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(54) BOX-FORMING PUNCHED BLANK WITH AUXILIARY FOLDING INCISIONS

(57) Punched blank (10;110) extending in a longitudinal lengthwise direction X-X and transverse widthwise direction Y-Y formed by a central body of corrugated cardboard, the opposite sides of which in a direction of thickness thereof are closed by a respective thinner paper covering layer subdivided into first surfaces (11) and second surfaces (12), alternating along the longitudinal direction and connected together by means of associated incision lines or transverse seams (13a, each first surface (11) comprising respective inner flaps (11a) and each second surface (12) comprising respective outer flaps (12a), all extending outwards in the transverse direction (Y-Y), each flap (11a, 12a) being connected to the respective surface (11, 12) by a longitudinal seam (11b, 12b), and wherein each inner flap (11a) is separated in a transverse direction from the adjacent outer flap (12a) by means of transverse cuts (14), wherein said longitudinal folding seams (11b, 12b) are aligned along the longitudinal direction (X-X); and said punched blank has auxiliary incisions (50;150) formed on the outer flaps (12a) of the second surfaces (12) and respectively provided extending from the longitudinally opposite transverse sides of the respective flap (12a) and towards the inside thereof, being arranged at a suitable distance from the folding incision (12a) of the flap and with a depth such as to deform the inner covering layer and the corrugated body of the punched blank.

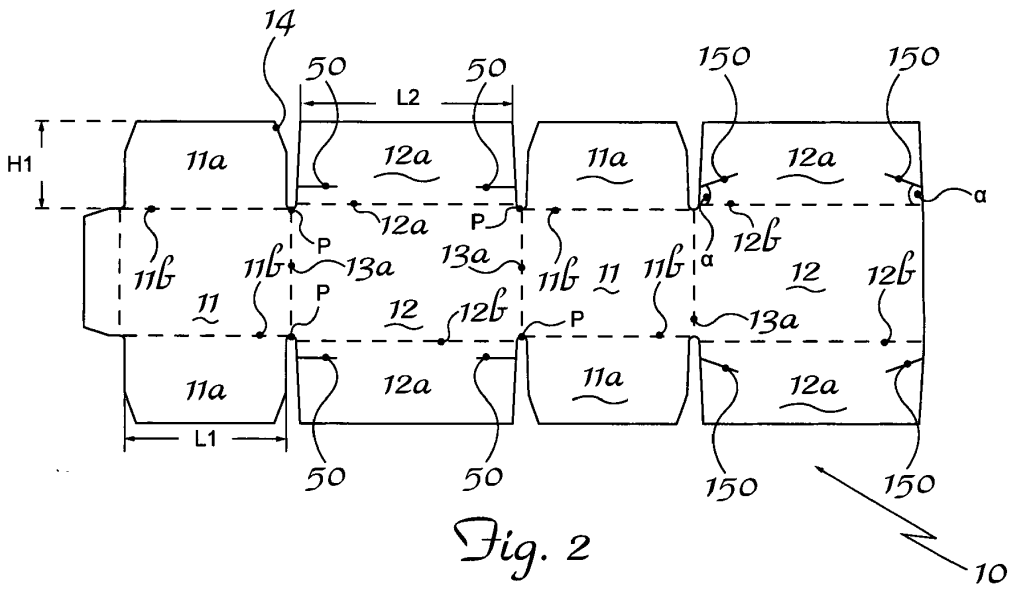


Fig. 2

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Description

[0001] The present invention relates to a punched blank for forming boxes, comprising associated surfaces and flaps and comprising auxiliary incision lines along the flaps of greater length in the longitudinal direction or outer flaps.

[0002] It is known, in the product packaging sector, that there exists the need to provide boxes of varying formats which, after introduction of the product to be packaged inside them, must be closed by means of gluing of the closing flaps or application of strips of adhesive tape for retaining them.

[0003] These boxes are formed from punched blanks comprising a central body of corrugated cardboard with suitable gramme weight, the opposite sides of which in a direction of thickness thereof are closed by a respective much thinner paper covering layer. It is also known that closing of the boxes is performed along continuous forming/filling/closing lines and that any defects occurring during closing of the box result in jamming of the boxes along the production lines with consequent stoppage of the plant and an increase in the production downtime and therefore costs.

[0004] In addition to this, any defects in the box can be detected only at the end of the cycle when it is no longer possible to remedy the problem.

[0005] Among the most common causes of improper closing of the boxes there is that due to the fact that, at the time of folding of the flaps in order to obtain closing of the box, the inner flaps, the folding lines of which are at the same height as the folding lines of the outer flaps, tend to exert on the outer flaps an outwards thrust which opposes closing thereof, resulting in the aforementioned operational problems during the subsequent processing steps and non-planarity of the top surface of the formed box. An example of this known technique is illustrated in US 2012/061456 which describes a punched blank with folding seams aligned in the longitudinal direction and which has cuts passing through the punched blank, formed along the longitudinal folding seams, so as to create visible reinforcing teeth along the entire perimeter when the box is formed and closed and designed to ensure a greater stacking stability and capacity of the formed boxes.

[0006] In an attempt to remedy these drawbacks, according to the prior art, the folding lines 1,2 (or "seams") of the flaps are cut (Fig. 1) offset relative to each other in the transverse direction Y-Y so that, upon folding, the inner flaps are arranged at a different height than the outer flaps and do not interfere with the latter.

[0007] Although serving its function, this method involves however the need to subject the punched blank to two separate punching steps for formation of the longitudinal folding lines (seams) of the flaps; this involving the need for remachining of the part, machine stoppages and consequent increased production costs.

[0008] The offset arrangement of the folding seams, moreover, has a significant negative effect on the performance of the box when the latter are subjected to vertical compression for example in the case of transportation of multiple boxes stacked on top of each other; the box does not act in fact over the whole of its base, but exclusively on the two higher sides (associated with the outer flaps), this meaning that, in order to obtain the compressive resistance required by the client, it is necessary to increase the gramme weight of the material with a consequent increase in the final cost of the box.

[0009] In addition to that above the known boxes, in particular if they have a vertical dimension, corresponding to the height of the box, greater than the transverse dimensions forming its support base, are subject to deformations which make the box unstable during its movement on production lines and/or on transportation pallets.

[0010] Examples of this known technique are described in US 3,182,887 in which the folding seams are not aligned and the outer closing flaps of the box have cuts only on the inner covering layer which are designed to allow delamination thereof so that it may be folded over to ensure hermetic sealing of the closure.

[0011] The technical problem which is posed, therefore, is to provide a punched blank for the production of boxes, which is able to ensure a better stability of the boxes as well as a reduction of the outward thrusts exerted by the inner flaps on the outer flaps, said thrusts causing gluing defects and preventing correct closure of said flaps.

[0012] In connection with this problem it is also required that the punched blank should be able to be produced in a single continuous cycle using cardboard with a low gramme weight such that the final cost of the box may be contained, while allowing at the same time a high compressive strength.

[0013] The present invention relates furthermore to a box with improved stability, the inner flaps of which are such as not to exert thrusts preventing correct closure of the outer flaps.

[0014] These results are obtained according to the present invention by a punched blank according to the characteristic features of Claim 1.

[0015] The present invention relates furthermore to a box formed by means of said punched blank according to Claim 9. Such a box formed from a punched blank according to Claim 1 has flap folding seams which are aligned in the longitudinal direction and it may therefore be produced in a cost-effective manner without the need for a double machining pass on the punched blank, the box having moreover a greater compressive strength. Owing to the particular auxiliary incisions, the reopening, ungluing and deformation stresses which arise in the boxes of the prior art formed from punched blanks with aligned folding seams are eliminated, without having to sacrifice the production cost efficiency and the compressive strength of the said boxes.

[0016] Further details may be obtained from the following description of a non-limiting example of embodiment

of the subject of the present invention, provided with reference to the accompanying drawings, in which:

Figure 1: shows a plan view of a punched blank according to the prior art for the formation of a box;
Figure 2: shows a plan view of a punched blank according to the present invention for the formation of a box;
Figs. 3a and 3b: show front elevation views of boxes which are respectively formed from the punched blank according to the invention and according to the prior art;
Figs. 4a and 4b: show views of the top closing flaps of boxes respectively made with the punched blank according to the invention and according to the prior art;
Figure 5: shows a plan view of a further example of a punched blank according to the prior art;
Figure 6: shows a plan view of a punched blank similar to that of Fig. 5, but realized according to the present invention; and
Figure 7: shows a plan view of a variation of embodiment of the punched blank according to the present invention.

[0017] As shown in Fig. 2 and assuming solely for easier description a longitudinal axis X-X corresponding to the lengthwise extension of the punched blank, a transverse axis Y-Y corresponding to the width of the punched blank and a vertical axis Z-Z corresponding to the height of the box formed, the punched blank 10 according to the present invention comprises according to the prior art a central body of corrugated cardboard with suitable gramme weight closed on the opposite sides (in the thickness direction) by a respective much thinner paper covering layer; the punched blank is cut in a conventional manner so as to produce two surfaces 11 and two surfaces 12 which are whole and which alternate with each other in the longitudinal direction X-X and are provided with respective inner flaps 11a and outer flaps 12a arranged on opposite sides of the respective surface 11,12 and extending outwards in the transverse direction Y-Y.

[0018] In detail the two surfaces 11 have a longitudinal lengthwise dimension L1 smaller than the longitudinal lengthwise dimension L2 of the surfaces 12.

[0019] It is envisaged, however, that the respective longitudinal dimensions may coincide.

[0020] Each transverse side common to the surfaces 11 and 12 has a transverse incision 13a; and each longitudinal side common to the surfaces 11,12 and the respective flaps 11a,12a has longitudinal incisions 11b,12b all designed to allow easier folding of each part with respect to the other part; these incisions, referred to also by the term "seams", are aligned with each other in the longitudinal or transverse direction and therefore formed by means of a single machining pass.

[0021] The flaps 11a will also be conventionally identified below as "inner flaps", while the flaps 12a will be identified as "outer flaps" in accordance with the respective position assumed upon folding for formation of the box.

[0022] Each flap is also separated from the adjacent flap by means of a transverse cut 14 which extends from the longitudinal free edge of each flap to the point P of intersection of the longitudinal seams 13a, between flaps 11a,12a and respective surface 11,12, and the transverse seams 13b, between surface 11 and surface 12, so as to ensure the separation of the inner flap from the respective adjacent outer flaps. As shown in Fig. 2, the punched blank according to the invention has auxiliary incisions 50 formed on the outer flaps 12a of the surfaces 12.

[0023] Said incisions 50 have a depth such as to deform at least the inner covering layer and the corrugated body of the punched blank, but preferably not the outer covering layer which may remain intact. Preferably, the incisions 50 are straight and discontinuous.

[0024] According to a first embodiment shown, in the outer left-hand flap 12a in Fig. 1, said auxiliary incisions 50 are parallel to the folding incisions 12b of the flaps and extend - preferably symmetrically - from the opposite transverse sides of the flap 12a towards the inside thereof. Preferably the auxiliary incisions 50 have a length in the longitudinal direction comprised between 20% and 150% of H1, wherein H1 is the transverse dimension of the respective outer flap 12a. Preferably, the incisions 50 are arranged at a distance from the folding incision 12a of the outer flap comprised between 5 mm and 40% of L2 wherein L2 is the longitudinal dimension of the inner flap 11a. As shown on the right-hand flap 12a of Fig. 2, according to a second embodiment of the punched blank according to the invention the incisions 150 are straight, discontinuous and inclined towards the outer free edge of the flap relative to the longitudinal seams 12b of the said flap 12. Preferably the auxiliary incisions 150 have a length comprised between 5 mm and 40% of L2, wherein L2 is the longitudinal dimension of the inner flap 11a. Preferably the angle α of inclination of the auxiliary incision 150 is comprised between 5° and 70°.

[0025] Although not shown it is envisaged that each side of the flap has more than two inclined auxiliary incisions 150 parallel to each other.

[0026] Figs. 3a, 3b show different behaviours of a box A formed from the punched blank according to the invention and a box B formed with punched blanks according to the prior art.

[0027] A comparison of the components of the two boxes show the different angles of deformation between the box A and the box B and in particular:

- the smaller angle of deformation (0.63) in the transverse direction of the box A with respect to the corresponding angle (3.89) of the box (Fig. 3b);
- the smaller opening angle (0.93/1.32) in the vertical direction of the inner/outer flap, respectively, compared to the corresponding angles 3.13/3.93 of the

flaps of the box B (Fig. 3a).

[0028] The auxiliary incisions therefore have a buffer function which prevents the reopening stresses exerted by the inner flaps on the outer flaps.

[0029] Figs. 5,6 show two punched blanks respectively formed with folding seam sections which are unaligned according to the prior art and with aligned seams and offset auxiliary incisions according to the invention.

[0030] Experimental tests have shown a compressive strength of the box according to the prior art (Fig. 5) of BCT=200 kg, as opposed to a compressive strength of the box according to the invention (Fig. 6) of BCT=280 kg.

[0031] This means that, for the same compressive strength, it is possible to provide the box according to the invention with a lower gramme weight of the material, resulting in an advantageous reduction in the final costs of the box, moreover avoiding the need for further machining passes needed to form the non-aligned folding seams.

[0032] Although not shown, it is envisaged that the auxiliary incisions may be realized in different forms such as Shark lines, free forms, punched forms, seams, half-cuts, or a combination of perforations and alternate seams.

[0033] According to a further embodiment of the punched blank according to the invention (Fig. 7) it is envisaged that the auxiliary incisions 50 have an end section 50a which is situated far from the transverse free edge of the respective inner flap and is folded at an acute angle or is curvilinear, with its concavity directed towards the respective surface 12.

[0034] It is therefore clear how with the punched blank according to the invention and the box obtained therefrom it is possible to perform correct machining of the material also along automatic lines, avoiding the need for remachining of the cardboard in order to form unaligned seams and drastically reducing the probability of errors during closing of the box and therefore the possibility of plant stoppages.

[0035] In addition to this the compressive strength and resistance to opening of the closing flaps of the boxes formed with the punched blank according to the invention are greatly improved compared to the boxes of the prior art, resulting in more reliable handling of the boxes both during production and during transportation on pallets and stacking on shelves or the like.

[0036] Depending on the quality characteristics required for the end product it is possible to carry out single pass machining operations on machines such as Casemaker FFG (Flexo-Folder-Gluers), flat punching machines and rotary punching machines.

[0037] The present relates furthermore to a method for forming a punched blank according to the invention comprising the steps of:

-) preparing a central body of corrugated cardboard with suitable gramme weight, the opposite sides of which in a direction of thickness thereof are closed by a respective thinner paper covering layer;

-) forming at least a first and a second folding incision or seam 11b, 12b, parallel to each other and parallel to a longitudinal direction X-X, each designed to form folding lines aligned longitudinally for folding the inner or outer flaps relative to a respective first or second surface 11, 12; this step may be performed by means of a single machining pass using a suitably shaped forming roller.

-) forming:

-- at least a first and second folding incision or seam 13a, parallel to each other and parallel to a transverse direction Y-Y, designed to form lines for folding a first surface 11 relative to an adjacent second surface 12,

-- transverse cuts 14 designed to separate each inner flap (11a) from the adjacent outer flap (12a), and

-- auxiliary incisions 50;150 formed on the outer flaps 12a of the second surfaces 12, respectively provided extending from the longitudinally opposite transverse sides of the respective flap 12a and towards the inside thereof, arranged at a suitable distance from the longitudinal folding incision or seam 12b of the flap and with a depth such as to deform the inner covering layer and the corrugated body of the punched blank. This step may also be performed by means of a single pass in a machine using a suitably shaped forming roller.

[0038] With the punched blank thus obtained it is possible to form a box by folding the punched blank along the folding lines and suitably gluing the inner and outer flaps.

Claims

1. Punched blank (10;110) extending in a longitudinal lengthwise direction X-X and transverse widthwise direction Y-Y formed by a central body of corrugated cardboard, the opposite sides of which in a direction of thickness thereof are closed by a respective thinner paper covering layer subdivided into first surfaces (11) and second surfaces (12), alternating along the longitudinal direction and connected together by means of associated incision lines or transverse seams (13a), each first surface (11) comprising respective inner flaps (11a) and each second surface (12) comprising respective outer flaps (12a), all extending outwards in the transverse direction (Y-Y), each flap (11a, 12a) being connected to the respective surface (11, 12) by a longitudinal incision or seam (11b, 12b), and wherein each inner flap (11a) is separated in a transverse direction from the adja-

cent outer flap (12a) by means of transverse cuts (14), wherein said longitudinal folding seams (11b, 12b) are aligned along the longitudinal direction (X-X); **characterized in that** it has auxiliary incisions (50;150) formed on the outer flaps (12a) of the second surfaces (12) and respectively provided extending from the longitudinally opposite transverse sides of the respective flap (12a) and towards the inside thereof, being arranged at a suitable distance from the folding incision or seam (12b) of the flap and with a depth such as to deform the inner covering layer and the corrugated body of the punched blank.

2. Punched blank according to Claim 1, **characterized in that** said auxiliary incisions (50;150) are straight and discontinuous.

3. Punched blank according to Claim 1 or 2, **characterized in that** said auxiliary incisions (50) are parallel to the folding incisions (12b) of the flaps.

4. Punched blank according to Claim 3, **characterized in that** said auxiliary incisions (50) have a length in the longitudinal direction comprised between 20% and 150% of H1, wherein H1 is the transverse dimension of the respective outer flap (12a).

5. Punched blank according to any one of Claims 1-4, **characterized in that** said auxiliary incisions (50) are arranged at a distance from the folding incision (12a) of the flap comprised between 5 mm and 40% of L2, wherein L2 is the longitudinal dimension of the inner flap (11a).

6. Punched blank according to Claim 1, **characterized in that** said auxiliary incisions (150) are inclined (α) towards the outer free edge of the flap relative to the longitudinal seams (12b) of the said flap (12).

7. Punched blank according to Claim 6, **characterized in that** said auxiliary incisions (150) have a length comprised between 5 mm and 40% of L2, wherein L2 is the longitudinal dimension of the inner flap (11a).

8. Punched blank according to Claim 6, **characterized in that** the angle of inclination of the auxiliary incisions (150) is comprised between 5° and 70°.

9. Punched blank according to Claim 6, **characterized in that** each side of the flap has more than two auxiliary incisions (150) parallel to each other.

10. Punched blank according to any one of Claims 1-9, **characterized in that** said auxiliary incisions (50) have an end section (50a) which is situated far from the transverse free edge of the respective inner flap and is folded at an acute angle or is curvilinear, with its concavity directed towards the respective adjacent surface (12).

11. Box formed from a punched blank (10,50;10,150) according to Claim 1.

12. Method for forming a punched blank according to Claim 1, comprising the steps of:

-) preparing a central body of corrugated cardboard with suitable gramme weight, the opposite sides of which in a direction of thickness thereof are closed by a respective thinner paper covering layer;
-) forming at least a first and a second folding incision or seam (11b, 12b), parallel to each other and parallel to a longitudinal direction (X-X), each designed to form folding lines aligned longitudinally for folding the inner or outer flaps relative to a respective first or second surface (11, 12);
-) forming:

-- at least a first and second folding incision or seam (13a), parallel to each other and parallel to a transverse direction (Y-Y), designed to form lines for folding a first surface (11) relative to an adjacent second surface (12),
-- transverse cuts (14) designed to separate each inner flap (11a) from the adjacent outer flap (12a), and
-- auxiliary incisions (50;150) formed on the outer flaps (12a) associated with the second surfaces (12), respectively provided extending from the longitudinally opposite transverse sides of the respective flap (12a) and towards the inside thereof, arranged at a suitable distance from the longitudinal folding incision or seam (12b) of the flap and with a depth such as to deform at least the inner covering layer and the corrugated body of the punched blank.

13. Method according to the preceding claim, wherein the step of forming the longitudinal incisions or seams is performed by means of a single pass of a suitably shaped forming roller and/or wherein the step of forming the folding incisions or seams (13a) in the transverse direction (Y-Y) and the transverse cuts (14) and the longitudinal auxiliary incisions (50;150) is performed by means of a single pass of a suitably shaped forming roller.

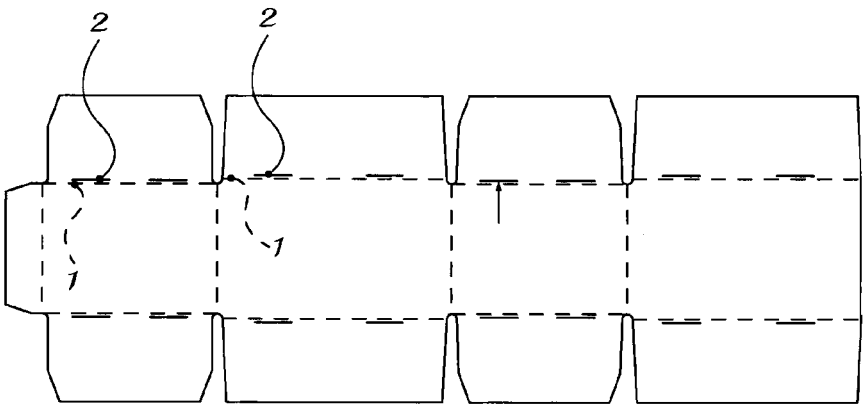


Fig. 1 PRIOR ART

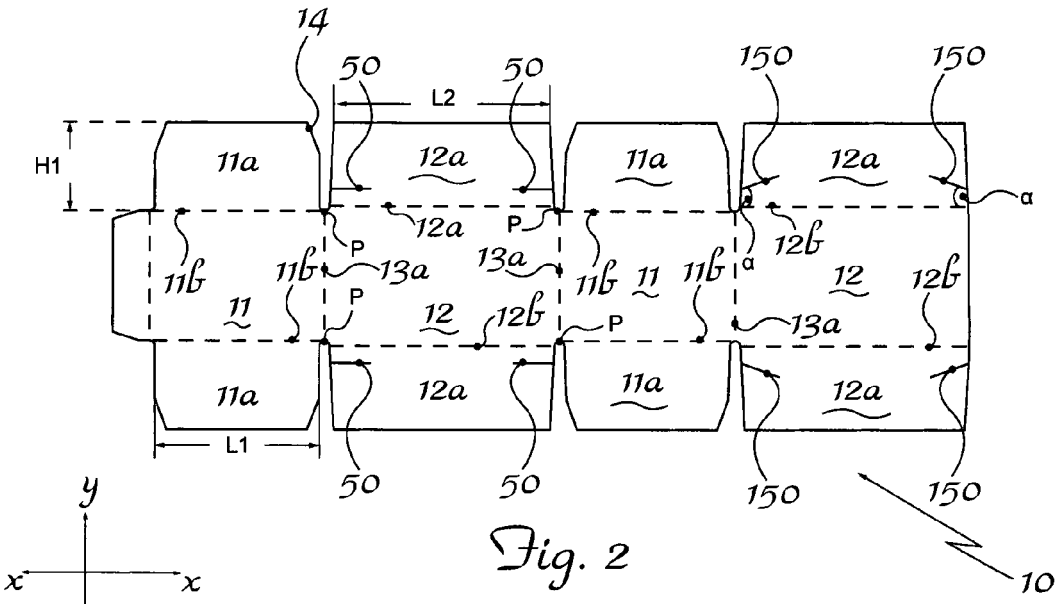


Fig. 2

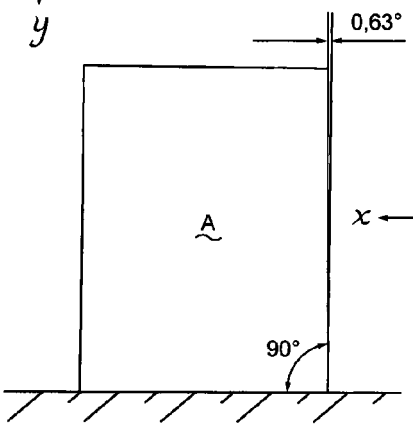


Fig. 3a

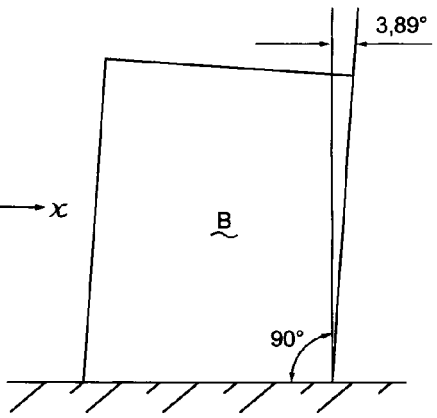


Fig. 3b

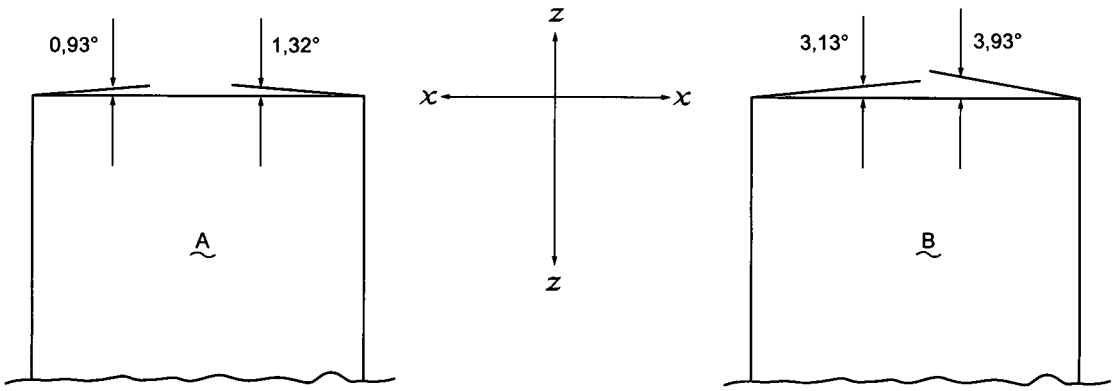


Fig. 4a

Fig. 4b

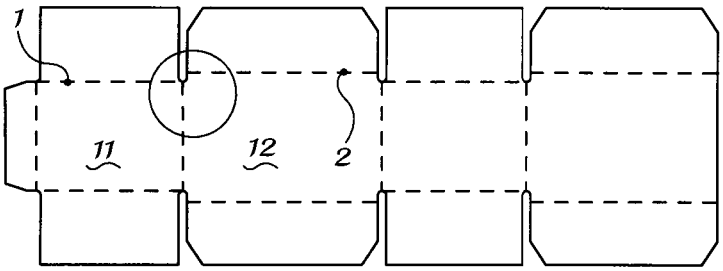
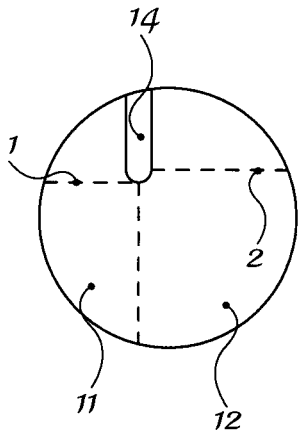


Fig. 5



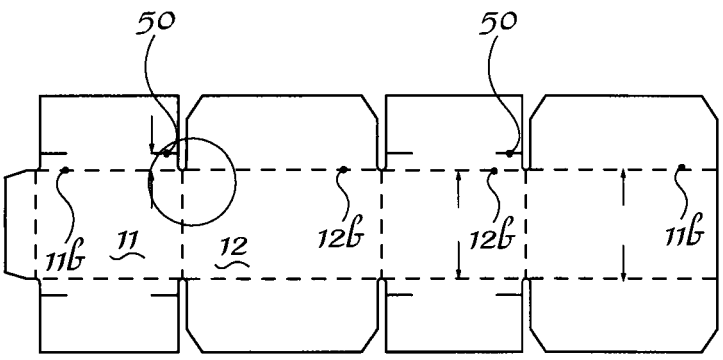
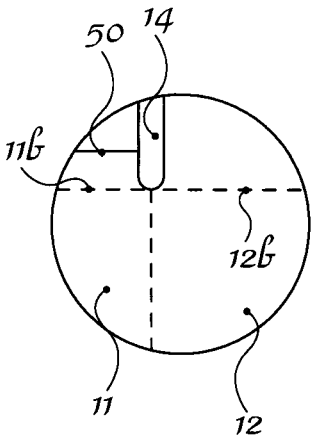
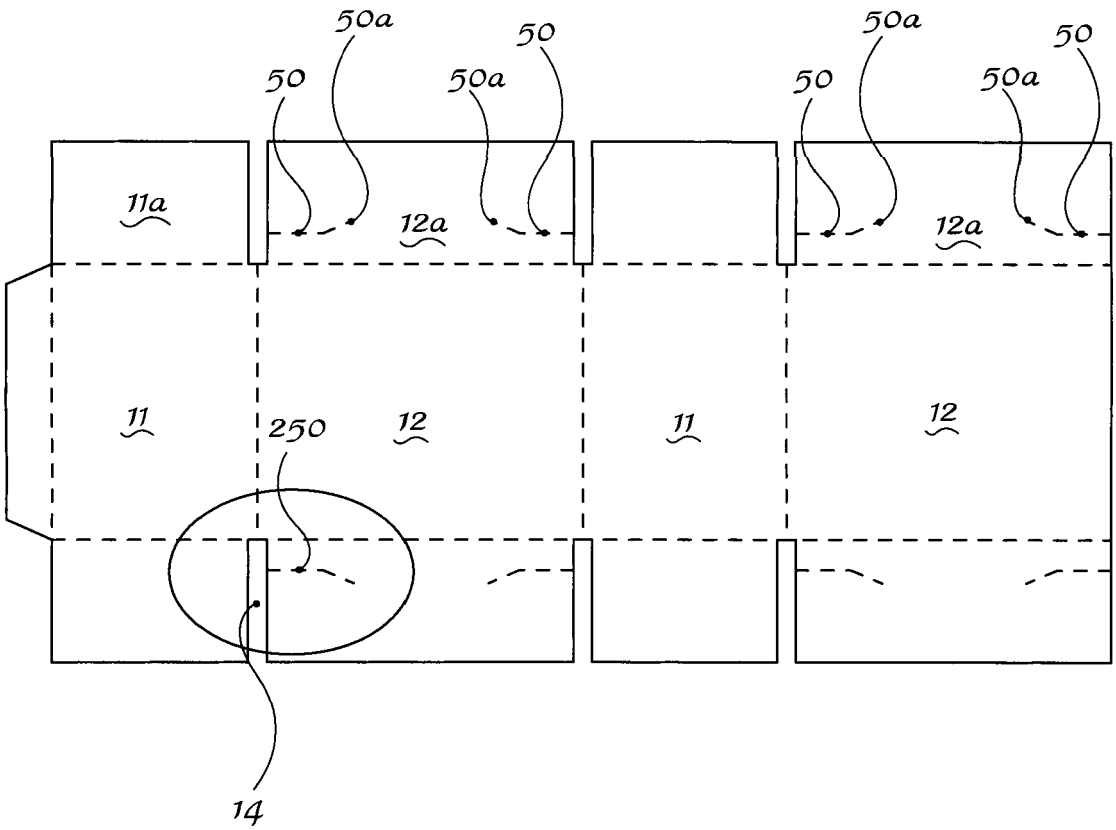


Fig. 6




50a
50
50a
50
50a
50
50a
50
11a
12a
12a
11
250
12
11
12
14

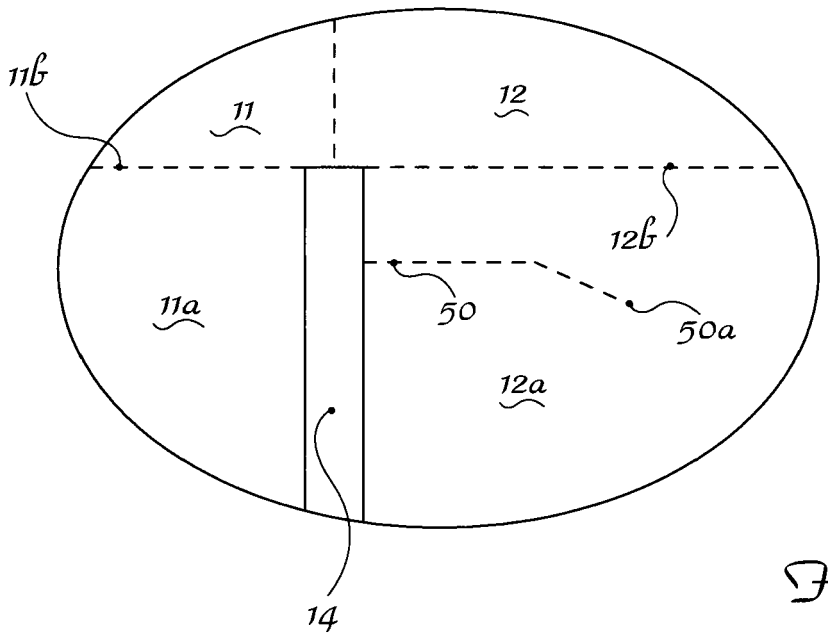

11b
11
12
12b
11a
50
50a
12a
14

Fig. 7

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EUROPEAN SEARCH REPORT

Application Number
EP 17 18 4303

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,D	US 2012/061456 A1 (ROSAS RAFAEL GONZALEZ [MX] ET AL) 15 March 2012 (2012-03-15) * figure 2 * -----	1-3, 11-13	INV. B65D5/02 B65D5/42
A,D	US 3 182 887 A (LARSON LOUIS P) 11 May 1965 (1965-05-11) * column 2, line 54 - column 4, line 22; figures 1, 10 * -----	1-8,11, 12	
A	US 278 851 A (J.C. BAUER) 5 June 1883 (1883-06-05) * figure 1 * -----	1,2,6, 11,12	

TECHNICAL FIELDS SEARCHED (IPC)

B65D
B31B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	9 October 2017	Balz, Oliver

CATEGORY OF CITED DOCUMENTS

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EPO FORM 1503 03.82 (P04C01)

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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US 3182887 A	11-05-1965	NONE	
US 278851 A	05-06-1883	NONE	

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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