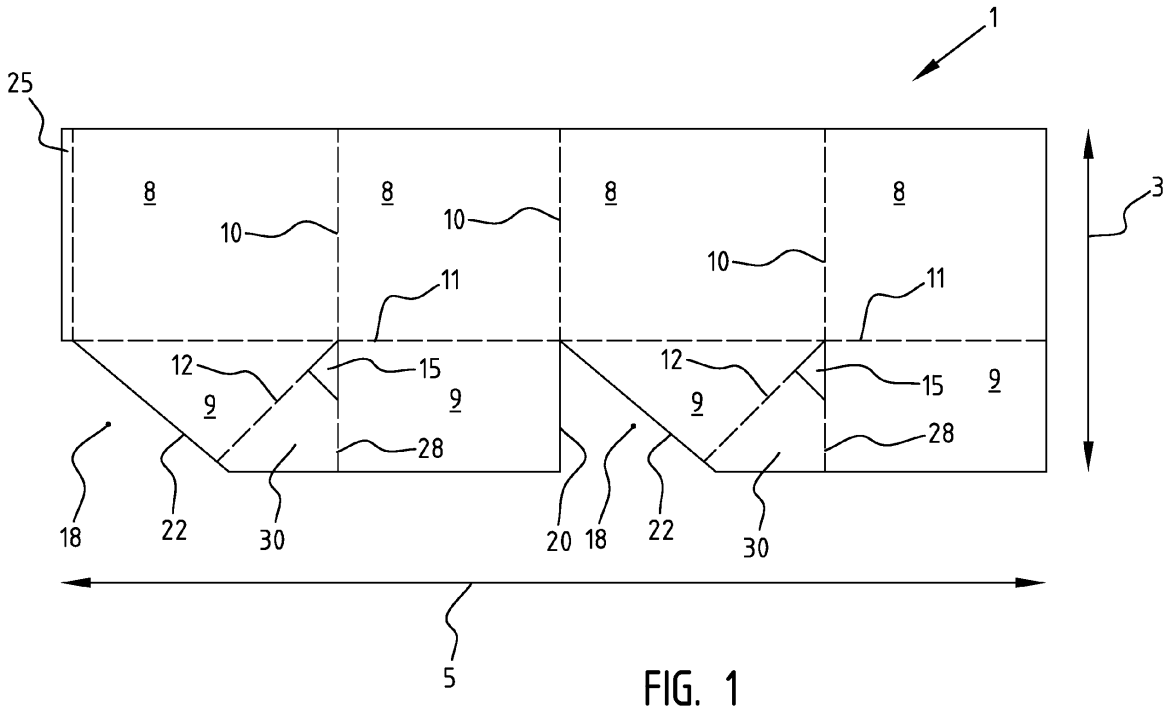

FIG. 1

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Description

[0001] The present invention relates to a container which is foldable from a flat, double-folded format into a three-dimensional container box wherein a bottom part is automatically formed. It also relates to a specific blank which is used for forming such a container, and a method of producing the foldable container from such blank.

[0002] Foldable containers, mainly made from cardboard or corrugated cardboard blanks, are known in the field. Such a container usually consists of side panels, bottom panels and top panels which are all present in the blank before the product is folded. The side panels are used as the vertical walls of the box and form together a rectangular tube. The top and bottom panels are folded such that they form a closed top and bottom surface. Boxes used for removal purposes require the user to fold the bottom and top by hand.

[0003] In order to produce a box with a self-forming bottom part, the present state of the art relies on the following major steps:

i) starting with a blank comprising a row of side panels and corresponding bottom panels, the side panels are folded towards each other and the outer side panels are glued to each other so that a tube form is constructed;
ii) bottom panels are glued to each other and folded inside the tube form of side panels according to a specific pattern and in a specific order;
iii) The product is flat folded in order to obtain a container which takes minimum space - it is more or less of a two-dimensional format - for the purpose of storage.

[0004] Such a product can be unfolded from its flat folded state into a three dimensional container wherein the side panels are brought into a tubular rectangular relationship, and the inside folded bottom panels automatically spread out to form a bottom surface.

[0005] However, this product has drawbacks: First, the folded product itself entails quite a stack of panels folded over each other, because it comprises two layers of side panels between which at least two layers of bottom panels are folded; thus at least four layers of panels are stacked in the flat folded product. In practice, this limits the use of these container boxes to panels with a small thickness, e.g. well below 5 mm., in order to avoid problems with the folding process and the unfolding. Larger thicknesses obstruct the folding and unfolding process. Typically, these structures of container boxes are used for cigarette boxes. Furthermore, the multiple folded structure inherently deviates from a perfectly flat folded structure which compromises their storage and stacking.

[0006] It is an aim of the invention to develop a new container box with a self-forming bottom part which allows the use of panels of larger dimensions and/or larger thickness than known thus far. A further aim is to develop such a container box which is easy in use, and which may be used as a single-use packaging for pellet loads (1000 x 1200 mm.). Finally, it an aim of the invention to develop a simple production method for such a container box based on known production machines.

[0007] To this aim, a non-folded blank is developed according to the claims, the blank being suitable to be formed into a container box.

[0008] In a first aspect the invention relates to a blank for a three-dimensional container box which is flat-foldable and has an automatically folding bottom part, the blank having a vertical and a horizontal dimension, comprising a horizontal row of four side panels and a horizontal row of four bottom panels adjacent to the side panels, the side panels being foldable with respect to the bottom panels over a horizontal fold line, and the individual side panels being foldable with respect to each other over parallel vertical fold lines, the individual bottom panels are foldable with respect to each other over cornering fold lines which extend from a top corner of the bottom panel to the edge of the bottom panel, the cornering fold lines having an oblique orientation with respect to the horizontal and vertical fold lines, and wherein two neighbouring bottom panels share one cornering fold line by which they form a pair of retractable cornering bottom panels in the three-dimensional container box.

[0009] The cornering fold lines have preferably an angle of 45° with respect to the horizontal and vertical fold lines. This angle, as will be shown in detail below, achieves that, when the container box formed from this blank is in its unfolded state, the side panels adapt mutual corners of 90°, while a flat bottom part is automatically formed by a retraction movement which is concomitant to the unfolding movement. In general, the angle of the cornering fold line determines the angle under which the adjacent side panels will be placed, according to the relationship: the angle with the horizontal fold line is half of the angle between neighbouring side panels.

[0010] In general the unfolding, or folding open, of the flat folded container made from the blank of the invention, is a combined movement which includes the retraction of the bottom panels into one assembled bottom part. This combined movement makes the container very easy to be formed into its three dimensional state, even when used in large dimensions for pellets. There are no specific handlings needed in forming the bottom part.

[0011] Folding lines are for the sake of clarity lines having a weakened resistance to folding, e.g. by compressing the material along that line using a roller.

[0012] Unless indicated otherwise, in this description the wording adjacent is used for parts that are vertically related, and neighbouring for parts that are horizontally related.

[0013] Preferably, in the upper corner of the bottom panel, which is adjacent to the cornering fold line, the bottom panel comprises a cut-out slot. This feature helps and eases the automatically forming of the bottom, in that less blank material is present in the bottom corners of an

unfolded container box. The automatically forming of the bottom is thus less hindered by accumulation of blank material in the bottom corners. If need be, cut-out slot may alternatively be comprised in the neighbouring bottom panel that shares the cornering fold line. Also a combination is comprised in the invention.

[0014] Preferably, the bottom panels are divided in neighbouring pairs by an incision extending over the vertical width of the bottom panels which are separated. In this way, two pairs of two bottom panels are formed, each pair sharing one cornering fold line. The retraction movement of the bottom panels is thus dependent of only two cornering fold lines, which assures a simple operation of the retraction movement.

[0015] Alternatively, all bottom panels are divided individually by an incision extending over the vertical width of the bottom panels which are separated. As will be shown below, the method of producing the flat folded container allows that neighbouring pairs of bottom panels are attached to each other in an attachment step. For that reason, the invention also comprises this alternative.

[0016] Preferably, the incision per pair is a two dimensional cut-away part extending over the vertical width of the bottom panels which are separated. Especially preferred is a triangular shape of a cut-away part which is defined along two cutting lines: one cutting line follows the vertical fold line between two adjacent side panels over the vertical width of the bottom panels, and the second cutting line is a line oblique to the vertical and horizontal fold lines and crosses the first cutting line, preferably in the upper corner of the bottom panel.

[0017] The cut-away part supports the automatic retraction of the bottom panels into a flat bottom part: it reduces the overlapping areas of bottom panels that are retracted together into an assembly forming the bottom part.

[0018] Alternatively, each bottom panel shares a cornering fold line with both its neighbouring bottom panels. This alternative allows the same automatic retraction of the bottom panels, and relies on four cornering fold lines which makes the bottom structure stronger.

[0019] Preferably, one outer side panel comprises a connecting strip for connecting with the opposite outer panel. The blank is intended to be formed into a rectangular tubular shape, which necessitates all four side walls to be consecutively connected together during the formation process. For this goal, a connecting strip which may extend over the full vertical width of the side panel, is expedient. The strip can be used to apply glue upon, and be pressed against the opposite outer panel. Alternatively the connecting strip may be applied as a separate part (i.e. not part of the blank) during the formation process.

[0020] In a second aspect, the invention relates to a method of forming a three-dimensional container box which is flat foldable, comprising:

- Flat folding a blank according to the invention, over its two outer vertical fold lines by a folding conveyor belt, so that the two outer side panels and the bottom panels adjacent to the side panels, are in an overlapping manner folded over the two inner side panels and their adjacent bottom panels,
  wherein before the flat folding is completed:

  a) glue is applied on a connecting strip for connecting the two outer side panels, and
  b) glue is applied on bottom corner connecting areas below the cornering fold line of a bottom panel,

  - the folding is completed by allowing the applied glue to harden in flat folded form of the blank, so that a flat folded container is obtained of which the outer side panels are connected over the connecting strip, and the corner connecting areas are connected to the bottom panels that overlap these areas.

[0021] This method is less complicated than known processes for forming a flat folded box having a automatically forming bottom part. In particular, the method relies on one main step of folding along one direction (i.e. the vertical direction), which is combined with steps of glue application. The method thus requires less equipment and less time because the bottom parts are not to be glued and pre-folded in a separate step.

[0022] The method is performed over a moving band conveyor which is commonly used in the field, and the conveyor is provided with glue applicators.

[0023] Advantageously, the flat folded product has only one direction of folding, instead of two, so that the product comprises less stacking of panel layers. The product allows the application of thicker material for the blank, for instance cardboard may be used of 7 to 10 mm thickness. This allows the use of so-called 'heavy duty' cardboard, which is used for more demanding situations as regards the strength of the container. The larger range of thickness for the process, also allows the production of containers of larger dimensions which necessarily require a more thick material to obtain a required rigidity so that spontaneous collapsing of the box is prevented.

[0024] The invention also relates to a three-dimensional container box which is flat foldable and is obtainable by the method of the invention.

[0025] In a third aspect, the invention relates to a three-dimensional container box which is flat foldable, comprising a blank according to the invention, wherein:

- the blank is folded over its two outer vertical fold lines, so that the two outer side panels and their corresponding bottom panels are double folded over the two inner side panels and their corresponding bottom panels, so that the outer panels oppose the inner panels in an overlapping way,

- the two outer side panels are attached to each other by attaching means, and
- bottom corner connecting areas below the cornering fold line of a bottom panel, are attached to the opposing areas of the opposed bottom panels, so that the opposing bottom panels share a cornering fold line which delimits the opposing areas that are attached to each other.

[0026] This container box is in its flat folded state easily stacked in large numbers because of its relative small thickness of two panel layers and its virtually planar character. From the stack, a user may immediately take one flat folded container, and in one single action, spread open the side panels which automatically are urged into a mutual relationship defined by the cornering fold lines. At the same time, the cornering fold lines together with the bottom connecting areas, urge the bottom panels to assemble into one bottom part.

[0027] The container thus unfolded may be used directly to place on a pellet and be filled with items to be packed. When the container is applied in transportation for single-use ('one-way use'), the container does not need to be removed from the pellet, and the assembled bottom part does not need to be further strengthened in any way.

[0028] The invention will be further demonstrated by means of a preferred embodiment, as shown in the appended figures.

Fig. 1 shows a blank according to a preferred embodiment of the invention;

Fig. 2 shows the blank prepared for forming a box (2a);

folding the blank into a flat folded box (2b) according to the method of the invention; and unfolding the flat folded box (2c) in use.

Fig. 3 shows a top-view of the bottom panels at the inside of the box, when the box is in its final unfolded shape.

Figure 1 shows a blank 1 which is designed for forming a flat foldable three dimensional container. The blank has a vertical width 3 and a horizontal width 5, and comprises four consecutive side panels 8 and four adjacent bottom panels 9, so that every side panel 8 has an adjacent bottom panel 9. The side panels are rectangular in shape and are delimited from each other by vertical folding lines 10. Each side panel 8 is delimited from the adjacent bottom panel 9 by a common horizontal folding line 11. Each two neighbouring bottom panels comprise a cornering folding line 12. Per pair of neighbouring bottom panels, one bottom panel 9 has a cut-out slot 15 in the upper corner of the bottom panel. Also one bottom panel 9 of each pair has a cut-away part 18 which is delimited by a vertical incision 20 and an oblique incision 22. The form of the cut-away part 18 is such that in folding the container box, the bottom part contains as little as possible overlapping layers of bottom panels.

[0029] To the left, one outer side panel 8 is provided with a connecting strip 25 for connecting to the opposite outer side panel 8 to the right. The bottom panels comprise further a folding line 28. The line 28 may alternatively be in the form of an incision line. A bottom corner connecting area 30 is present between folding line 12 and line 28.

[0030] Figure 2a shows a blank 1 of fig. 1, with the same features as above. In addition, the bottom corner connecting areas 30 are covered with glue which is suitable for attaching cardboard pieces together. Also the connecting strip 25 is provided with glue. The two outer side panels 8a and outer fold lines 10a are indicated in view of the process for producing the flat foldable container. The two inner side panels are marked 8b.

[0031] Figure 2b shows a blank which is flat folded over its two outer fold lines 10a, so that the two outer side and bottom panels now overlap the two inner side and bottom panels. The outer side panels 8a fully overlap the inner side panels 8b. The connecting strip 25 is overlapped by the outer side panel 8a. In the flat folded state shown in fig. 2b, the product is held until the parts 25 and 30 provided with glue are fixedly attached to their opposing and contacting surfaces by the hardened glue.

[0032] Figure 2c shows the product obtained in figure 2b, wherein one side panel 8 is lifted so that the container is unfolded from its flat folded state into a 3-dimensional box. Because of the connecting areas 30, the bottom panels 9 are automatically urged to flip according to the arrows F so that all bottom panels 9 are folded over the horizontal fold lines 11 in such a way that they are retracted and assemble into one bottom panel which is perpendicular to the side panels 8.

[0033] Figure 3 shows a top-view of the bottom panels at the inside of the box, when unfolded into its final form of a rectangular box, subsequent to the unfolding stage shown in figure 2c. In its final form, the side panels 8 (not shown) of the box are brought into a rectangular orientation, so that all neighbouring side panels 8 are in a perpendicular orientation to one another. The bottom parts of the box are formed by the folded bottom panels 9, which are retracted, folded, and partly overlap. There are two pairs of retracting cornering bottom panels: 9IA + 9IB, resp. 9IIA + 9IIB. Each pair has a common cornering folding line 12 which urges each pair in perpendicular orientation towards the side panels when the box is unfolded. The oblique incision lines 22 limiting the 9IA and 9IIA panels, are chosen such that the respective incision lines border on each other in the final unfolded state of the box. Effectively these panels do not overlap which assures an easy unfolding.

[0034] The opposite side of the bottom part of the box, is formed by the two retracted bottom panels 9IB and 9IIB which are bordering on each other at the dotted line 40. Effectively these two rectangular bottom panels cover

the whole bottom of the box at the outside.

Claims

1. A blank (1) for a three-dimensional container box which is flat-foldable and has an automatically folding bottom part, the blank having a vertical and a horizontal dimension, comprising a horizontal row of four side panels (8) and a horizontal row of four bottom panels (9) adjacent to the side panels, the side panels (8) being foldable with respect to the bottom panels (9) over a horizontal fold line (11), and the individual side panels (8) being foldable with respect to each other over parallel vertical fold lines (10), the individual bottom panels (9) are foldable with respect to each other over cornering fold lines (12) which extend from a top corner of the bottom panel to the edge of the bottom panel, the cornering fold lines (12) having an oblique orientation with respect to the horizontal (11) and vertical fold lines (10), and wherein two neighbouring bottom panels (9) share one cornering fold line (12) by which they form a pair of retractable cornering bottom panels (9) in the three-dimensional container box.

2. A blank (1) according to claim 1, wherein in the upper corner of the bottom panel (9), which is adjacent to the cornering fold line (12), the bottom panel comprises a cut-out slot (15).

3. A blank (1) according to one of the preceding claims, wherein the bottom panels (9) are divided in neighbouring pairs by an incision (18) extending over the vertical width of the bottom panels (9) which are separated.

4. A blank (1) according to one of the preceding claims, wherein all bottom panels (9) are divided individually by an incision (18) extending over the vertical width of the bottom panels (9) which are separated.

5. A blank (1) according to one of the preceding claims, wherein the incision (18) per pair is a two dimensional cut-away part (18) extending over the vertical width of the bottom panels (9) which are separated.

6. A blank (1) according to one of the preceding claims, wherein each bottom panel (9) shares a cornering fold line (12) with both its neighbouring bottom panels (9).

7. A blank (1) according to one of the preceding claims, wherein one outer side panel (8) comprises a connecting strip (25) for connecting with the opposite outer panel (8).

8. A method of forming a three-dimensional container box which is flat foldable, comprising:

   - flat folding a blank (1) according to one of the preceding claims 1-7, over its two outer vertical fold lines (10a) by a folding conveyor belt, so that the two outer side panels (8a) and the bottom panels (9) adjacent to the side panels, are in an overlapping manner folded over the two inner side panels (8b) and their adjacent bottom panels (9),
   wherein before the flat folding is completed:

      a) glue is applied on a connecting strip (25) for connecting the two outer side panels (8a), and
      b) glue is applied on bottom corner connecting areas (30) below the cornering fold line (12) of a bottom panel (9),

   - the folding is completed by allowing the applied glue to harden in flat folded form of the blank (1), so that a flat folded container is obtained of which the outer side panels (8a) are connected over the connecting strip (25), and the corner connecting areas (30) are connected to the bottom panels (9) that overlap these areas.

9. A three-dimensional container box which is flat foldable and is obtainable by the method of claim 8.

10. A three-dimensional container box which is flat foldable, comprising a blank (1) according to one of the preceding claims 1-7,
    wherein:

    - the blank (1) is folded over its two outer vertical fold lines (10a), so that the two outer side panels (8a) and their corresponding bottom panels (9) are double folded over the two inner side panels (8b) and their corresponding bottom panels (9), so that the outer panels (8a) oppose the inner panels (8b) in an overlapping way,
    - the two outer side panels (8a) are attached to each other by attaching means (25), and
    - bottom corner connecting areas (30) below the cornering fold line (12) of a bottom panel (9), are attached to the opposing areas of the opposed bottom panels (9), so that the opposing bottom panels (9) share a cornering fold line (12) which delimits the opposing areas that are attached to each other.

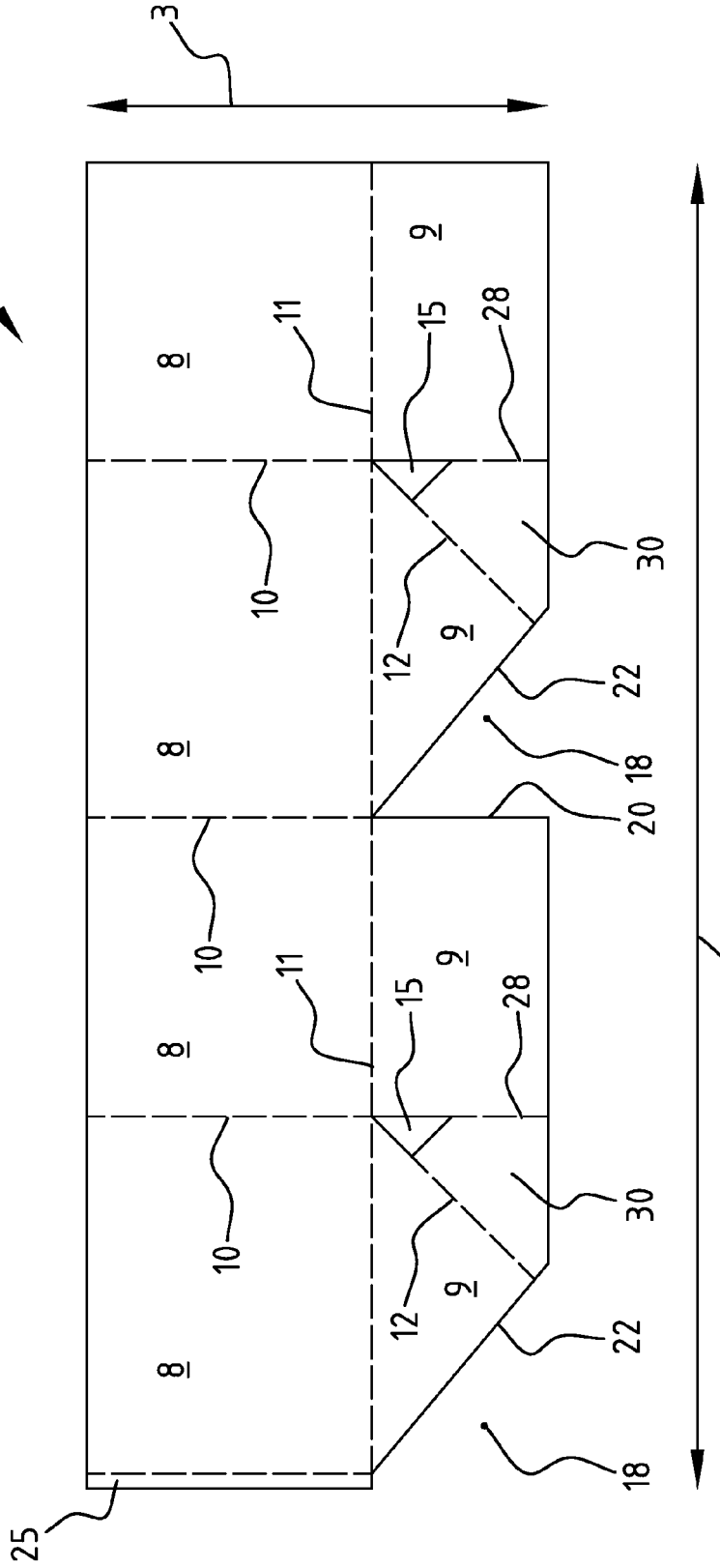

FIG. 1

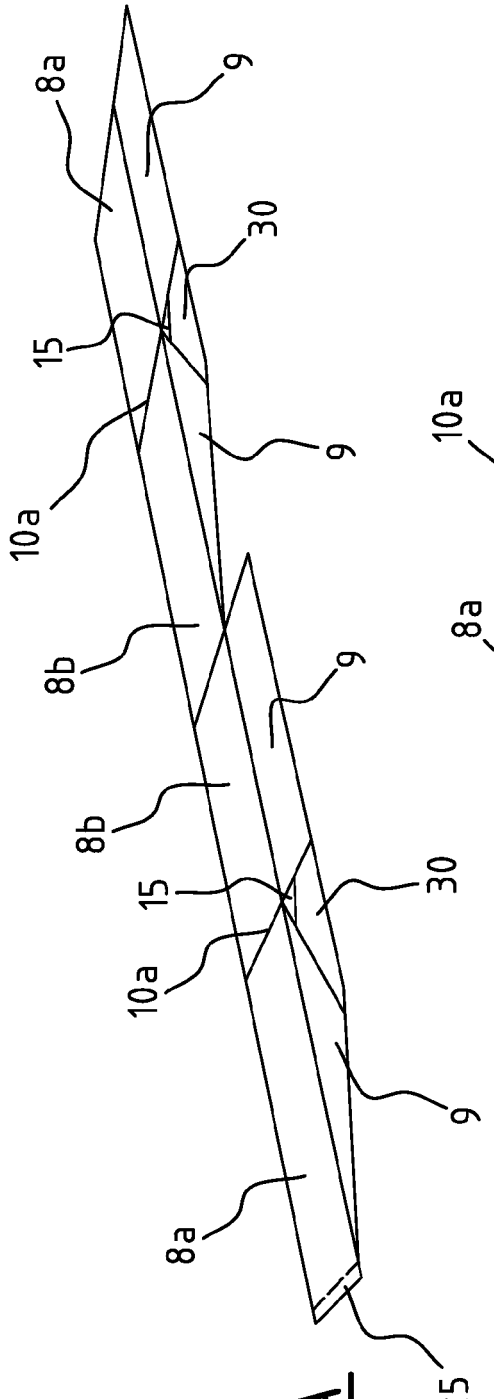

FIG. 2A

FIG. 2B

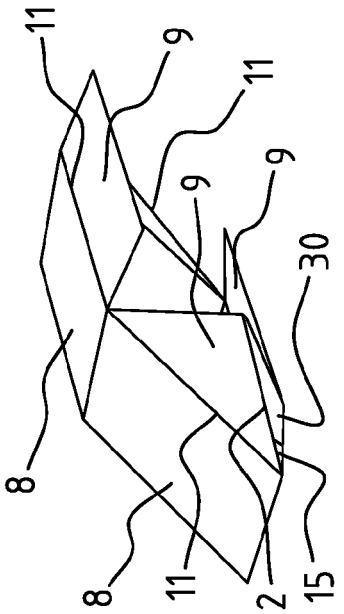

FIG. 2C

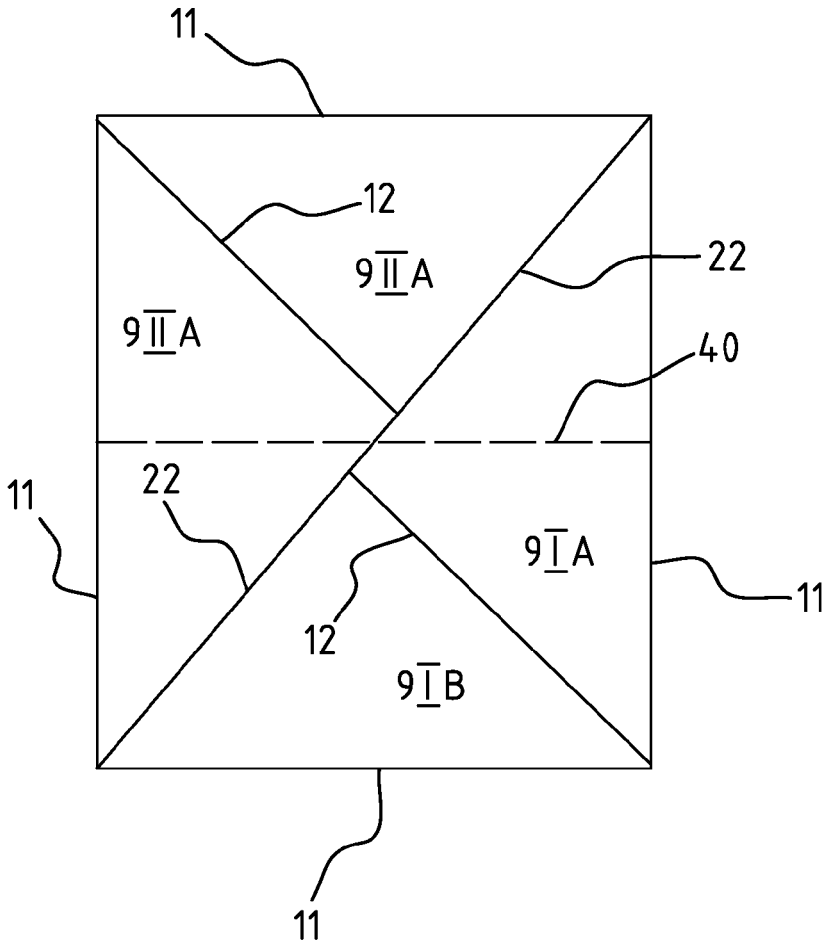

FIG. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 10 15 0816

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 6 557 749 B1 (GILL WALTER S [US]) 6 May 2003 (2003-05-06) * column 4, line 26 - column 5, line 15 * * column 5, line 23 - line 38; claims 1,2,6,8,24,25; figures 1-7 * -----	1-10	INV. B65D5/36
X	WO 2004/041525 A2 (INT PAPER CO [US]; MOSS WILLIAM F [US]; ABSHIRE TONY J [US]) 21 May 2004 (2004-05-21) * page 4, line 20 - page 6, line 3; claims 1-3,6,8,9,12; figures 1-6 * -----	1-10	
X	GB 2 357 278 A (FIELD GROUP PLC [GB]) 20 June 2001 (2001-06-20) * page 3, line 11 - line 32; figures 1-4 * -----	1-7	

TECHNICAL FIELDS SEARCHED (IPC)

B65D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	21 April 2010	Janosch, Joachim

CATEGORY OF CITED DOCUMENTS

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21-04-2010

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