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

(11) EP 3 266 603 A1

(12) EUROPEAN PATENT APPLICATION
published in accordance with Art. 153(4) EPC

(43) Date of publication:
10.01.2018 Bulletin 2018/02

(21) Application number: **15883930.8**

(22) Date of filing: **03.03.2015**

(51) Int Cl.:
B31B 1/88 *(0000.00)* ***B65D 81/38*** *(2006.01)*

(86) International application number:
PCT/JP2015/056267

(87) International publication number:
WO 2016/139762 (09.09.2016 Gazette 2016/36)

(84) Designated Contracting States:
AL 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 RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA

(71) Applicant: **Tokan Kogyo Co., Ltd.**
Tokyo 141-0022 (JP)

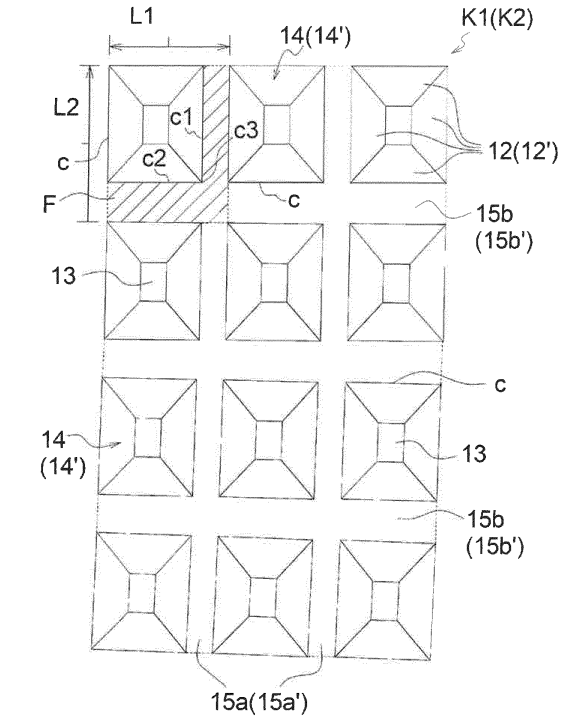
(72) Inventor: **KADOWAKI, Sadakazu**
Tokyo 141-0022 (JP)

(74) Representative: **Green, Mark Charles**
Urquhart-Dykes & Lord LLP
Euston House
24 Eversholt Street
London NW1 1AD (GB)

(54) PAPER CUP, AND MANUFACTURING METHOD AND MANUFACTURING DEVICE THEREFOR

(57) The present invention pertains to the following: a manufacturing method and a manufacturing device for a paper cup in which a pair of embossing rolls form opposing embossments in a middle section of the paper cup or an outer sleeve which is wrapped around the outer circumference of the middle section; and the improvement of the paper cup. [Solution] Each of dies formed on the surface of a pair of embossing rolls has substantially an identical shape and is provided with the following: a frame section that is formed of a flat surface and that partitions cells which are surrounded by lattice frames extending at regular intervals in the horizontal and vertical directions and mutually crossing; and a projection section that includes four lateral-wall surfaces that raise up from the four directions of the sides of a cell towards the center of the cell, and a peak section formed in a plane or linear shape by assembled distal ends of the lateral-wall surfaces. A pair of the dies are characterized in that: the projection sections of the dies are disposed in a direction of approaching a blank; the vertical and horizontal lengths of a quadrangular shape of a unit section are each set as one pitch, the unit section including a cell, frame sections of two sides respectively extending along the adjacent vertical and horizontal side of the cell, and an intersection of these two frame sections; and one die of the pair is offset by half the pitch in the horizontal and vertical directions with respect to the other die.

Fig 7



EP 3 266 603 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to a paper cup including an inner cup around which outer circumference an embossed outer sleeve is wrapped, a manufacturing method and a manufacturing device therefor.

BACKGROUND

[0002] Conventionally paper cups are used to contain hot and cold drinks. One commonly known paper cup is treated with heat insulation against high temperature of hot drinks to allow users to hold with fingers the outer circumference of the paper cup without burn injuries.

[0003] One typical example is a heat-insulating cup, as disclosed in Patent Document 1, and includes a lateral wall portion around which outer circumference a heat-insulating paper sheet is wrapped, which further includes protruding portions and recessed portions alternately arranged.

[0004] Advantageously, such protruding portions and recessed portions formed on the heat-insulating sheet cut off direct heat transmission from a hot drink to the outer circumference of the cup. This heat insulation effect allows users to readily hold with fingers the outer circumference of the cup.

[0005] Heat insulation efficiency can be improved by raising or arranging densely protruding portions. Unfortunately, this approach is inappropriate in die embossment, because each die presses a blank of a heat-insulating sheet, resulting in cracks or damages thereto.

[0006] A similar drawback was found in embossed sheets provided with recessed and protruding portions, whether heat insulated or not.

[0007] That is, a conventional sheet-forming method is pressing or roll-forming, using dies (male-and-female mating type). The pressing method fails to pull out a blank in sequence to be interwoven. On the other hand, the roll-forming method employs an upper die and a lower die whose recessed and protruding patterns are inversion of the upper die. These two dies can be engaged with each other without allowance at pressed portions, thereby pulling and cutting a blank or causing wrinkles thereon.

PRIOR ART DOCUMENTS

PATENT DOCUMENTS

[0008] Patent Document 1: JP-A-2603108

SUMMARY OF THE INVENTION

PROBLEM TO BE SOLVED BY THE INVENTION

[0009] In view of the problems with the above-mentioned prior art, an object of the present invention is to provide a paper cup formed by using a pair of opposed dies formed on the surface of a pair of opposed embossing rolls disposed so as to have substantially an identical shape and allow protruding portions of the dies to face each other, with the pair of opposed dies disposed out of alignment by half a pitch in the vertical and horizontal directions to emboss a blank traveling between the pair of embossing rolls so as have protruded and densely arranged protruding portions, resulting in no cracks or damages to the blank, a manufacturing method and a manufacturing device therefor.

MEANS FOR SOLVING THE PROBLEM

[0010] To solve the aforementioned problem, the invention according to claim 1 is to provide a method for manufacturing a paper cup, including: embossing with a pair of opposed embossing rolls a blank of an outer sleeve that is wrapped around a middle section of the paper cup or the outer circumference of the middle section, wherein a pair of opposed dies formed on the surface of the pair of opposed embossing rolls are disposed so as to have substantially an identical shape and include: a frame section that is formed of a flat surface and that partitions quadrangular cells that are surrounded by lattice frames extending at regular intervals in the vertical and horizontal directions and mutually crossing; and a projection section that includes four lateral wall surfaces that protrude from four sides of the cell towards the center of the cell and a peak section formed in a plane or linear shape at distal ends of the lateral wall surfaces, the dies of the pair of embossing rolls are arranged so as to allow projection sections thereof to face and approach the blank, and the vertical and horizontal lengths of a unit quadrangle are each set as one pitch, the unit quadrangle including the cell, and a frame section defined by two sides respectively extending along the vertical and horizontal sides adjacent to the cell within an intersection of the two sides, with the pair of opposed dies disposed out of alignment by half a pitch in the vertical and horizontal directions to provide the blank with recessed and protruding portions.

[0011] The invention according to claim 2 is characterized in that a peak section of each projection section of one of the pair of opposed dies approaches and faces a predetermined intersection of frame sections in the center of four projection sections adjacent to each other in the vertical and horizontal directions of the opposed die, four corner sections of lateral wall surfaces of each projection section of one of a pair of opposed dies approach and face a corner section of each of four projection sections of the opposed die so as to be in alignment therewith,

an inclined plane except four corner sections of the lateral wall surfaces of each projection section of one of a pair of opposed dies aslant faces a frame section of the opposed die, and a frame section between a pair of projec-

tion sections adjacent in the vertical or horizontal direction of one of a pair of opposed dies faces and crosses a frame section between a pair of projection sections adjacent in the vertical and horizontal directions of the opposed die so as to be spaced from each other.

[0012] The invention according to claim 3 is characterized in that a peak section of each projection section of a pair of opposed dies is set within the width of a frame section of the opposed die that faces the peak section.

[0013] The invention according to claim 5 is to provide a device for manufacturing a paper cup by embossing with a pair of opposed embossing rolls a blank of an outer sleeve that is wrapped around a middle section of the paper cup or the outer circumference of the middle section, wherein

a pair of opposed dies formed on the surface of the pair of opposed embossing rolls are disposed so as to have substantially an identical shape and include: a frame section that is formed of a flat surface and that partitions quadrangular cells that are surrounded by lattice frames extending at regular intervals in the vertical and horizontal directions and mutually crossing; and a projection section that includes four lateral wall surfaces that protrude from four sides of the cell towards the center of the cell and a peak section formed in a plane or linear shape at distal ends of the lateral wall surfaces,

the dies of the pair of embossing rolls are arranged so as to allow projection sections thereof to face and approach the blank, and the vertical and horizontal lengths of a unit quadrangle are each set as one pitch, the unit quadrangle including the cell, and a frame section defined by two sides respectively extending along the vertical and horizontal sides adjacent to the cell within an intersection of the two sides, with the pair of opposed dies disposed out of alignment by half a pitch in the vertical and horizontal directions to provide the blank with recessed and protruding portions.

[0014] The invention according to claim 7 provides a paper cup formed by embossing with a pair of opposed embossing rolls a blank of an outer sleeve that is wrapped around a middle section of the paper cup or the outer circumference of the middle section, wherein

the surface of the blank includes : a frame section that is formed of a flat surface and that partitions quadrangular cells that are surrounded by lattice frames extending at regular intervals in the vertical and horizontal directions and mutually crossing; and a projection section that includes four lateral wall surfaces that protrude from four sides of the cell towards the center of the cell and a peak section formed in a plane or linear shape at distal ends of the lateral wall surfaces, the back surface of the blank includes: a frame section that is formed of a flat surface and that partitions quadrangular cells that are surrounded by lattice frames extending at regular intervals in the vertical and horizontal directions and mutually crossing and disposed out of alignment by half a pitch in the vertical and horizontal directions of the frame section of the surface; a projection section that includes four lateral wall surfaces that protrude from the back surface of the blank to other lateral side from four sides of the cell towards the center of the cell and a bottom section formed in a plane or linear shape at distal ends of the lateral wall surfaces, a recessed portion being formed out of alignment by half a pitch in the vertical and horizontal directions of the projection section of the surface viewed from the surface of the blank; and an inclined plane where the lateral wall surfaces of the protruding portion and the lateral wall surfaces of the recessed portion correspond to each at least four corner sections.

[0015] Herein, paper cups include not only cup-shaped paper containers, but also stencil paper cups laminated with films of various materials.

EFFECT OF THE INVENTION

[0016] The paper cup, the manufacturing method and the manufacturing device therefor of the present invention are capable of embossing a blank of an outer sleeve that is wrapped around a middle section of the paper cup or the outer circumference of the middle section using a pair of embossing rolls that include opposed dies having substantially an identical shape whose projection sections face each other and that are disposed out of alignment by half a pitch in the vertical and horizontal directions, the blank's surface and back surface being pressed to raise each protruding portion and increase the density thereof without cracks or damages to the blank.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017]

FIG. 1 is a front view overall illustrating an embossed paper cup;

FIG. 2 is a front view illustrating one example of embossing rolls;

FIG. 3 is a side view illustrating a pair of embossing rolls;

FIG. 4(a) is a fragmentary cross-sectional view illustrating a pair of opposed dies for embossment viewed from the upper side of a blank;

FIG. 4(b) is a fragmentary cross-sectional view illustrating a pair of opposed dies form embossment viewed from the lower side of a blank;

FIG. 5 is a developed view illustrating a die viewed in front;

FIG. 6 is a front view partially illustrating upper and lower projection sections and a frame section of a die;

FIG. 7 is an explanatory drawing viewed in a plane partially illustrating a die for embossing the upper portion of a blank;

FIG. 8(a) is an explanatory drawing illustrating a pair of opposed dies press a blank;

FIG. 8(b) is an explanatory drawing illustrating positional relationships of a pair of opposed dies with

reference to hatched areas in FIG. 8(a);

FIG. 9(a) is an explanatory drawing viewed in a plane illustrating one of a pair of opposed dies for embossing the lower portion of a blank;

FIG. 9(b) is an explanatory drawing viewed in a plane illustrating the other of a pair of opposed dies for embossing the lower portion of a blank;

FIG. 10 is an explanatory drawing illustrating hatched areas when one of a pair of opposed dies shown in FIG. 9 presses a blank;

FIG. 11(a) is an end view taken along the line of x-x of FIG. 8(a);

FIG. 11(b) is an end view taken along the line of y-y of FIG. 8(a);

FIG. 11(c) is an end view taken along the line of z-z of FIG. 8(a); and

FIG. 11(d) is an explanatory drawing illustrating that in FIG. 11(a), portions both engaged by a pair of opposed dies (denoted by line) and portions put otherwise are arranged on the horizontal axis, and the vertical direction is defined as the flow of embossing rolls.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Example 1

[0018] FIG. 1 is a side view of the paper cup of this embodiment. Numeral "1" denotes a paper cup, "2" an inner cup, "3" an outer sleeve, "4" a protruding portion formed on the outer sleeve 3, and "5" a recessed portion formed on the outer sleeve 3.

[0019] The paper cup 1 of this Example, as shown in FIG. 1, consists of an inner cup 2 formed of an inverted truncated cone that is open upward and an embossed outer sleeve 3 that is wound around the outer circumference of the middle section of the inner cup 2 as a known form. In the present invention, the paper cup 1 may not be provided with an outer sleeve 3, but the middle section of the inner cup may directly be embossed.

[0020] In this Example, the outer sleeve 3 is a blank B formed of a sector, the outer sleeve 3 is provided with protruding portions 4 arranged vertically and horizontally at regular intervals surrounded by a large number of quadrangular frame sections 6 formed of a lattice along the vertical (height) direction and the horizontal (arc) direction of the paper cup, and recessed portions 5 where intersection of the frame sections 6 come at the bottommost position (see a die in FIG. 5) .

[0021] Consider that in a paper cup provided with such an outer sleeve, protruding portions 4 are arranged at regular intervals in the vertical and horizontal directions of the paper cup. The width of a protruding portion 4 disposed on the outer sleeve 3 in the upper portion of the paper cup and the width of a frame section 6 must be set smaller stepwise down the paper cup. The vertical width of each protruding portion 4 may be the same through the vertical line, or may be any length such as shorter length in either upper or lower direction as long as the protruding portions 4 are arranged at regular intervals.

[0022] Further, the protruding portions 4 may be set so as to be lower down the paper cup, thereby allowing stacked paper cups to be readily pulled out one after another.

[0023] In the figure, a lattice frame section 6 is a square or rectangle where a vertical line and a horizontal line cross at right angles, but in the present invention, the frame section 6 may be a tetragon such as a rhombus whose lines cross at non-right angles. The protruding portions 4 may be arranged aslant in the vertical and horizontal directions.

[0024] Then, one example of dies K1, K2 that form the protruding portions 4 and the recessed portions 5 will be described.

[0025] The dies K1, K2 are each formed of the same shape, and formed on the surface of a pair of embossing rolls R1, R2, respectively. In the figure, the die K1 is defined as an upper die, the die K2 as a lower die. The lower die embosses a blank B, followed by the upper die by half a pitch, but in the present invention, the upper die may emboss a blank B first (FIGS. 2 to 6).

[0026] For reference, the same components of different dies are distinguished by a numeral with or without a symbol "'".

[0027] The die K1 (K2), as partially shown in FIG. 7, comprises strip-shaped and flat frame sections 15a, 15b (15a', 15b') formed of a lattice frame that crosses in the vertical and horizontal directions, and a projection section 14 (14') that includes four lateral wall surfaces 12 (12') that aslant protrude from each side of each quadrangular cell c towards the center of the cell c partitioned by the frame sections 15a, 15b, and a peak section 13 (13') formed in a plane or linear shape by distal ends of the lateral wall surfaces 12.

[0028] Herein, the cell c corresponds to the outer circumference of the proximal end of the projection section 14.

[0029] The dies K1, K2, as shown in FIG. 4 (a) and (b), are each disposed on the pair of embossing rolls R1, R2 so that peak sections 13, 13' of projection sections 14, 14' of the dies K1, K2, respectively, face each other out of alignment.

[0030] It is to be noted that FIG. 4 (a) shows recessed and protruding portions on the upper side of a paper cup, and FIG. 4 (b) shows recessed and protruding portions on the lower side of a paper cup. The lower projection sections 14, 14' are of lower height and shorter width than the upper projection sections 14, 14' (see FIG. 6).

[0031] Herein, a smaller width is attributed to the fact that in this Example, the number of upper projection sections in a row in the horizontal direction and the number of lower projection sections in a row in the horizontal direction are set as the same.

[0032] In the dies K1, K2, one pitch is defined as having the vertical and horizontal lengths L1, L2 of a rectangle are each set as one pitch, and the rectangle includes the

quadrangular cell c, and an L-shaped frame section F (shaded area in FIG. 7) defined by two sides c1, c2 respectively extending along the vertical and horizontal sides adjacent to the cell within an intersection c3 of the two sides. A die K1 of one embossing roll R1 is disposed by half a pitch in the vertical and horizontal directions (L1/2, L2/2) after the die K2 of the other embossing roll R2 to emboss a blank (see FIG. 8).

[0033] Accordingly, a peak section 13 of each projection section 14 of one die K1 (in thin line in FIG. 8(a)) approaches and faces an intersection 15c' of frame sections 15a' and 15b' in the center surrounded by four projection sections 14' adjacent to each other in the vertical and horizontal directions of the opposed die K2 (in thick line in FIG. 8 (a)). Four corner sections 12c of lateral wall surfaces 12 of each projection section 14 of one of the pair of opposed dies K1 are disposed to approach and face corner sections 12c' adjacent to lateral wall surfaces 12' of each of the four projection sections 14' of the opposed die K2 on an inclined plane of substantially the same angle (see FIG. 11).

[0034] Likewise, a peak section 13' of each projection section 14' of the other die K2 approaches and faces an intersection 15c of frame sections 15a and 15b in the center surrounded by four projection sections 14 adjacent to each other in the vertical and horizontal directions of the opposed die K1. Four corner sections 12c' of lateral wall surfaces 12' of each projection section 14' of the other die K2 are disposed to approach and face corner sections 12c adjacent to lateral wall surfaces 12 of each of the four projection sections 14 of the opposed die K1 on an inclined plane of substantially the same angle.

[0035] In the figure, the corner sections 12c, 12c' refer to a scope where ends of lateral wall surfaces 12 adjacent in one projection section come in contact with each other and projection sections 14, 14' are overlapped by defining an edge extending from the upper end to the lower end of the two lateral wall surfaces as substantially the center.

[0036] In other words, the corner sections in the figure consist of a square or rectangle in a plan view. With the edge as a diagonal line, each of the corner sections includes two planes that incline from the edge in the vertical and horizontal directions of the cell c.

[0037] A blank B travels between the embossing rolls R1, R2 provided with the dies K1, and K2, which are as disposed above. The blank B is subsequently pressed and embossed to have recessed portions 5 and protruding portions 4.

[0038] Herein, projection sections 14 of one die K1 form protruding portions 4 on the surface of the blank B, and projection sections 14' of the other die K2 form protruding portions and recessed portions 5, viewed from the surface of the blank B and the back surface of the blank B, respectively.

[0039] With reference to FIGS. 8 (a) and (b), a portion "A" (FIG. 8(b)) for forming a peak section of a protruding portion 4 is pressed after a peak section 13 of the projection section 14 and an intersection 15c' of frame sections 15a' , 15b' that faces the peak section 13 approach in parallel with each other.

[0040] Conversely, a portion "D" for forming a bottom section of a recessed portion 5 is pressed after a peak section 13' of the projection section 14' and an intersection 15c of frame sections 15a, 15b that faces the peak section 13' approach in parallel with each other.

[0041] Then, a portion "B" for forming a corner section of lateral wall surfaces of a protruding portion 4 and a corner section of lateral wall surfaces of a recessed portion 5 is pressed after four corner sections 12c of lateral wall surfaces 12 of the projection sections 14 approach corner sections 12c' adjacent to lateral wall surfaces 12' of the four projection sections 14' so as to form an inclined plane having substantially the same angle therewith.

[0042] A portion "C" that faces a frame section 15b' formed of a flat surface is defined as an inclined plane extending in the vertical and horizontal directions of a peak section 13 in the center of lateral wall surfaces 12 except four corner sections 12c of lateral wall surfaces 12 of the projection sections 14.

[0043] Likewise, a portion "E" that faces a frame section 15b formed of a flat surface is defined as an inclined plane extending in the vertical and horizontal directions of a peak section 13' in the center of lateral wall surfaces except four corner sections 12c' of lateral wall surfaces 12' of projection sections 14'.

[0044] The portions "C" and "E" are pressed, with one inclined surface approaching a flat surface and the other inclined surface being spaced from the flat surface. Consequently, the blank is slightly nipped on the approaching side, but is released on the spaced side.

[0045] A portion "F" is defined as an intersection of a frame section 15a' sandwiched between two portions "C" opposed between projection sections 14 adjacent to each other in the vertical direction and a frame section 15b sandwiched between two portions "E" opposed between projection sections 14' adjacent to each other in the horizontal direction. The portions "F" face each other, with flat frame sections spaced from each other.

[0046] Likewise, a portion "F" is defined as an intersection of a frame section 15a sandwiched between two portions "E" opposed between projection sections 14' adjacent to each other in the vertical direction and a frame section 15b' sandwiched between two portions "C" opposed between projection sections 14 adjacent to each other in the horizontal direction. The portions "F" face each other, with flat frame sections spaced from each other. The F portion is not pressed with frame sections spaced during pressing work, and the deformation of the blank B is not limited thereto.

[0047] As described above, the blank B is embossed both from the surface and back surface, the surface and back surface of the blank B are embossed out of alignment by half a pitch in the vertical and horizontal directions to have recessed portions and protruding portions.

[0048] Conventionally blanks have been entirely sand-

wiched throughout the plane, causing entire and uniform deformation, but in this Example the dies K1, K2 don't sandwich a blank B throughout the plane, but linearly. Accordingly, during die pressing, the blank B has portions left to be freely deformed by being pulled out towards the side of higher load to form protruding portions and recessed portions. Consequently, this technique allows a certain difference in the height of recessed and protruding portions to be secured and protruding portions to be embossed as densely as possible, without cracks or damages to the blank B.

[0049] That is, a blank can freely move at both ends sandwiched throughout the plane (and linearly) in the axial direction. (see FIGS. 11(a) and (d)).

[0050] Meanwhile, the dies K1, K2 press and sandwich the blank to emboss the blank and unpressed portions (i.e., freely moving portions of the blank) one after another with rotating embossing rolls R1, R2.

[0051] In other words, as shown in FIG. 11(d), a freely moving portion at both ends of a sandwiched portion is subsequently sandwiched with the rotating rolls.

[0052] Accordingly, the pressed and unpressed portions with the dies K1, K2 are uniformly distributed in the axial direction.

[0053] For the above reasons, the blank can be embossed with few wrinkles or fractures.

[0054] In this Example, as described above, in a paper cup formed from a blank, the width of projection sections 14, 14' and frame section 15a, 15a' becomes smaller down the paper cup, and the height of the projection sections 14, 14' is set low.

[0055] FIGS. 9(a) and (b) show one example of the shape of the projection sections 14, 14' in such a case.

[0056] The projection sections 14, 14' have lateral wall surfaces 12, 12' that incline towards the center from four sides of a cell c. One of a pair of opposed lateral wall surfaces forms linear peak sections 13, 13' by upper ends thereof, the other of a pair of opposed lateral wall surfaces forms the peak sections 13, 13', with upper ends thereof as part of the peak section 13, 13' in hip-roof shape.

[0057] In this Example, since a blank B is formed of a sector, the width of projection sections 14, 14' (cell c) of upper and lower dies K1, K2 gradually becomes smaller from the arc of the upper end of the blank B having a larger width to the arc of the lower end of the blank B having a smaller width, or from upper to lower portions of the middle section of the cup.

[0058] For reference, the rows of the cells c are numbered from upper to lower rows (row 1, row 2, row 3, and so forth) . The width of cells c in each row is the same, but the width of a cell c in a lower row (e.g., cell in row 2) is within the width of a cell c in an upper row (e.g., cell in row 1).

[0059] A blank B is first pressed by the lower die K2, followed by the upper die K1 by half a pitch in the vertical and horizontal directions. The width of a cell c in row 1 of the lower die K2 is larger than the width of a cell c in row 1 of the upper die K1 and the width of a cell c in row 2 of the lower die K2, which is repeated in subsequent embossment.

[0060] The width of a cell c neither changes according to each of upper and lower rows, nor to a number of rows.

[0061] Peak sections 13, 13' of projection sections 14, 14' are linearly formed. During pressing work, the peak sections 13', 13 are each included within the width of frame sections 15a, 15a', and the peak section 13, 13' are arranged so that the surface of intersections 15c', 15c of the frame sections includes main portions thereof.

[0062] FIG. 10 shows that dies K1 and K2 are disposed out of alignment by half a pitch, and a combination of dies with reference to the hatched areas of portions "A" to "F" in the FIG. 8(b).

[0063] Other configurations that are the same as in the Example will not be described.

[0064] Even vertical and horizontal frame sections 15a, 15b, 15a', 15b' form a lattice with the projection sections 14,14' can form protruding portions 4 and recessed portions 5 down the blank B according to the configuration. This is because one die K1 and the other die K2 are disposed out of alignment by half a pitch in the vertical and horizontal directions, as in the FIG. 8 (see FIG. 8).

[0065] Accordingly, the surface of the blank B is provided with a frame section 6 that partitions quadrangular cells c that are surrounded by lattice frames extending at regular intervals in the vertical and horizontal directions and mutually crossing, and a projection section 4 that includes lateral wall surfaces 4a that protrude from the surface of the blank B to other lateral side from four sides of the cell c surrounded by the frame section 6 towards the center of the cell c and a peak section 4b formed in a plane or linear shape at distal ends of the lateral wall surfaces 4a.

[0066] Meanwhile, the back surface of the blank B includes: a frame section 6' that partitions quadrangular cells c that are surrounded by lattice frames extending at regular intervals in the vertical and horizontal directions and mutually crossing and are disposed out of alignment by half a pitch in the vertical and horizontal directions of the frame section 6 of the surface; and a projection section that includes lateral wall surfaces 6a' that protrude from the back surface of the blank B to other lateral side from four sides of the cell c towards the center of the cell and a recessed portion 5b' formed in a plane or linear shape at distal ends of the lateral wall surfaces 6a', a recessed portion 5' being formed out of alignment by half a pitch in the vertical and horizontal directions of the protruding portion 4 of the surface viewed from the surface of the blank B, and an inclined plane where the lateral wall surfaces 4a of the protruding portion 4 and the lateral wall surfaces 5a' of the recessed portion 5 correspond to each at least four corner sections.

[0067] It is to be noted that the recessed portions 5' are viewed as such from the surface of the blank B, but viewed as protruding portions from the back surface.

[0068] In addition, the middle section of lateral wall surfaces 4a, 5a' of protruding portions 4 and recessed por-

tions 5' and the intersection of frame sections 6, 6' at regular intervals are not directly pressed. Accordingly, even though some portions are pressed with the dies, the blank can freely be pulled out, thereby embossing the blank B without cracks or damages to the blank B.

[0069] In the above Example, the blank B is formed of a sector, but may be of a square or rectangle, or any other shape.

[0070] Also, one example shown here is that the blank B is entirely embossed, but may be partially embossed.

[0071] While this invention has been described with an emphasis upon preferred embodiments, it will be obvious to those of ordinary skill in the art that variations of the preferred embodiments may be used and that it is intended that the invention may be practiced otherwise than as specifically described herein.

EXPLANATIONS OF LETTERS AND NUMERALS

[0072]

1 Paper cup
2 Inner cup
3 Outer sleeve
4 Protruding portion
5 Recessed portion
6 Frame section (lattice frame section)
12, 12' Lateral wall surface
13, 13' Peak section
14, 14' Projection sections
15a, 15a' Vertical frame section
15b, 15b' Horizontal frame section
15c, 15c' Intersection
c Cell
c1, c2 2 sides adjacent to cell
c3 Intersection
K1, K2 Die
R1, R2 Embossing rolls

Claims

1. A method for manufacturing a paper cup, comprising:

embossing with a pair of opposed embossing rolls a blank of an outer sleeve that is wrapped around a middle section of the paper cup or the outer circumference of the middle section,
wherein
a pair of opposed dies formed on the surface of the pair of opposed embossing rolls are disposed so as to have substantially an identical shape and include: a frame section that is formed of a flat surface and that partitions quadrangular cells that are surrounded by lattice frames extending at regular intervals in the vertical and horizontal directions and mutually crossing; and a projection section that includes four lateral wall surfaces that protrude from four sides of a cell towards the center of the cell and a peak section formed in a plane or linear shape at distal ends of the lateral wall surfaces,
the dies of the pair of embossing rolls are arranged so as to allow projection sections thereof to face and approach a blank,
and the vertical and horizontal lengths of a unit quadrangle are each set as one pitch, the unit quadrangle including the cell, and a frame section defined by two sides respectively extending along the vertical and horizontal sides adjacent to the cell within an intersection of the two sides,
with the pair of opposed dies disposed out of alignment by half a pitch in the vertical and horizontal directions to provide the blank with recessed and protruding portions.

2. The method for manufacturing a paper cup according to claim 1, wherein
a peak section of each projection section of one of the pair of opposed dies approaches and faces a predetermined intersection of frame sections in the center of four projection sections adjacent to each other in the vertical and horizontal directions of the opposed die,
four corner sections of lateral wall surfaces of each projection section of one of a pair of opposed dies approach and face a corner section of each of four projection sections of the opposed die so as to be in alignment therewith,
an inclined plane except four corner sections of the lateral wall surfaces of each projection section of one of a pair of opposed dies aslant faces a frame section of the opposed die, and a frame section between a pair of projection sections adjacent in the vertical or horizontal direction of one of a pair of opposed dies faces and crosses a frame section between a pair of projection sections adjacent in the vertical and horizontal directions of the opposed die so as to be spaced from each other.

3. The method for manufacturing a paper cup according to claim 1 or 2, wherein
a peak section of each projection section of a pair of opposed dies is set within the width of a frame section of the opposed die that faces the peak section.

4. The method for manufacturing a paper cup according to any one of claims 1 to 3, wherein
the width of a vertical frame of one of a pair of opposed dies that first comes in contact with a blank and the width of a projection section are set larger than the width of a vertical frame of the other of the pair of the opposed dies that subsequently comes in contact with the blank and the width of the projection section.

5. A device for manufacturing a paper cup by embossing with a pair of opposed embossing rolls a blank of an outer sleeve that is wrapped around a middle section of the paper cup or the outer circumference of the middle section, wherein
a pair of opposed dies formed on the surface of the pair of opposed embossing rolls are disposed so as to have substantially an identical shape and include: a frame section that is formed of a flat surface and that partitions quadrangular cells that are surrounded by lattice frames extending at regular intervals in the vertical and horizontal directions and mutually crossing; and a projection section that includes four lateral wall surfaces that protrude from four sides of the cell towards the center of the cell and a peak section formed in a plane or linear shape at distal ends of the lateral wall surfaces,
the dies of the pair of embossing rolls are arranged so as to allow projection sections thereof to face and approach the blank, and the vertical and horizontal lengths of a unit quadrangle are each set as one pitch, the unit quadrangle including the cell, and a frame section defined by two sides respectively extending along the vertical and horizontal sides adjacent to the cell within an intersection of the two sides, with the pair of opposed dies disposed out of alignment by half a pitch in the vertical and horizontal directions to provide the blank with recessed and protruding portions.

6. A device for manufacturing a paper cup used in the method for manufacturing a paper cup according to any one of claims 1 to 4.

7. A paper cup formed by embossing with a pair of opposed embossing rolls a blank of an outer sleeve that is wrapped around a middle section of the paper cup or the outer circumference of the middle section, wherein
the surface of the blank includes : a frame section that is formed of a flat surface and that partitions quadrangular cells that are surrounded by lattice frames extending at regular intervals in the vertical and horizontal directions and mutually crossing; and a projection section that includes four lateral wall surfaces that protrude from four sides of the cell towards the center of the cell and a peak section formed in a plane or linear shape at distal ends of the lateral wall surfaces,
the back surface of the blank includes: a frame section that is formed of a flat surface and that partitions quadrangular cells that are surrounded by lattice frames extending at regular intervals in the vertical and horizontal directions and mutually crossing and disposed out of alignment by half a pitch in the vertical and horizontal directions of the frame section of the surface, a projection section that includes four lateral wall surfaces that protrude from the back surface of the blank to other lateral side from four sides of the cell towards the center of the cell and a bottom section formed in a plane or linear shape at distal ends of the lateral wall surfaces, a recessed portion being formed out of alignment by half a pitch in the vertical and horizontal directions of the projection section of the surface viewed from the surface of the blank; and an inclined plane where the lateral wall surfaces of the protruding portion and the lateral wall surfaces of the recessed portion correspond to each at least four corner sections.

8. A paper cup formed by the method for manufacturing a paper cup according to any one of claims 1 to 4.

FIG 1.

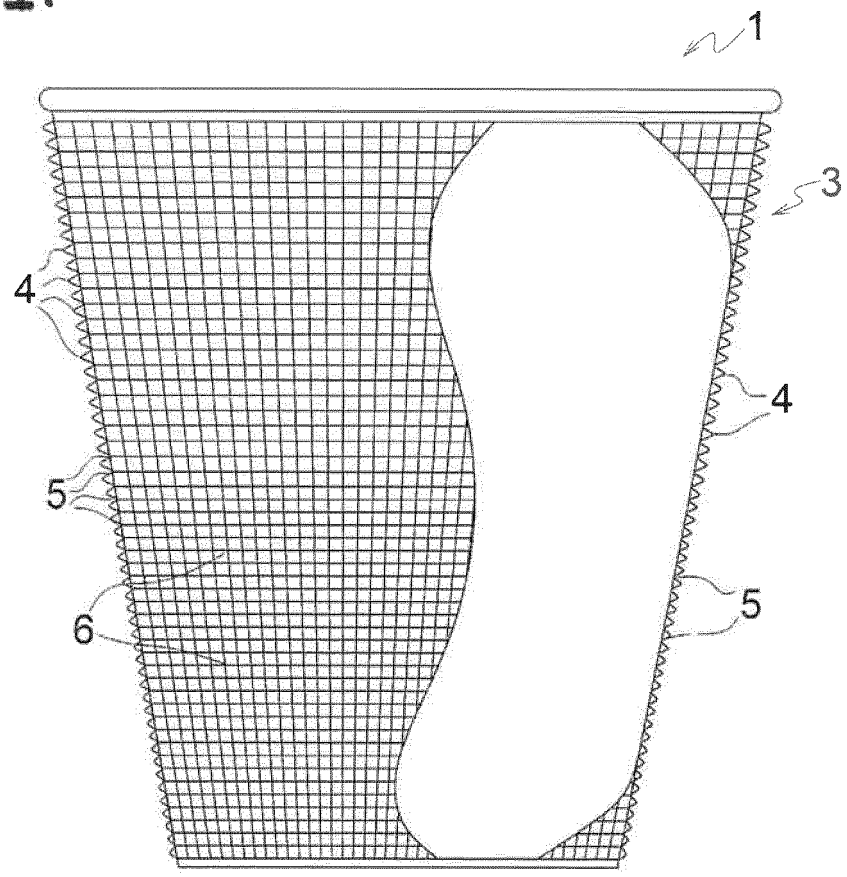


FIG 2

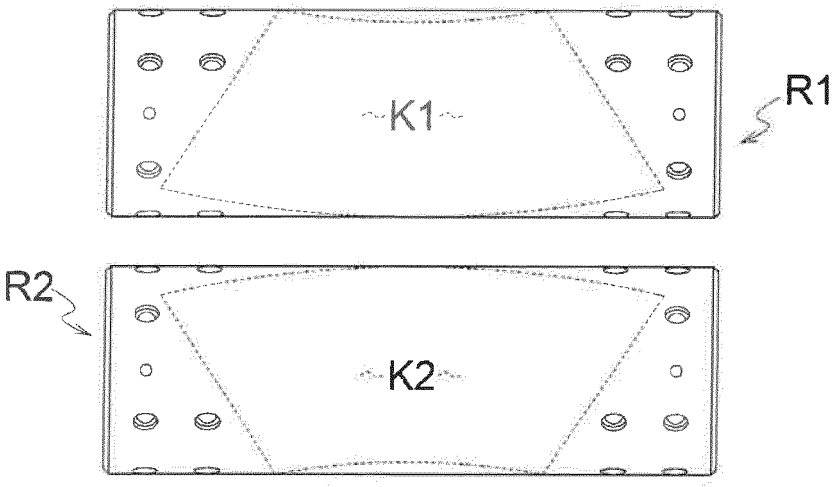


FIG 3

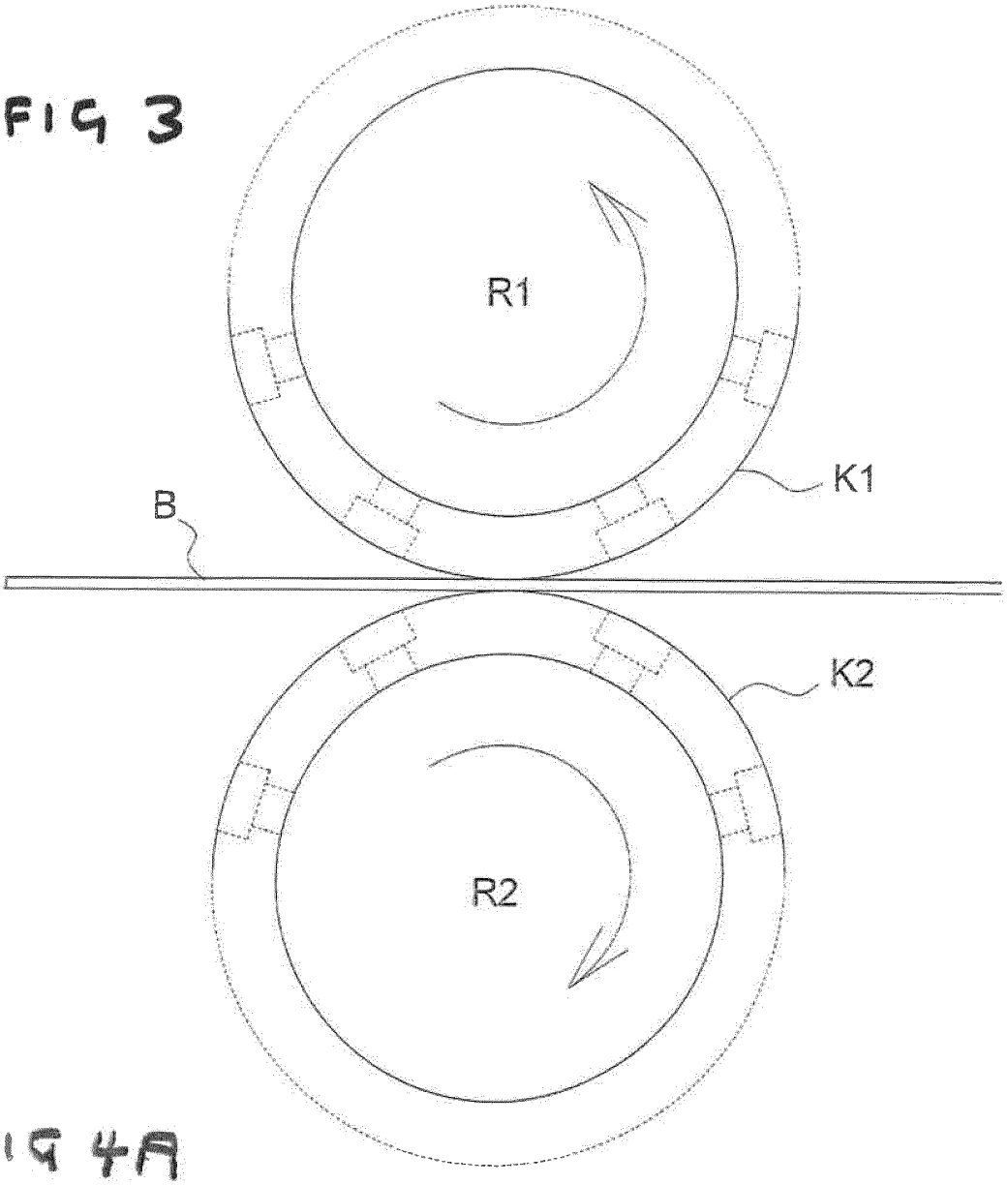


FIG 4A

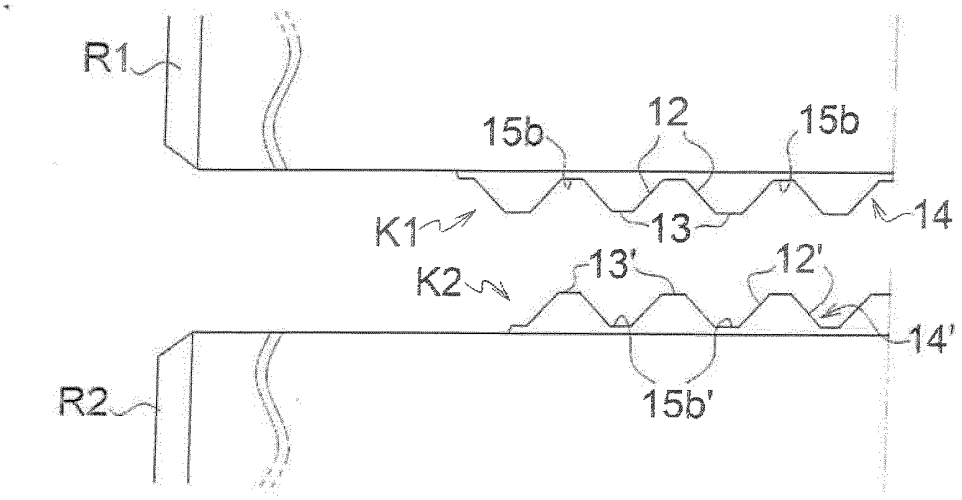


FIG 4B

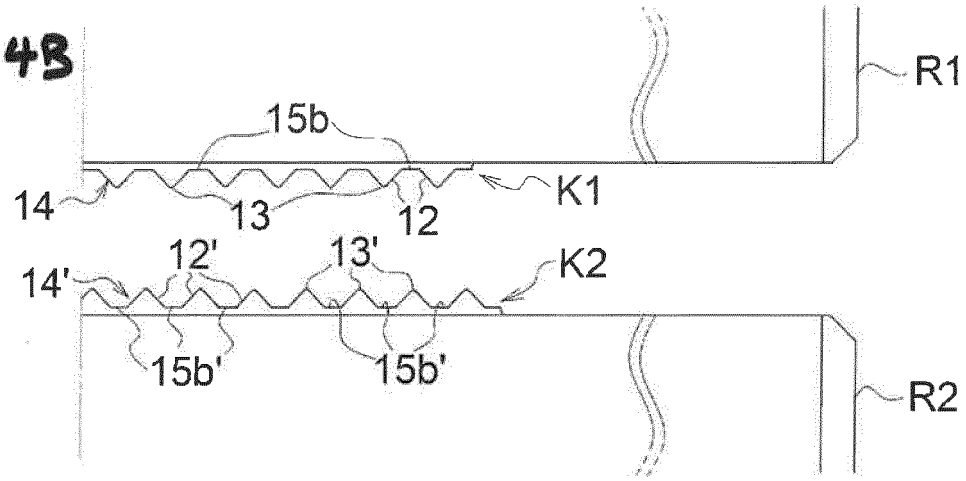


FIG 5

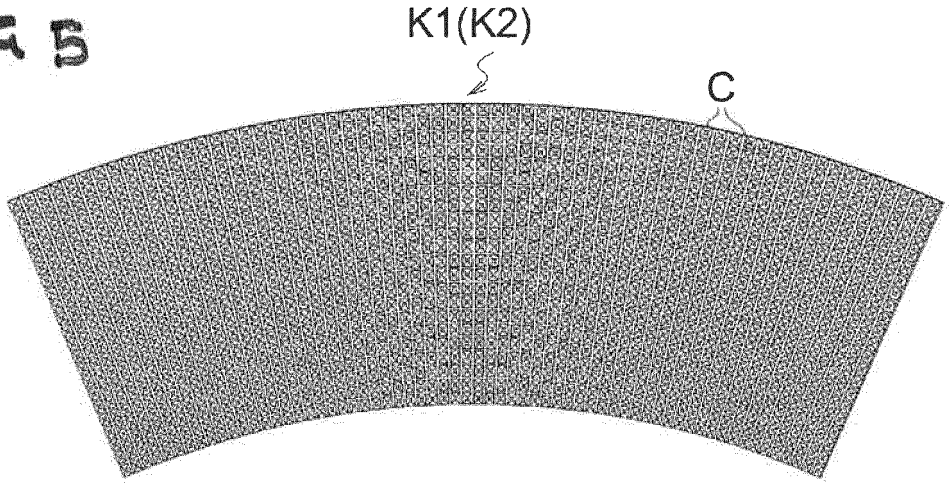


FIG 6

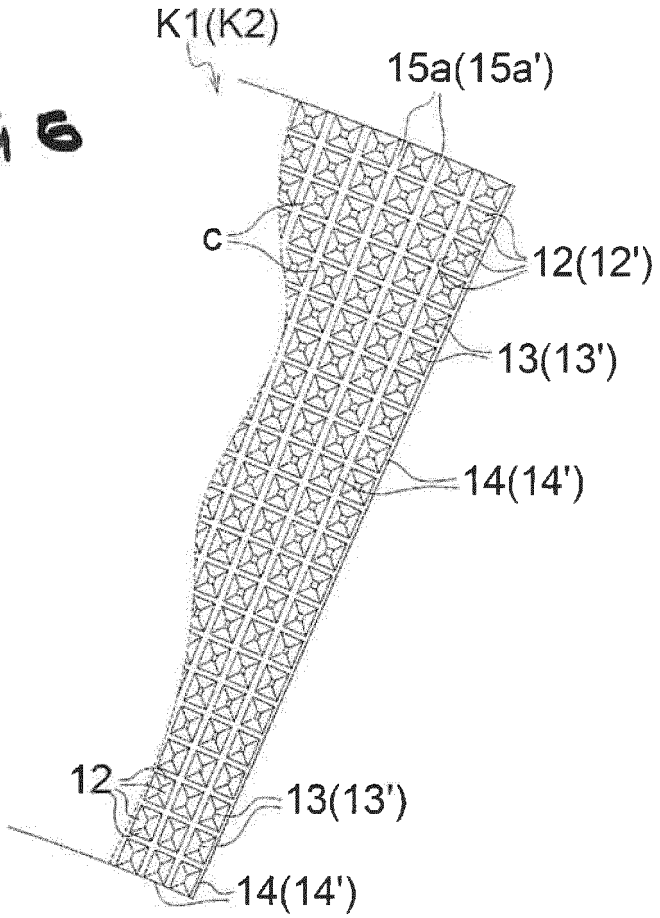


Fig 7

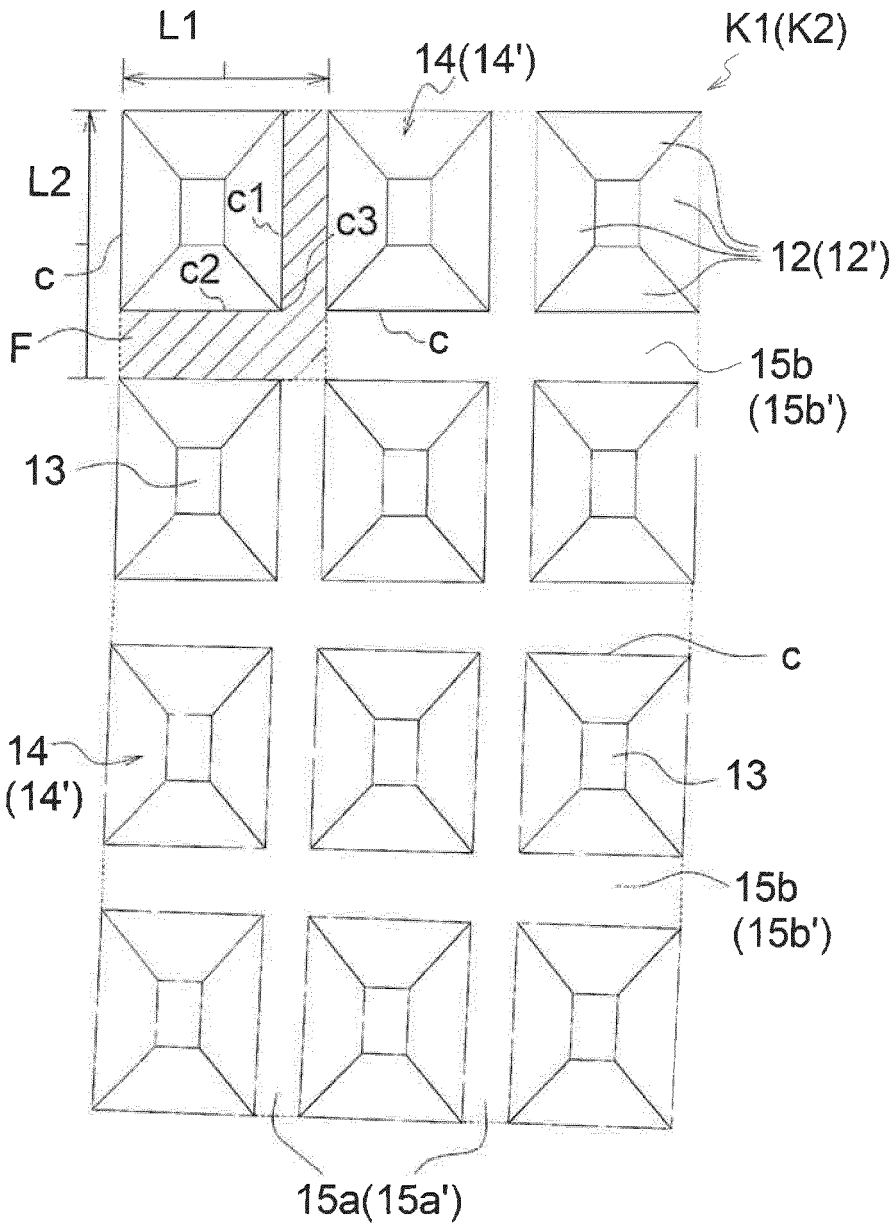

L1
14(14')
K1(K2)
L2
c1
c3
c2
c
12(12')
F
c
15b
(15b')
13
c
14
(14')
13
15b
(15b')
15a(15a')

FIG 8A

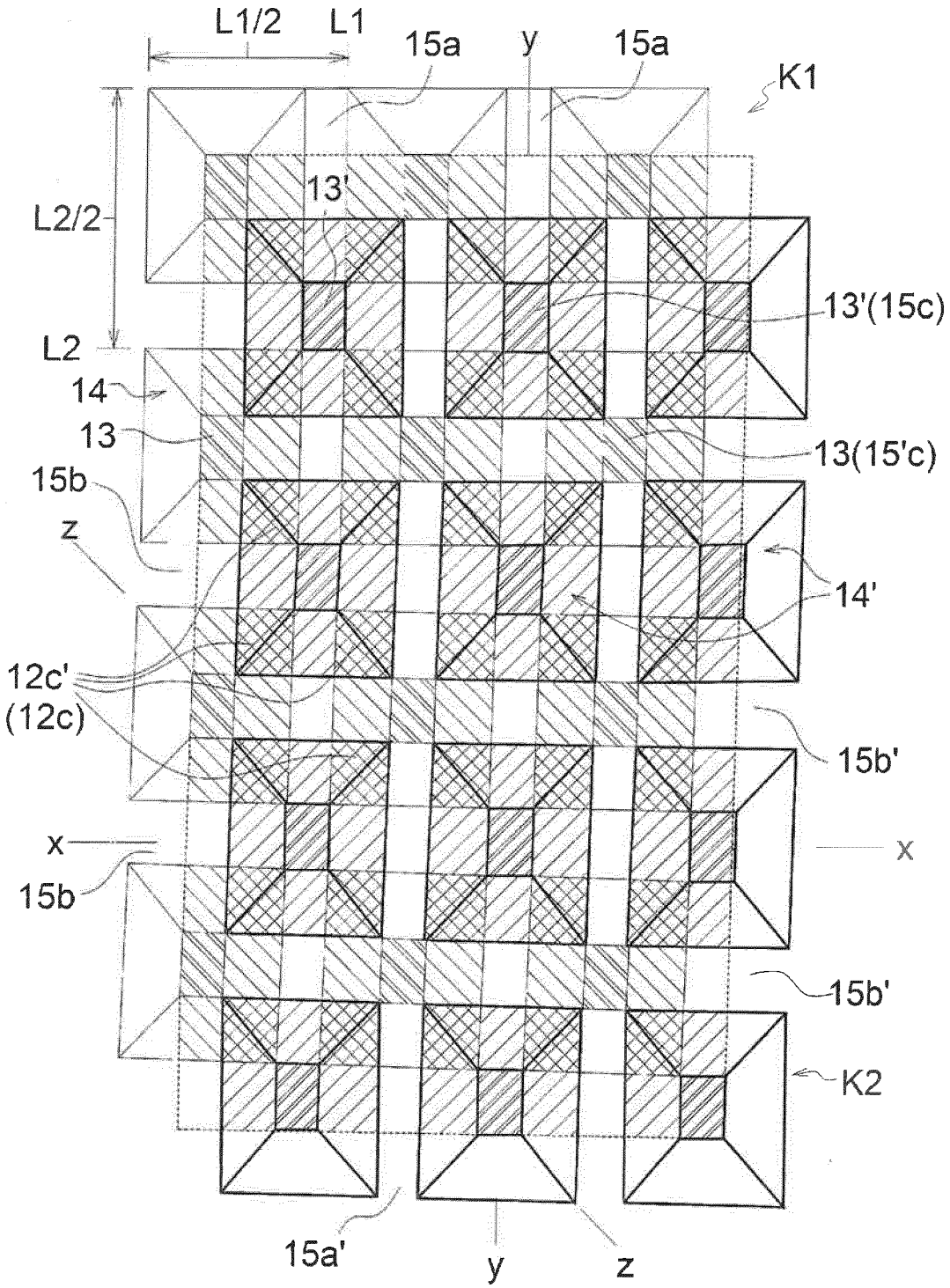

L1/2
L1
15a
y
15a
K1
13'
L2/2
13'(15c)
L2
14
13
13(15'c)
15b
z
14'
12c'
(12c)
15b'
x
x
15b
15b'
K2
15a'
y
z

FIG 8B

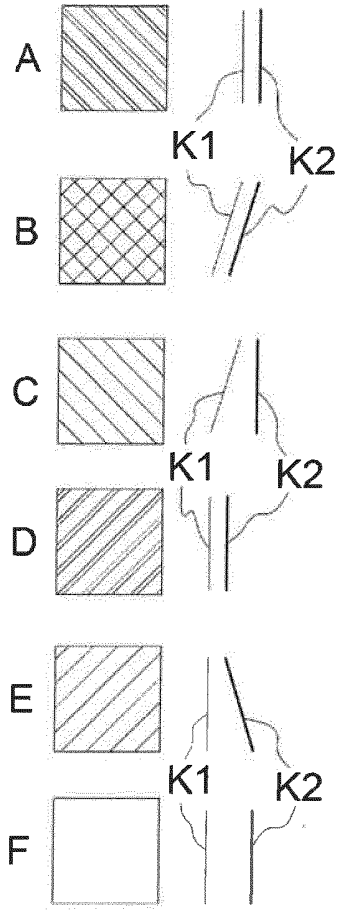

A
B
C
D
E
F
K1
K2
K1
K2
K1
K2

FIG 9A

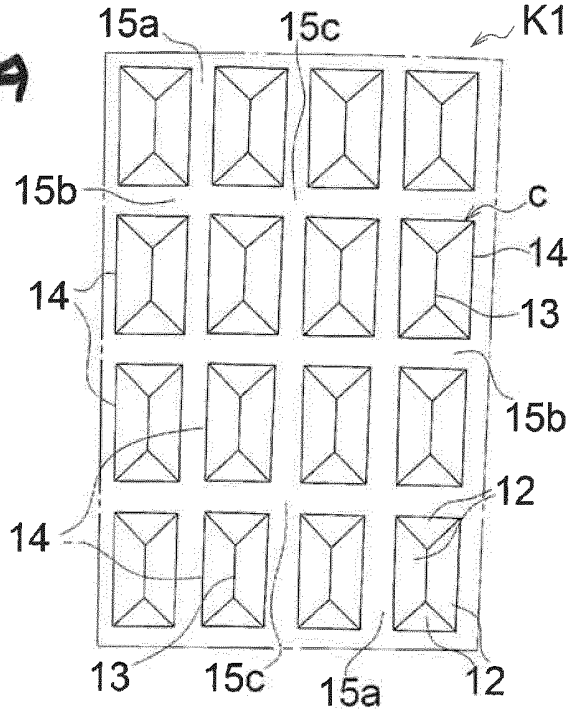

15a
15c
K1
15b
c
14
14
13
15b
12
14
13
15c
15a
12

FIG 9B

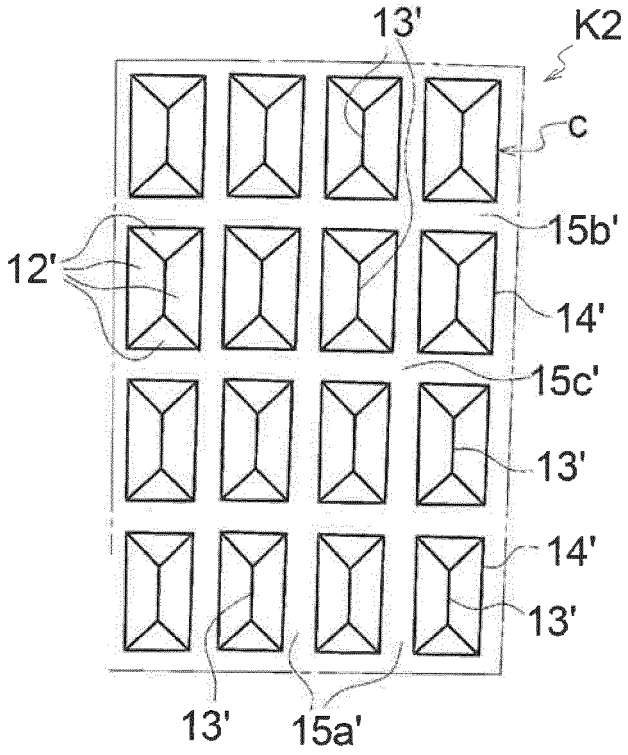


FIG 10

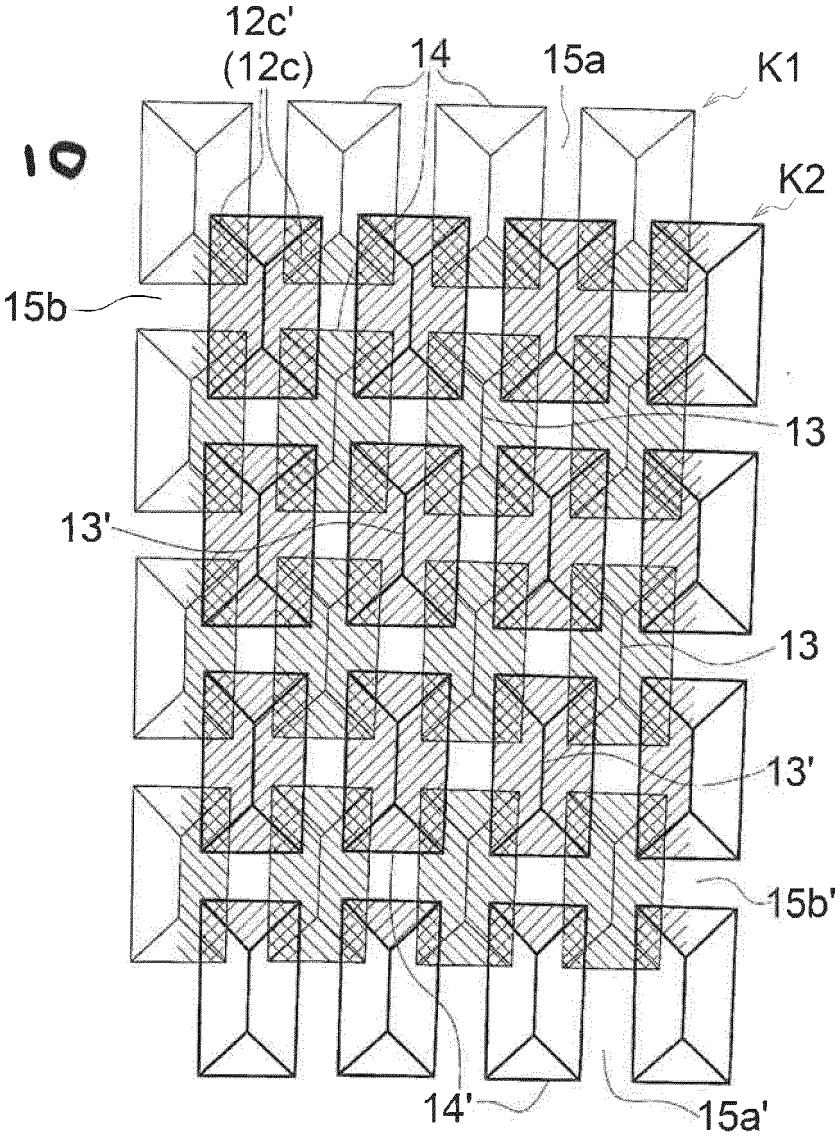


FIG 11A

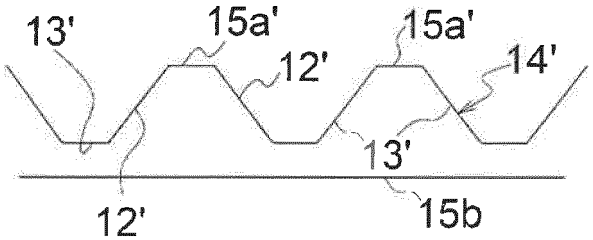


FIG 11B

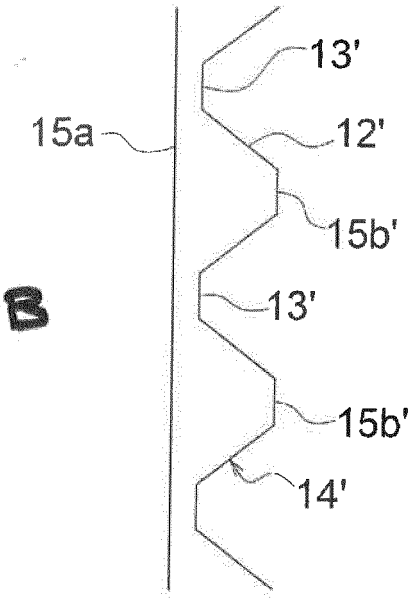


FIG 11C

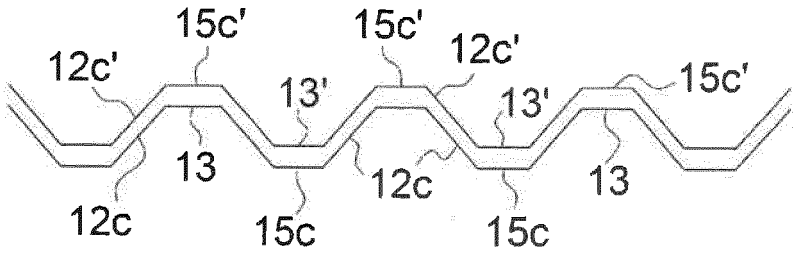
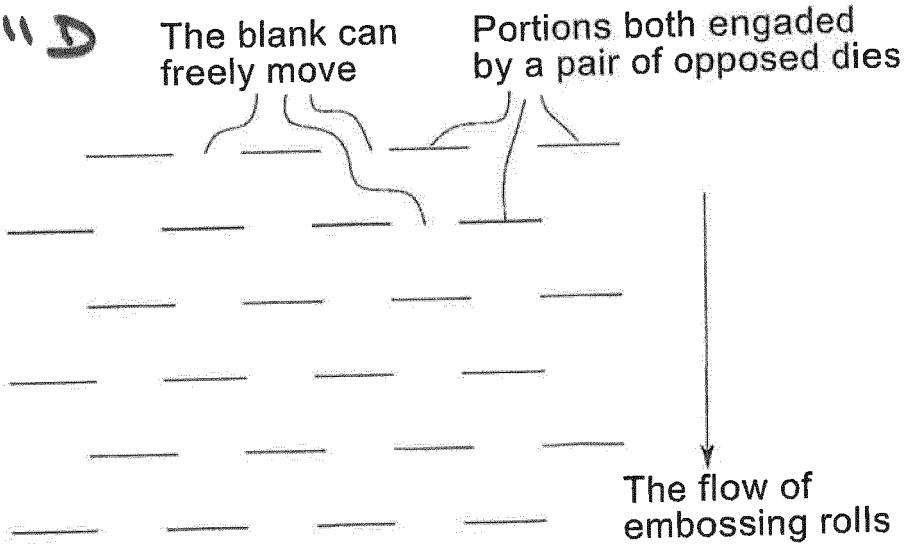


FIG 11D



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2015/056267

A. CLASSIFICATION OF SUBJECT MATTER
B31B1/88(2006.01)i, *B65D81/38*(2006.01)i

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)
B31B1/88, B65D81/38

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2015
Kokai Jitsuyo Shinan Koho 1971-2015 Toroku Jitsuyo Shinan Koho 1994-2015

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2000-142837 A (Toppan Printing Co., Ltd.), 23 May 2000 (23.05.2000), entire text; all drawings (Family: none)	1-8
A	JP 2011-184833 A (Uni-Charm Corp.), 22 September 2011 (22.09.2011), entire text; all drawings & US 2013/0031813 A1 & WO 2011/111579 A1	1-8

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14 May 2015 (14.05.15)	26 May 2015 (26.05.15)
Name and mailing address of the ISA/ Japan Patent Office 3-4-3,Kasumigaseki,Chiyoda-ku, Tokyo 100-8915,Japan	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2015/056267

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2014-516323 A (The Procter & Gamble Co.), 10 July 2014 (10.07.2014), entire text; all drawings & JP 2014-512914 A & JP 2014-516302 A & JP 2014-517879 A & US 2012/0276341 A1 & US 2012/0273146 A1 & US 2012/0276331 A1 & US 2012/0276337 A1 & US 2012/0277393 A1 & US 2012/0282436 A1 & US 2014/0120323 A1 & WO 2012/149074 A1	1-8
A	JP 60-143926 A (Nippon Petrochemicals Co., Ltd.), 30 July 1985 (30.07.1985), entire text; all drawings & US 4614632 A & EP 149844 A2	1-8

Form PCT/ISA/210 (continuation of second sheet) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 2603108 A **[0008]**