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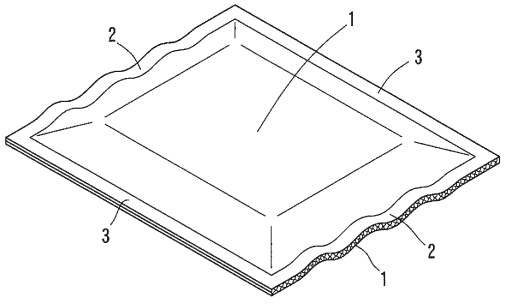
(54) CORRUGATION-CRIMPED PACKAGE OF PAPER MATERIAL

(57) A package is provided which is formed by, with a commodity (G) sandwiched between single-faced corrugated paperboards (1) that are vertically disposed paper members, pressure-bonding together the paper members at the edges (2, 3) of the paper members along the peripheral sides thereof. The edges (2) of the single-faced corrugated paperboards (1) along at least two opposed sides thereof are subjected to waveform bonding by pressure bonding such that a wave shape is formed in the thickness direction of the single-faced corrugated paperboards (1). The dimensional difference between (i) the length L_1 of the portion of each paper member deflected by sandwiching a commodity (G), and (ii) the flat-bonding length (imaginary linear distance) L_2 of a respective one of the edges (2) extending parallel to the direction of the length L_1, and each imaginarily bonded flat is absorbed by the waveform bonding, so that, at these edges (2), the vertical gaps between the single-faced corrugated paperboards (1) are eliminated.

FIG. 1A



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Description

TECHNICAL FIELD

[0001] The present invention relates to packaging performed by sandwiching an item to be packaged, such as a commodity to be shipped, between vertically disposed paper members; and pressure-bonding the periphery of the paper members.

BACKGROUND ART

[0002] In recent years, mail order through the Internet has widely become common. When shipping a commodity ordered by mail order, the commodity is often packaged in a corrugated paperboard box after wrapped in a bubble wrap made of plastic film, or after wrapped with a plastic film together with a corrugated paperboard.

[0003] If such a packaging method is used, even when the commodity is a relatively flat one such as a book, since an angular corrugated paperboard box is used, an unnecessary space is generated in the box, thus deteriorating the transport efficiency.

[0004] In order to overcome such a problem, use of a package as disclosed in the below-identified Patent Document 1 is considered. As shown in Fig. 9A and Fig. 9B, this package is formed by, with a commodity G that is an item to be packaged, such as a book, sandwiched between two paper members 51, pressure-bonding the paper members 51 together at the edges 52 of the package along the peripheral sides thereof by flat bars with an adhesive layer interposed therebetween so as to minimize the height of the package portion sandwiching the commodity G, and to thin the edges.

[0005] However, the paper members 51 are not stretched to a large degree compared to a plastic film. Therefore, in this package, the edges 52 wrinkle, so that gaps are generated between the two paper members 51.

[0006] On the other hand, the below-identified Patent Document 2 discloses a technique in which, as shown in Fig. 10, when superposed portions of a paper member 61 that are folded into a bag-like shape so as to be superposed on each other are pressure-bonded together successively at edges 62 of the paper member 61 along two opposed sides thereof, and at an edge 63 of the paper member 61 along one side thereof, thereby forming a package, the edges 62 and 63 of the superposed portions of the paper member 61 are compressed by a fine-toothed processing tool such that pulp fibers are entangled together, and the superposed portions of the paper member 61 are jointed together without using an adhesive layer therebetween. However, even if a wave shape having a high wave or a small pitch is formed by such a fine-toothed processing tool, the gaps between the (two) superposed portions of the paper member 61 cannot be eliminated.

PRIOR ART DOCUMENTS

PATENT DOCUMENTS

[0007]

Patent Document 1: Japanese Unexamined Patent Application Publication No. 2006-103722
Patent Document 2: Japanese Unexamined Patent Application Publication No. 2010-116182

SUMMARY OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0008] As described above, there is no known technique for eliminating the gaps between two paper members at their edges when the two paper members are pressure-bonded together at their edges with an item to be packaged sandwiched therebetween. When an item to be packaged, such as a commodity ordered by mail order, is transported with gaps generated at the edges of the package, dust or foreign matter could enter the package, which causes the shipping company to receive a complaint from its customer.

[0009] It is therefore an object of the present invention to prevent a phenomenon in which when a pressure-bonded package is formed, gaps are generated between the edges of vertically disposed paper members, thereby preventing entry of dust or foreign matter in a packaged state.

MEANS FOR SOLVING THE PROBLEMS

[0010] In order to achieve the above object, the present invention provides a waveform pressure-bonded package

comprising a paper member or paper members, and formed by: with an item to be packaged sandwiched between vertically disposed portions of the paper member that are vertically disposed, or sandwiched between the paper members that are vertically disposed, pressure-bonding together the vertically disposed portions of the paper member or the paper members at edges of the paper member or the paper members along peripheral sides thereof, characterized in that edges of the paper member or the paper members along at least two opposed sides thereof are subjected to waveform bonding by pressure bonding such that a wave shape is formed in a thickness direction of the paper member or the paper members, wherein a dimensional difference between (i) a length of each of deflected portions of the paper member or the paper members deflected by sandwiching an item to be packaged, and (ii) a flat-bonding length (imaginary linear distance) of a respective one of parallel-extending edges of the paper member or the paper members extending parallel to a direction of the length of the each of the deflected portions, and each imaginarily bonded flat by flat-bonding is absorbed by the waveform bonding, so that, at the parallel-extending edges, vertical gaps between the vertically disposed portions of the paper member, or between the paper members are eliminated.

[0011] The paper members that are vertically disposed comprise two paper members having a first pair of opposed sides and a second pair of opposed sides.

[0012] In this package, edges of the two paper members along one pair of the first pair of opposed sides and the second pair of opposed sides are subjected to the waveform bonding, and edges of the two paper members along the other pair of the first pair of opposed sides and the second pair of opposed sides are subjected to the flat-bonding.

[0013] Alternatively, edges of the two paper members along all of four peripheral sides thereof are subjected to the waveform bonding.

[0014] The vertically disposed portions of the paper member comprise portions of one paper member folded into two along a fold line, edges of the one paper member along two sides thereof that are orthogonal to the fold line and that are opposed to each other are subjected to the waveform bonding, and an edge of the one paper member along one side thereof that is opposed to the fold line is pressure-bonded by the flat-bonding.

[0015] The paper member or each of the paper members is a single-faced corrugated paperboard comprising a corrugated medium forming a corrugated flute, and a linerboard bonded to one surface of the corrugated medium, and with portions of the corrugated medium of the single-faced corrugated paperboard constituting the paper member opposed to each other, the single-faced corrugated paperboard is pressure bonded, or with the corrugated media of the single-faced corrugated paperboards constituting the paper members opposed to each other, the single-faced corrugated paperboards are pressure bonded together.

[0016] The present invention also provides a corrugated pressing member having a corrugated pressing surface configured such that when the above waveform pressure-bonded package is formed, the corrugated pressing surface compresses the paper member or paper members so that an edge of the vertically disposed portions of the paper member, or an edge of the paper members that are vertically disposed is subjected to waveform bonding.

[0017] In view of a case where the variation range of height of the item to be packaged is small, this corrugated pressing member comprises a rigid die body having a corrugated top surface; and a low-friction layer disposed on the top surface of the die body, and the low-friction layer is used as the pressing surface.

[0018] Alternatively, in view of a case where the variation range of height of the item to be packaged is large, this corrugated pressing member comprises a rigid die body having a corrugated top surface; a cushion layer disposed on the top surface of the die body; and a low-friction layer disposed on a surface of the cushion layer, and the low-friction layer is used as the pressing surface.

[0019] The present invention also provides a pressure-bonding device comprising an upper die and a lower die that are configured to move up and down; and opposed corrugated pressing members disposed, respectively on the upper die and the lower die so as to be opposed to each other, and each comprising the above corrugated pressing member, and the pressure-bonding device is configured such that with the upper die and the lower die separated from each other, the vertically disposed portions of the paper member or the paper members that are vertically disposed are fed between the pressing surfaces of the opposed corrugated pressing members, an item to be packaged is sandwiched between the vertically disposed portions of the paper member or between the paper members, and the upper die and the lower die are moved toward each other until an edge of the paper member or the paper members is compressed by the pressing surfaces of the opposed corrugated pressing members, and is subjected to waveform bonding.

EFFECTS OF THE INVENTION

[0020] In the waveform pressure-bonded package of the present invention, which comprises paper members, when the paper members which are vertically disposed and between which an item to be packed is sandwiched are pressure-bonded together at the edges of the package along the peripheral respective sides thereof, even if the paper members are paper members that are not stretched to a large degree, a dimensional excess of the edges caused by deflection of the paper members is absorbed by the waveform bonding, and thus gaps are eliminated.

[0021] Therefore, it is possible to protect the packaged item from entry of dust or foreign matter, improve the appearance

of the bonded portions, reliably improve the package quality, and prevent a situation where the shipping company that deliver the commodity receives a complaint from its customer.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022]

Fig. 1A is a perspective view of a waveform pressure-bonded package comprising single-faced corrugated paperboards according to a first embodiment of the present invention.
Fig. 1B is a side view of the package of Fig. 1A, when seen from its pressure-bonded edge.
Fig. 2 is a perspective view of a waveform pressure-bonded package comprising single-faced corrugated paperboards according to a second embodiment of the present invention.
Fig. 3 is a perspective view of a waveform pressure-bonded package comprising a single-faced corrugated paperboard according to a third embodiment of the present invention.
Fig. 4 is a perspective view of a pressure-bonding device for forming the waveform pressure-bonded package of the first embodiment, the pressure bonding device including corrugated pressing members having a cushion layer.
Fig. 5 is a side view of the pressure-bonding device of Fig. 4, the side view showing a state during pressure-bonding by the corrugated pressing members having a cushion layer.
Fig. 6 is a side view of the pressure-bonding device of Fig. 4, the side view showing a state after pressure-bonding by waveform bonding.
Fig. 7 is a side view of a pressure-bonding device for forming the package of the first embodiment, the side view showing a state during pressure-bonding by corrugated pressing members having no cushion layer.
Fig. 8 is a side view of the pressure-bonding device Fig. 7, the side view showing a state after pressure-bonding by waveform bonding.
Fig. 9A is a perspective view of a package disclosed in Patent Document 1.
Fig. 9B is a vertical sectional view of the package shown in Fig. 9A.
Fig. 10 is a perspective view of a package disclosed in Patent Document 2.
Fig. 11 is a side view showing specific names for dimensions relating to waveform bonding.

BEST MODE FOR CARRYING OUT THE INVENTION

<Embodiments of package>

(First embodiment)

[0023] Fig. 1A and Fig. 1B show a waveform pressure-bonded package according to a first embodiment of the present invention.

[0024] This package is an envelope-shaped package (i) in which, as paper members, two single-faced corrugated paperboards 1 are used that are each constituted by a corrugated medium forming a corrugated flute and a linerboard bonded to one surface of the corrugated medium, and (ii) which is formed by:

allowing the corrugated media of the two single-faced corrugated paperboards 1 to be opposed to each other; and with a commodity G that is an item to be packaged, such as a book, sandwiched between the two single-faced corrugated paperboards 1,
pressure-bonding together the two single-faced corrugated paperboards 1 at the edges 2 of the package along two opposed sides of the peripheral sides thereof (these two opposed sides are hereinafter referred to as "the first two opposed sides"), and at the edges 3 of the package along the other two opposed sides of the peripheral sides thereof (these two opposed sides are hereinafter referred to as "the second two opposed sides").

[0025] The edges 2 of the package along the first two opposed sides extend in a conveyance direction defined in a production process of the single-faced corrugated paperboards 1. At the edges 2, the two single-faced corrugated paperboards 1 are subjected to waveform bonding by pressure bonding with an adhesive such that a wave shape is formed in a thickness direction. The adhesive used is not limited if it allows for bonding of paper, and is preferably a vinyl acetate-based emulsion adhesive. The waveform bonding will be described later in detail in the section <pressure-bonding processing>.

[0026] The edges 3 of the package along the second two opposed sides extend in a width direction orthogonal to the conveyance direction of the single-faced corrugated paperboards 1. At the edges 3, the two single-faced corrugated paperboards 1 are subjected to flat-bonding so as to be bonded together flat by normal pressure bonding, that is, by

pressing them with flat bars while using an adhesive. The flat-bonding may be performed without using an adhesive by compressing the corrugated paperboards 1 at binding portions so as to be bound together.

(Second embodiment)

[0027] Fig. 2 shows a waveform pressure-bonded package according to a second embodiment of the present invention.
[0028] This package is also an envelope-shaped package (i) in which, as paper members, two single-faced corrugated paperboards 1 are used that are each constituted by a corrugated medium forming a corrugated flute and a linerboard bonded to one surface of the corrugated medium, and (ii) which is formed by:

allowing the corrugated media of the two single-faced corrugated paperboards 1 to be opposed to each other; and with a commodity G that is an item to be packaged, such as a book, sandwiched between the two single-faced corrugated paperboards 1,
pressure-bonding together the two single-faced corrugated paperboards 1 at the edges 2 of the package along two opposed sides (first two opposed sides) of the peripheral sides thereof, and at the edges 3 of the package along the other two opposed sides (second two opposed sides) of the peripheral sides thereof. However, the edges 2 along the first two opposed sides and the edges 3 along the second two opposed sides are both subjected to the waveform bonding.

(Third embodiment)

[0029] Fig. 3 shows a waveform pressure-bonded package according to a third embodiment of the present invention.
[0030] This package is also an envelope-shaped package (i) in which, as a paper member, one single-faced corrugated paperboard 1 is used that is constituted by a corrugated medium forming a corrugated flute and a linerboard bonded to one surface of the corrugated medium, but (ii) which is formed by:

folding the one single-faced corrugated paperboard 1 into two along a fold line 4 such that portions of the corrugated medium of the paperboard 1 are opposed to each other; and
with a commodity G that is an item to be packaged, such as a book, sandwiched between the opposed portions of the single-faced corrugated paperboard 1,
pressure-bonding together the opposed portions of the single-faced corrugated paperboard 1 at the edges 2 of the package along two opposed sides thereof orthogonal to the fold line 4, and pressure-bonding together the opposed portions at the edge 3 of the package along one side thereof opposed to the fold line 4 by the flat-bonding.

<Pressure-bonding processing>

(Pressure-bonding device)

[0031] Fig. 4 exemplifies a pressure-bonding device for forming, of the above-described packages, the package of the first embodiment. This pressure-bonding device includes a lower die 11 and an upper die 12 that are configured to move toward and away from each other by their upward and downward movements. Two single-faced corrugated paperboards 1 disposed vertically are fed between the lower die 11 and the upper die 12, and a commodity G that is an item to be packaged is fed between the lower die 11 and the upper die 12 by a conveyer.
[0032] The lower die 11 and the upper die 12 are each provided with pressing members 13 for waveform bonding; and a pair of pressing members 14 for flat-bonding which is disposed to be orthogonal to the pressing members 13. The pressing members 13 on the lower die 11 are vertically opposed to the respective pressing members 13 on the upper die 12, and the pair of pressing members 14 on the lower die 11 is vertically opposed to the pair of pressing members 14 on the upper die 12. As the lower and upper dies 11 and 12 approach each other, the pressing members 13 and 14 pressure-bond the paperboards 1 together.
[0033] In view of a case where the variation range of height of the commodity G is large, as shown in Figs. 5 and 6, each pressing member 13 comprises a rigid die body 13a having a corrugated top surface; a cushion layer 13b disposed on the top surface of the die body 13a; and a low-friction layer 13c disposed on the surface of the cushion layer 13b, and used as a pressing surface. The cushion layers 13b of the pressing members 13 prevent cracks in the surface layers of the single-faced corrugated paperboards 1 due to excessive tensile forces.
[0034] As for the material of each pressing member 13, the die body 13a may be made of, e.g., monomer cast nylon or metal, and the cushion layer 13b may be formed of, e.g., a sponge or a rubber. Also, the low-friction layer 13c may be formed of, e.g., (i) a fluorine resin adhesive tape comprising a fluorine resin-impregnated glass cloth in which a silicone-based adhesive has been applied onto the back surface of the glass cloth, or (ii) a polyethylene acrylic adhesive

tape having a surface formed with ridges extending in a sliding direction.

[0035] When the static friction coefficient and dynamic friction coefficient of each of these tapes were measured, the fluorine resin adhesive tape had an average static friction coefficient of 0.06 and an average dynamic friction coefficient of 0.02, and the polyethylene acrylic adhesive tape had an average static friction coefficient of 0.08 and an average dynamic friction coefficient of 0.03. Therefore, the static friction coefficient of the surface of the low-friction layer 13c is set to 0.1 or less.

[0036] If the variation range of height of the commodity G is small, as shown in Fig. 7 and Fig. 8, the cushion layer 13b may be omitted from each pressing member 13 such that the pressing member 13 comprises a rigid die body 13a having a corrugated top surface; and a low-friction layer 13c disposed on the top surface of the die body 13a, and used as a pressing surface. In this case/arrangement, too, the low-friction layer 13c is an essential element. If the cushion layers 13b of the pressing members 13 are omitted, the device is designed such that even when the lower die 11 and the upper die 12 come closest to each other, a gap is ensured/defined between the opposed pressing surfaces of each pressing member 13 on the upper die 12 and the corresponding pressing member 13 on the lower die 11 so as to prevent the pressing surfaces of the low-friction layers 13c from interfering with each other.

[0037] The pressing members 14 on each of the lower and upper dies 11 and 12 are flat bars having a flat pressing surface, and comprise two pressing members extending parallel to each other so as to correspond to positions in front of and behind each boundary of a continuous package continuously extending in the conveyance direction. A cutting blade member 15 is disposed between the pressing members 14 on the lower die 11 so as to cut and separate the continuous package into individual packages.

[0038] On the upstream side of the lower die 11 and the upper die 12 in the conveyance direction of single-faced corrugated paperboards 1 and commodities G, glue guns 16 are disposed to spray and apply an adhesive onto bonding surfaces of single-faced corrugated paperboards 1. The adhesive used here may be, for example, a vinyl acetate-based emulsion adhesive.

(Pressure-bonding step)

[0039] In order to form the package of the first embodiment using the above-described pressure-bonding device, as shown in Fig. 4, the corrugated media of two single-faced corrugated paperboards 1 disposed vertically are made opposed to each other, an adhesive is sprayed and applied from the glue guns 16 onto the corrugated medium of one of the two single-faced corrugated paperboards 1 at the edges 2, and, with the lower die 11 and the upper die 12 separated from each other, the two single-faced corrugated paperboards 1 are fed between the corrugated pressing surfaces of the pressing members 13 after passing between the pressing surfaces of the pairs of pressing members 14, which are vertically opposed to each other, and a commodity G is sandwiched between the two single-faced corrugated paperboards 1.

[0040] Then, as shown in Fig. 5 or Fig. 7, when the two single-faced corrugated paperboards 1 are conveyed and the lower die 11 and the upper die 12 are moved toward each other, the edges 2 on both sides of the two single-faced corrugated paperboards 1 are each subjected to the waveform bonding by being compressed by the corresponding opposed pressing members 13, and concurrently with this, the edges 3 on the other sides are subjected to the flat-bonding by being compressed by the opposed pairs of pressing members 14.

[0041] The cutting blade member 15, which is configured to move up and down, cuts the superposed single-faced corrugated paperboards 1 so as to be separated from the package continuously extending in the conveyance direction.

[0042] Then, as shown in Fig. 6 or Fig. 8, the lower die 11 and the upper die 12 are separated from each other, and the thus-formed package is taken out of the pressure-bonding device. In the package taken out of the pressure-bonding device, as shown in Fig. 1A, the edges 2 along the first two opposed sides of the single-faced corrugated paperboards 1 have been subjected to the waveform bonding, and the edges 3 along the second two opposed sides thereof have been subjected to the flat-bonding. The method for closing the edges 3 is not limited to flat-bonding using an adhesive if the openings can be sealed, and examples thereof include using an adhesive tape or staples and binding by compression at binding portions.

[0043] In this package, as shown in Fig. 1B, the dimensional difference between (i) the length L_1 of the portion of each single-faced corrugated paperboard 1 deflected by sandwiching the commodity G, and excluding bonding margins a for bonding on both sides of the paperboards 1, and (ii) the flat-bonding length (imaginary linear distance) L_2 of a respective one of the edges 2 extending parallel to the direction of the length L_1, and each imaginarily bonded flat is absorbed by the waveform bonding, so that the gaps between the two single-faced corrugated paperboards 1 at the edges 2 are eliminated.

<Effect obtained by waveform bonding>

[0044] In a waveform pressure-bonded package as described above, when two single-faced corrugated paperboards

1 between which a commodity that is an item to be packaged has now been sandwiched are pressure-bonded together at the edges along the peripheral respective sides, even if the single-faced corrugated paperboards 1 are paper members that do not stretch to a large degree, a dimensional excess of the edges caused by deflection of the single-faced corrugated paperboards 1 is absorbed by the waveform bonding, and thus gaps due to wrinkles are eliminated. Therefore, it is possible to protect the commodity from entry of dust or foreign matter, improve the appearance of the bonded portions, and reliably improve the package quality.

[0045] Also, since the pressing members 13 of the pressure-bonding device each includes the low-friction layer as its pressing surface, this prevents cracks in the surface layers of the single-faced corrugated paperboards 1 due to the waveform bonding, thus improving the package quality.

<Others>

[0046] While, as an example, the above-described pressure-bonding processing is directed to formation of the package of the first embodiment, the pressure-bonding device can also form the package of the second or third embodiment by appropriately changing the arrangement of the pressing members 13 and 14 and/or the method for supplying a single-faced corrugated paperboard or paperboards 1.

[0047] Also, while, in each of the above embodiments, the package in which a single-faced corrugated paperboard or paperboards are used as a paper member or members, and the pressure-bonding device for pressure-bonding the paperboard(s) were described, the present invention is also applicable to paper members other than the single-faced corrugated paperboard(s). For example, by using the present invention, in a package in which an item to be packaged is sandwiched between two paper members each comprising a single layer, too, it is possible to prevent gaps at the edges.

Examples

<Specific examples and evaluation of waveform bonding>

[0048] For evaluation of specific examples of the waveform bonding, specific names relating to dimensions of portions of a package are shown in Fig. 11. Here, the length of a single-faced corrugated paperboard deflected by sandwiching a commodity is denoted by a thick solid line. The actual or imaginary flat-bonding length of an edge is denoted by a thin broken line, and the waveform bonding length of an edge is denoted by a thick broken line. Corresponding to Fig. 1B, the width dimensions of bonding margins for bonding that are orthogonal to the edge subjected to the flat-bonding or the waveform bonding are denoted by "a".

(Effect of parameters of wave shape on bondability and appearance)

[0049] Various packages were actually formed to confirm the effect of parameters (length, number of waves, etc.) of a wave shape on bondability and appearance. The results are shown in Table 1.

[0050] Here, single-faced corrugated paperboards were used that are each constituted by a front linerboard of class LC, 120 g/m^2 and a corrugated medium of E flute of class MC, 115 g/m^2, and that have a size of width 300 mm × conveyance direction 250 mm. The bonding margins a for bonding were set to 8 mm.

[0051] Items to be packaged were used that have a size of width 197 mm × conveyance direction 160 mm × height 25 mm.

[0052] Wave shapes were selected from those shown in Table 2 and Table 3, and used.

[0053] The flat-bonding length (imaginary linear distance) and the waveform bonding length shown in tables inserted below are calculated values, and evaluation was performed using jigs manufactured based on these values.

[Table 1]

■ Effects of parameters of corrugated shape on bondability and appearance												
Length of single-faced corrugated paperboard [mm]	250											
Flat-bonding length [mm] (Imaginary linear distance)	229.6											
Corrugation bonding length [mm]	231.6				233.6				239.6			
Number of waves	2	3	5	10	2	3	5	10	2	3	5	10
Bondability	○	○	○	○	○	○	○	○	○	○	○	○

(continued)

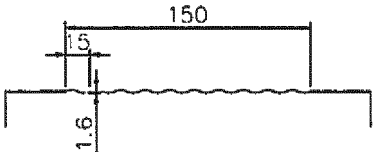
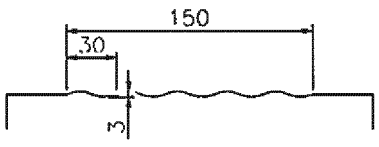
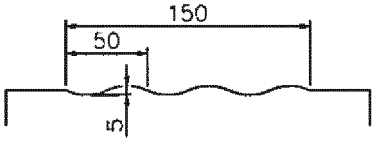
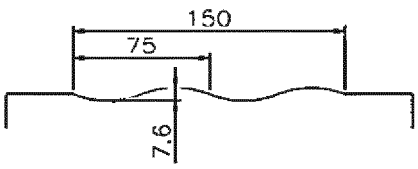
■ Effects of parameters of corrugated shape on bondability and appearance												
Appearance	○-	○-	○-	○-	◎	◎	◎	◎	○	○	○	○

[Evaluation criteria]
[Bondability] ○: No problem
◎: No problem
[Appearance] ○: No problem (Vertical displacement of the material was outstanding)
○-: No problem (Wrinkles were slightly outstanding)

[Table 2]

■ Corrugated shape specification			
Corrugation bonding length [mm]	Number of waves	Pitch of wave [mm]	Height of wave [mm]
231.6	2	75	5.4
231.6	3	50	3.6
231.6	5	30	2.2
231.6	10	15	1.0
233.6	2	75	7.6
233.6	3	50	5.0
233.6	5	30	3.0
233.6	10	15	1.6
239.6	2	75	12.0
239.6	3	50	8.0
239.6	5	30	4.8
239.6	10	15	2.4
* The size of the single-faced corrugated paperboard in the conveyance direction is fixed to 250 mm.			

[Table 3]

■ Dimensions of corrugated shape		
Wave pitch [mm]	15	30
Shape diagram		
Wave pitch [mm]	50	75
Shape diagram		
* Cases of a corrugation bonding length of 233.6 mm are shown as representatives.		

[0054] In the cases shown in Table 1, the bondability was excellent irrespective of the waveform bonding length and the number of waves.

[0055] In the case of waveform bonding length < length of single-faced corrugated paperboard - 2a, wrinkles are likely to occur, but the degree of the wrinkles is small, and thus it is considered that there is no problem.

[0056] Even when a different material and/or a different flute was used with respect to the single-faced corrugated paperboards, a similar tendency was seen. For example, a similar tendency was seen also when using kraft paper of 50 g/m^2 × 50 m^2; and using, as constituent parts, a front linerboard of class LC, 120 g/m^2 and a corrugated medium of B flute of class MC, 115 g/m^2.

(Effect of difference between flat-bonding and waveform bonding on formable range)

[0057] The effect of the difference in pressure-bonded shape between adhesive-using flat-bonding and waveform bonding on a formable range was confirmed. The results are shown in Table 4.

[0058] Here, single-faced corrugated paperboards were used which are each constituted by a front linerboard of class LC, 120 g/m^2 and a corrugated medium of E flute of class MC, 115 g/m^2, and which have a size of width 300 mm × conveyance direction 250 mm.

[0059] Verification was conducted by using items to be packaged of which the widths were all fixed to 197 mm, and of which the heights and the sizes in the conveyance direction were set to various values as shown in Table 4.

[0060] As for a typical wave shape, the number of waves was set to 3, and d (waveform bonding length - flat-bonding length) was set to 4 mm.

[Table 4]

■ Formable ranges of flat-bonding and corrugation bonding								
Size of commodity in conveyance direction [mm]		180	180	160	160	160	160	140
Height of commodity [mm]		5	10	15	20	25	30	35
Flat-bonding length [mm]		233.8	233.1	232.5	231.2	229.6	227.6	227.2
Corrugation bonding length [mm]		237.8	237.1	236.5	235.2	233.6	231.6	231.2
Δ [mm]		0.2	0.9	1.5	2.8	4.4	6.4	6.8
d [mm]		4.0						
Bondability	Flat-bonding	○	○	○	×	×	×	×
	Corrugation bonding	○	○	○	○	○	○	×
* Δ = Length of single-faced corrugated paperboard - Flat-bonding length - 2a [Evaluation criteria] d = Corrugation bonding length - Flat-bonding length = 4.0 mm ○: No problem [Bondability] * Length of single-faced corrugated paperboard: 250 mm ×: Not formable * Bonding margin for bonding: a = 8 mm								

[0061] In case of use of pressing members of flat type, if the height of the commodity is 15 mm or less (Δ is 1.5 mm or less), sufficient bondability is obtained, whereas if the height of the commodity is 20 mm or more (Δ is 2.8 mm or more), gaps are generated.

[0062] In case of use of pressing members of waveform type, bonding is impossible under the condition of Δ - d ≥ 2.8 mm, but the formable range is wider than in the flat type.

(Conceivable ranges of parameters)

[0063] The above shows that under the conditions of the sizes and material of the packages actually formed, if the lower limit and the upper limit of the number of waves of waveform bonding are 2 and 10, respectively, and the lower limit and the upper limit of the waveform bonding length are, respectively, the length of the single-faced corrugated paperboard - 2a - 2.4 mm and the length of the single-faced corrugated paperboard - 2a + 5.6 mm, the gaps at the edges due to wrinkling are eliminated.

DESCRIPTION OF REFERENCE NUMERALS

[0064]

1: Single-faced corrugated paperboard
2, 3: Edge
4: Fold line
11: Lower die
12: Upper die
13: Pressing member
13a: Die body
13b: Cushion layer
13c: Low-friction layer
14: Pressing member
15: Cutting blade member
16: Glue gun

Claims

1. A waveform pressure-bonded package comprising a paper member or paper members, and formed by:

with an item to be packaged sandwiched between vertically disposed portions of the paper member that are vertically disposed, or sandwiched between the paper members that are vertically disposed,
pressure-bonding together the vertically disposed portions of the paper member or the paper members at edges of the paper member or the paper members along peripheral sides thereof,
characterized in that edges of the paper member or the paper members along at least two opposed sides thereof are subjected to waveform bonding by pressure bonding such that a wave shape is formed in a thickness direction of the paper member or the paper members,
wherein a dimensional difference between (i) a length of each of deflected portions of the paper member or the paper members deflected by sandwiching an item to be packaged, and (ii) a flat-bonding length (imaginary linear distance) of a respective one of parallel-extending edges of the paper member or the paper members extending parallel to a direction of the length of the each of the deflected portions, and each imaginarily bonded flat by flat-bonding is absorbed by the waveform bonding, so that, at the parallel-extending edges, vertical gaps between the vertically disposed portions of the paper member, or between the paper members are eliminated.

2. The waveform pressure-bonded package according to claim 1, wherein the paper members that are vertically disposed comprise two paper members having a first pair of opposed sides and a second pair of opposed sides.

3. The waveform pressure-bonded package according to claim 2, wherein edges of the two paper members along one pair of the first pair of opposed sides and the second pair of opposed sides are subjected to the waveform bonding, and edges of the two paper members along the other pair of the first pair of opposed sides and the second pair of opposed sides are subjected to the flat-bonding.

4. The waveform pressure-bonded package according to claim 2, wherein edges of the two paper members along all of four peripheral sides thereof are subjected to the waveform bonding.

5. The waveform pressure-bonded package according to claim 1, wherein the vertically disposed portions of the paper member comprise portions of one paper member folded into two along a fold line, and
wherein edges of the one paper member along two sides thereof that are orthogonal to the fold line and that are opposed to each other are subjected to the waveform bonding, and an edge of the one paper member along one side thereof that is opposed to the fold line is pressure-bonded by the flat-bonding.

6. The waveform pressure-bonded package according to claim 1, wherein the paper member or each of the paper members is a single-faced corrugated paperboard comprising a corrugated medium forming a corrugated flute, and a linerboard bonded to one surface of the corrugated medium, and
wherein with portions of the corrugated medium of the single-faced corrugated paperboard constituting the paper member opposed to each other, the single-faced corrugated paperboard is pressure bonded, or with the corrugated media of the single-faced corrugated paperboards constituting the paper members opposed to each other, the single-faced corrugated paperboards are pressure bonded together.

7. A corrugated pressing member having a corrugated pressing surface configured such that when the waveform

pressure-bonded package according to claim 1 is formed, the corrugated pressing surface compresses the paper member or paper members so that an edge of the vertically disposed portions of the paper member, or an edge of the paper members that are vertically disposed is subjected to waveform bonding.

8. The corrugated pressing member according to claim 7, comprising a rigid die body having a corrugated top surface; and
a low-friction layer disposed on the top surface of the die body, wherein the low-friction layer is used as the pressing surface.

9. The corrugated pressing member according to claim 7, comprising a rigid die body having a corrugated top surface;

a cushion layer disposed on the top surface of the die body; and
a low-friction layer disposed on a surface of the cushion layer, wherein the low-friction layer is used as the pressing surface.

10. A pressure-bonding device comprising an upper die and a lower die that are configured to move up and down; and

opposed corrugated pressing members disposed, respectively on the upper die and the lower die so as to be opposed to each other, and each comprising the corrugated pressing member according to claim 8 or 9,
wherein the pressure-bonding device is configured such that with the upper die and the lower die separated from each other, the vertically disposed portions of the paper member or the paper members that are vertically disposed are fed between the pressing surfaces of the opposed corrugated pressing members, an item to be packaged is sandwiched between the vertically disposed portions of the paper member or between the paper members, and the upper die and the lower die are moved toward each other until an edge of the paper member or the paper members is compressed by the pressing surfaces of the opposed corrugated pressing members, and is subjected to waveform bonding.

FIG. 1A

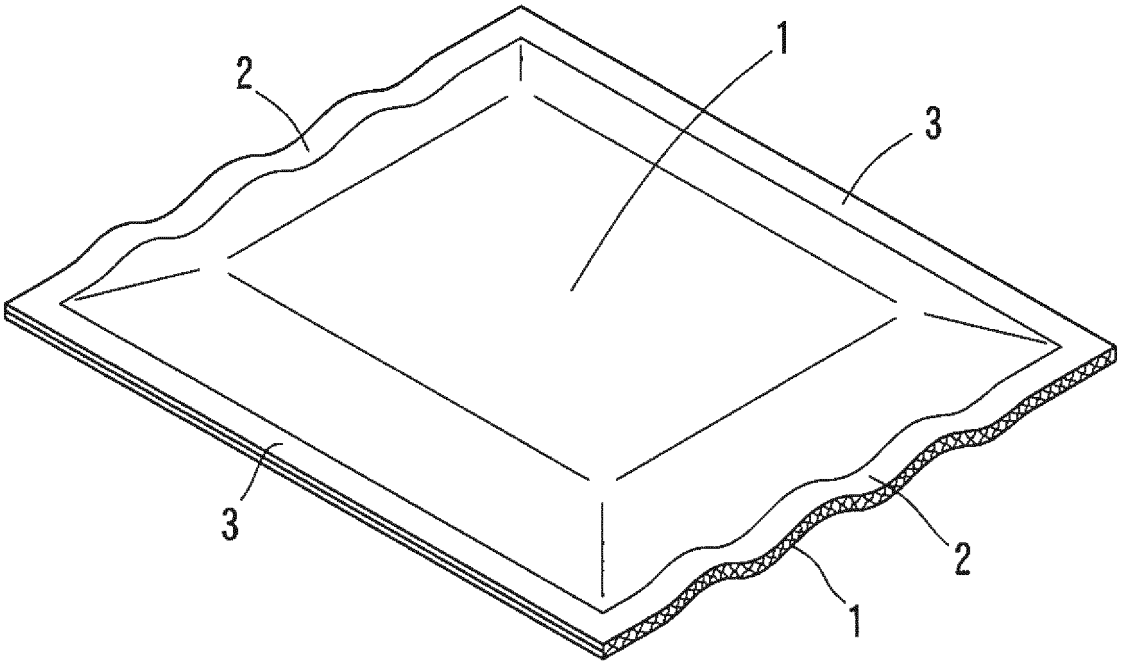


FIG. 1B

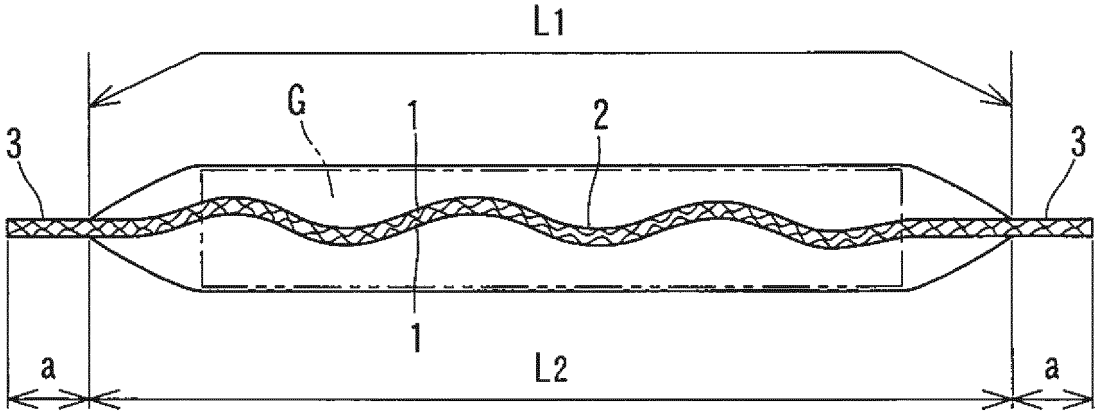


FIG. 2

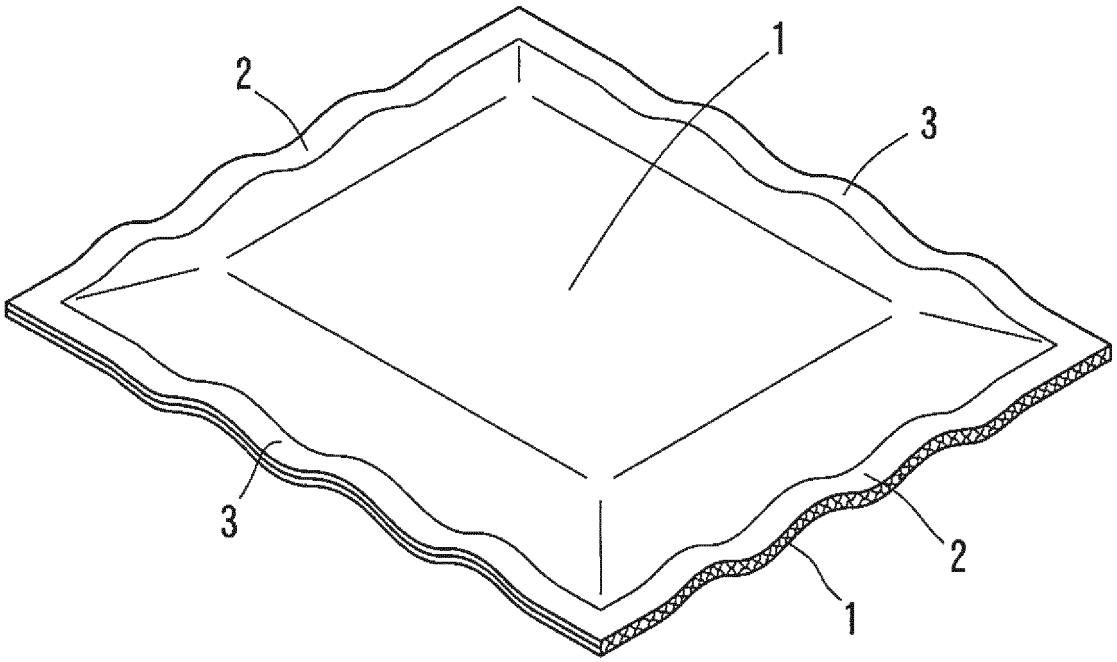


FIG. 3

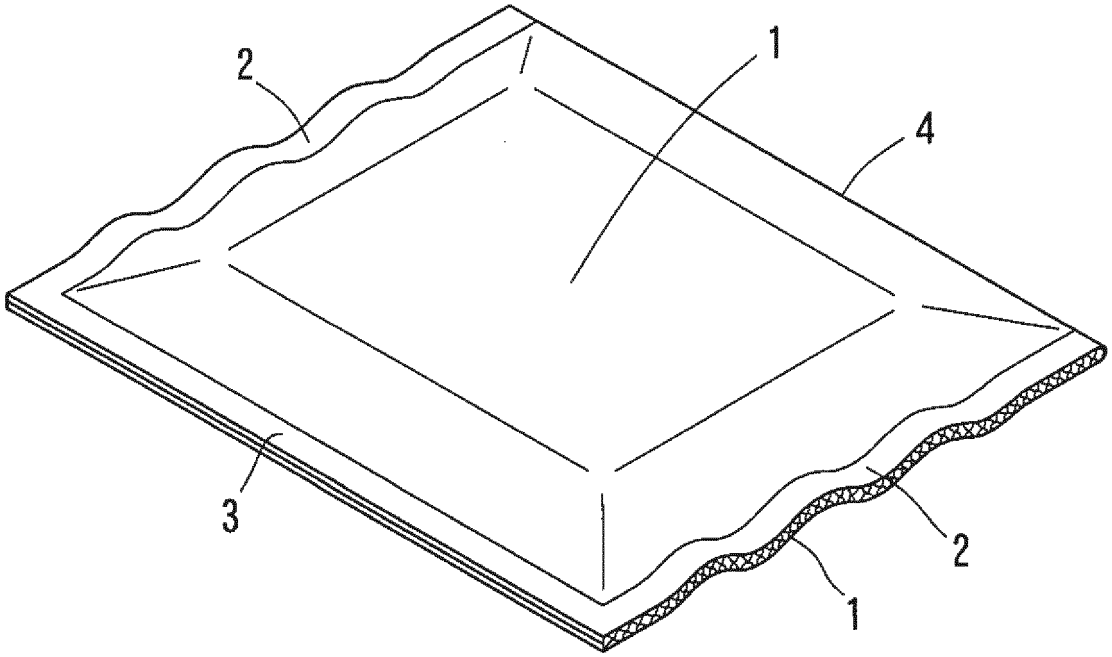


FIG. 4

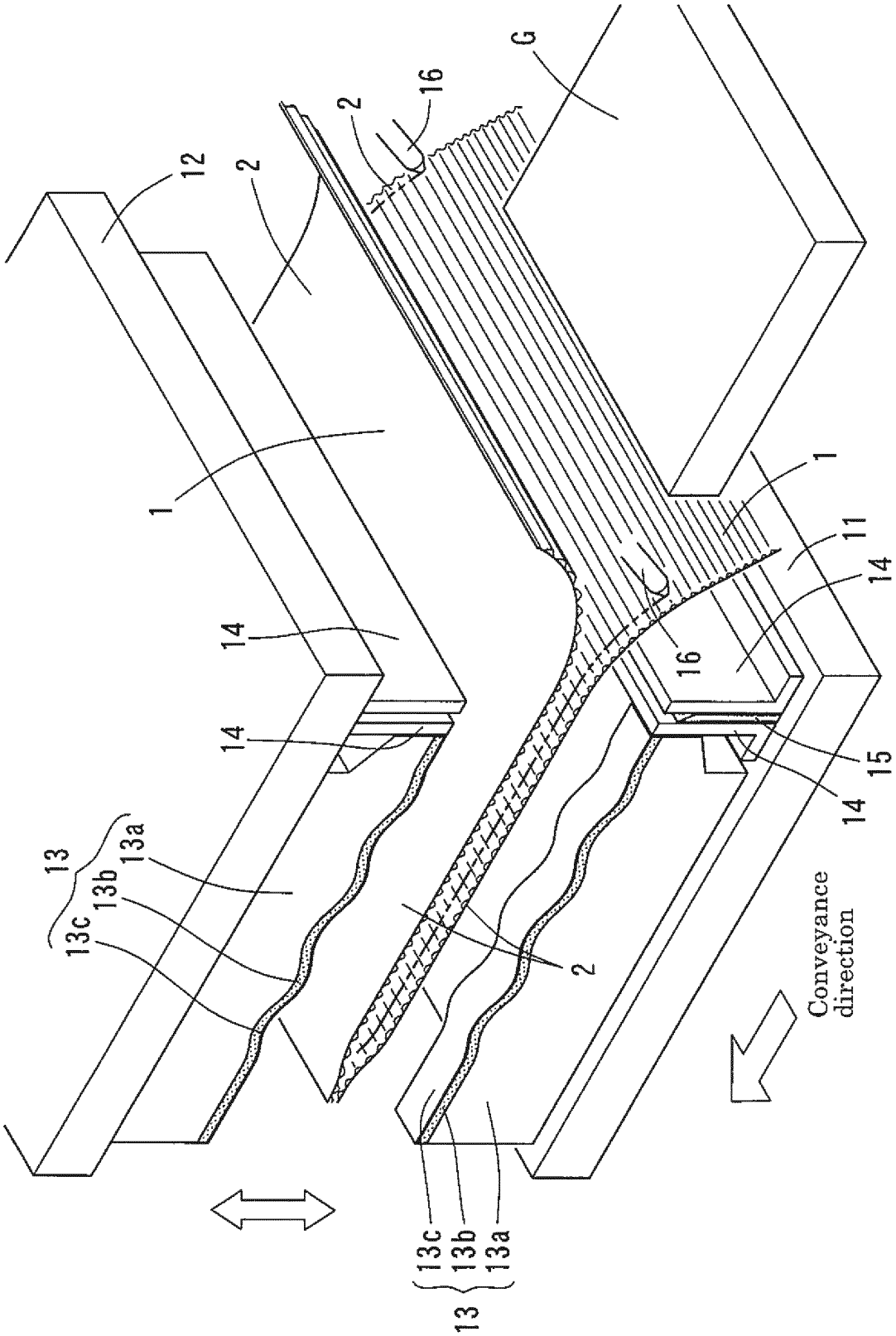
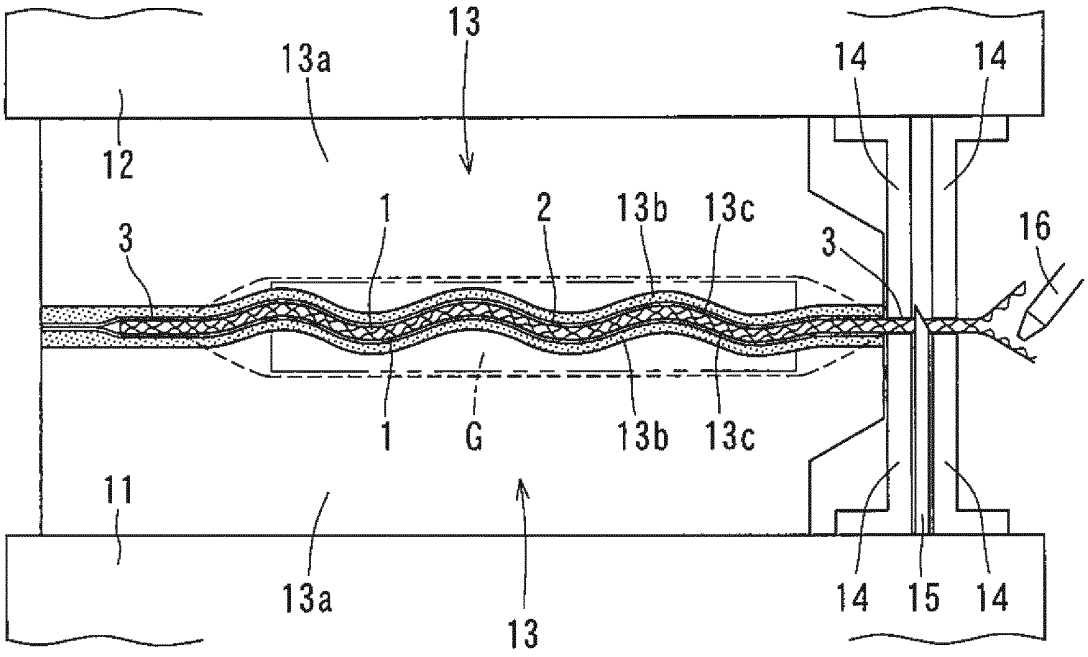

G
16
2
12
2
1
14
14
13
13a
13b
13c
2
1
11
14
16
15
14
Conveyance direction
13c
13b
13a
13

FIG. 5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14

FIG. 6

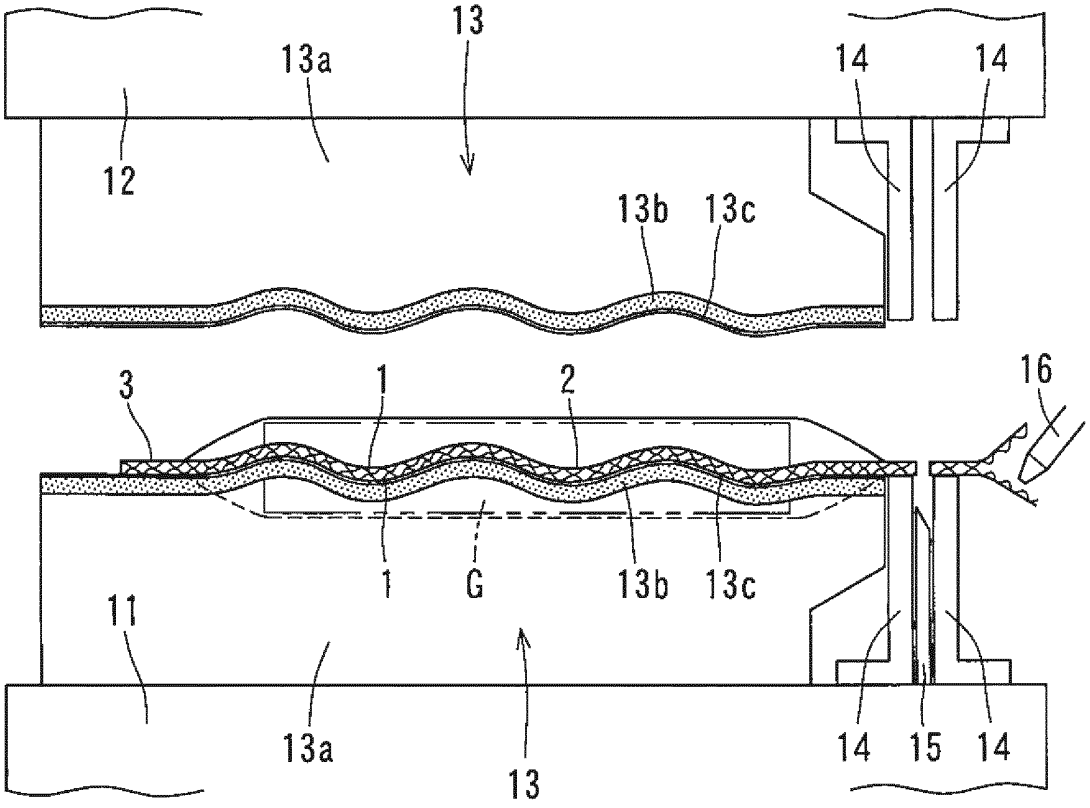
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FIG. 7

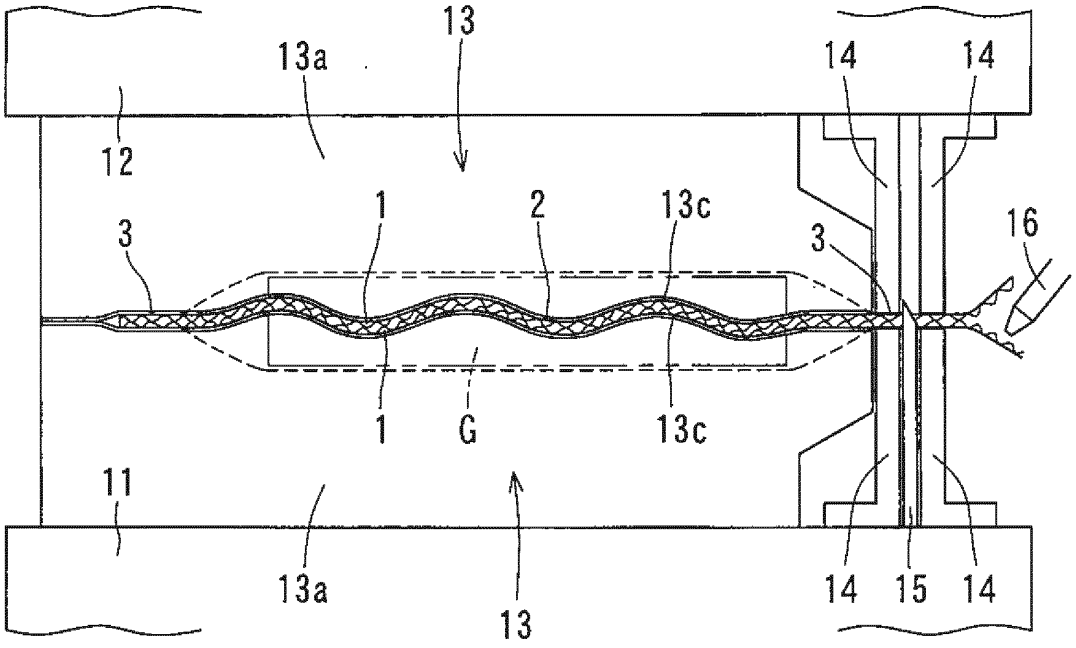
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FIG. 8

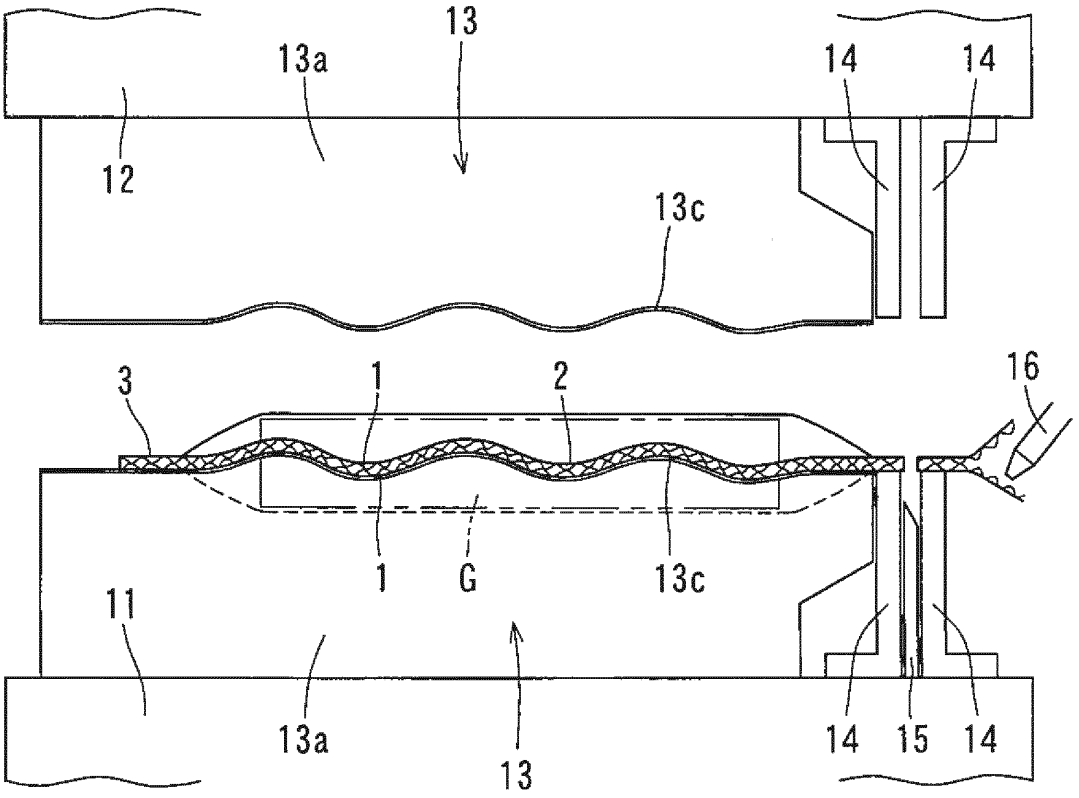
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FIG. 9A

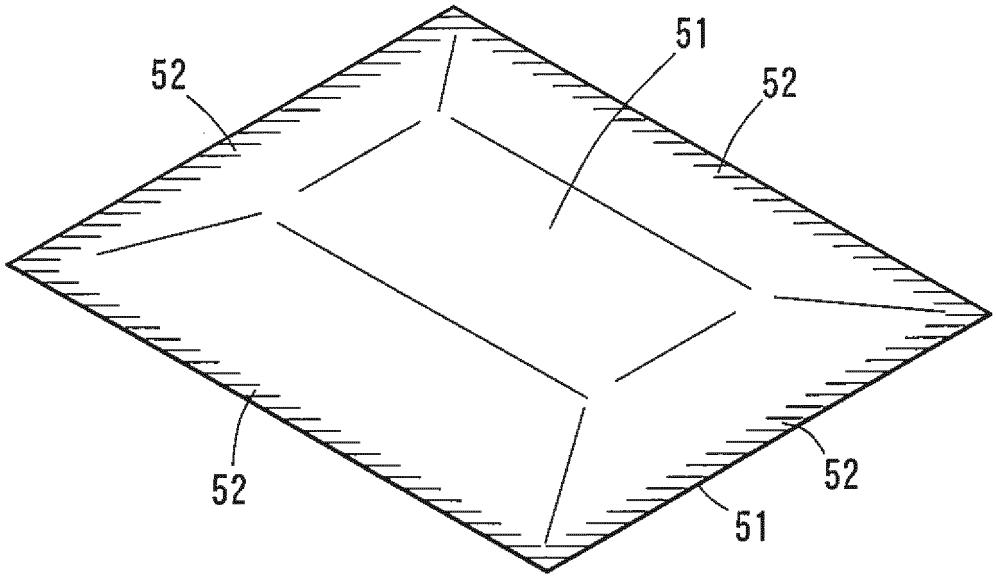


FIG. 9B

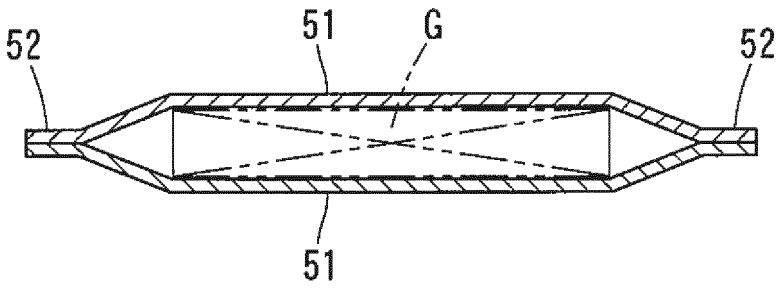


FIG. 10

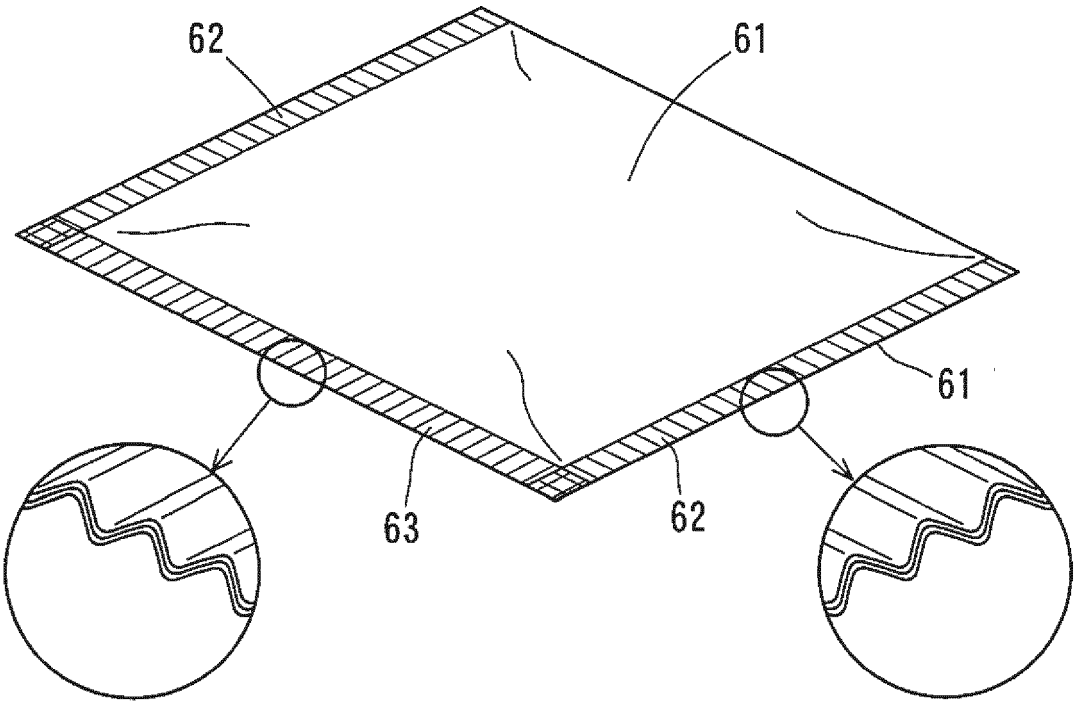
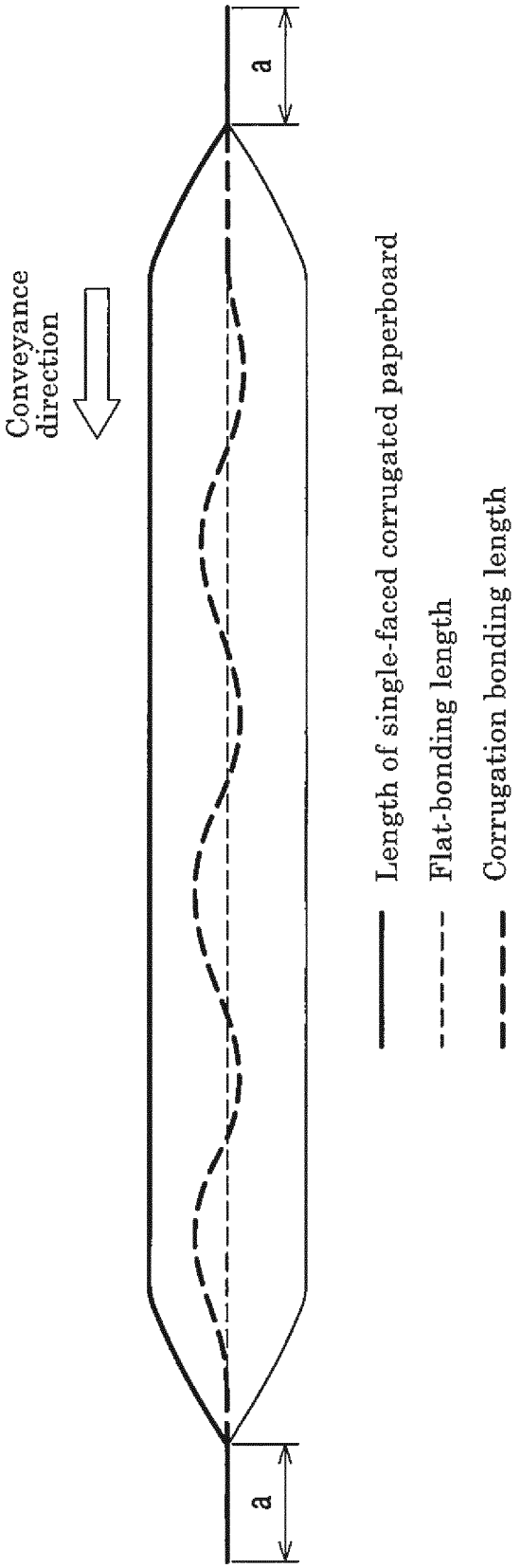


FIG. 11


a
Conveyance direction
a
Length of single-faced corrugated paperboard
Flat-bonding length
Corrugation bonding length

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2022/033673

A. CLASSIFICATION OF SUBJECT MATTER

B65D 75/30(2006.01)i; ***B65B 9/02***(2006.01)i; ***B65B 11/50***(2006.01)i; ***B65D 75/08***(2006.01)i
FI: B65D75/30 Z; B65D75/08; B65B9/02; B65B11/50

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)

B65D75/30; B65B9/02; B65B11/50; B65D75/08

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Published examined utility model applications of Japan 1922-1996
Published unexamined utility model applications of Japan 1971-2022
Registered utility model specifications of Japan 1996-2022
Published registered utility model applications of Japan 1994-2022

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.
X	JP 2010-116182 A (ISHIDA CO LTD) 27 May 2010 (2010-05-27) claims, paragraphs [0027]-[0042], [0071], [0075], fig. 1-10	1-5, 7
Y		6, 8-10
Y	JP 2005-225523 A (NIPPON MATAI CO LTD) 25 August 2005 (2005-08-25) claim 1, fig. 1-2	6
Y	JP 2012-20776 A (KAWASHIMA PACKAGING MACH LTD) 02 February 2012 (2012-02-02) paragraph [0019], fig. 3	8-10
Y	JP 2011-31892 A (INA FOOD INDUSTRY CO LTD) 17 February 2011 (2011-02-17) paragraph [0020], fig. 2	9-10

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

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
21 October 2022	**01 November 2022**
Name and mailing address of the ISA/JP **Japan Patent Office (ISA/JP)** **3-4-3 Kasumigaseki, Chiyoda-ku, Tokyo 100-8915** **Japan**	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/JP2022/033673

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
JP 2010-116182 A	27 May 2010	(Family: none)	
JP 2005-225523 A	25 August 2005	(Family: none)	
JP 2012-20776 A	02 February 2012	(Family: none)	
JP 2011-31892 A	17 February 2011	(Family: none)	

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Patent documents cited in the description

- JP 2006103722 A **[0007]**
- JP 2010116182 A **[0007]**