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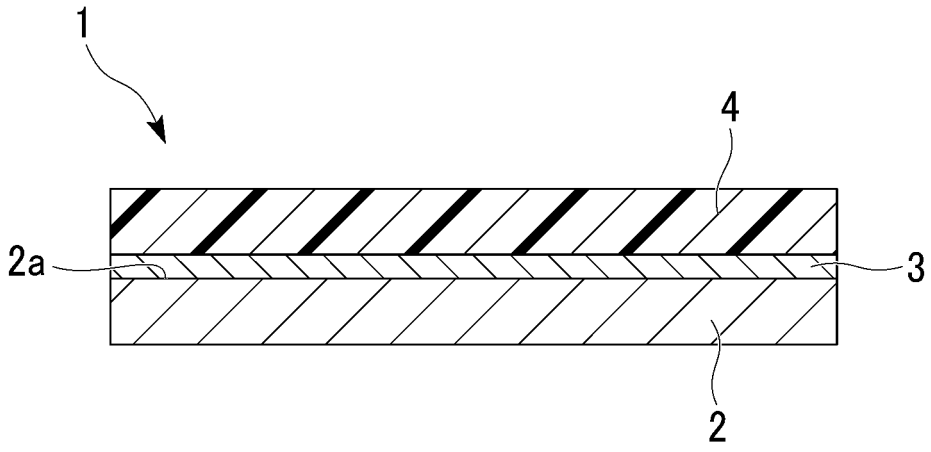
(54) **PAPER CONTAINER AND METHOD FOR MANUFACTURING PAPER CONTAINER**

(57) In a paper container including a container main body formed by folding a blank formed of a sheet-shaped material, the sheet-shaped material includes a base material of paper, an anchor layer formed on the base material, and a sealant layer having a thickness of 20 μm or more and less than 60 μm formed on the anchor layer. The anchor layer is formed of acid-modified polypropylene resin aqueous dispersion and a melting point of polypropylene contained in the acid-modified polypropylene resin aqueous dispersion is 120 °C or more. The sealant layer is formed of homopolymer type polypropylene and the melting point of the homopolymer type polypropylene is 135 °C or more.

FIG. 2



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Description

TECHNICAL FIELD

[0001] The present invention relates to a paper container, and a method for manufacturing the paper container.

[0002] Priority is claimed on Japanese Patent Application No. 2018-151561, filed August 10, 2018, and Japanese Patent Application No. 2018-245476, filed December 27, 2018, the contents of which are incorporated herein by reference.

BACKGROUND ART

[0003] A paper container disclosed in Patent Document 1 is known as a packaging container for frozen food. The paper container is formed by folding a sheet which is a paper blank and adhering predetermined surfaces thereof.

PRIOR ART

PATENT DOCUMENT

[0004] [Patent Document 1] Japanese Patent No. 3687396

DISCLOSURE OF INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0005] While the paper container disclosed in Patent Document 1 is appropriate as a container for food eaten without heating, for example, ice cream or the like, there is still room for improvement in this paper container for a container for food that is heated with a microwave oven and used for eating and drinking.

[0006] For example, in Patent Document 1, in order to improve the waterproof characteristic, a polyethylene layer is provided on one surface of the blank that is an inner surface of the container; however, when the layer is heated by a microwave oven, the polyethylene layer may foam to form pinholes, and ingredients of the food may pass through the polyethylene layer to contaminate the paper.

[0007] In addition, as described below in detail, even if as a countermeasure to this problem an inner layer is formed using a resin having a high melting point, there is a problem that the production efficiency of the paper container is significantly reduced.

[0008] Based on the above-mentioned circumstances, the present invention is directed to providing a paper container that can be efficiently manufactured and that is suitable for heating using a microwave oven, and a method for manufacturing the same.

MEANS FOR SOLVING THE PROBLEMS

[0009] A first aspect of the present invention is a paper container including a container main body formed by folding a blank formed of a sheet-shaped material.

[0010] The sheet-shaped material includes a base material of paper, an anchor layer formed on the base material, and a sealant layer having a thickness of 20 μm or more and less than 60 μm formed on the anchor layer. The anchor layer is formed of an acid-modified polypropylene resin aqueous dispersion and the melting point of polypropylene contained in the acid-modified polypropylene resin aqueous dispersion is 120 °C or more. The sealant layer is formed of a homopolymer type polypropylene and the melting point of the homopolymer type polypropylene is 135 °C or more.

[0011] A second aspect of the present invention is a method for manufacturing a paper container, which is provided to manufacture the paper container according to the first aspect.

[0012] The method includes a process A of disposing the blank on a female mold, a process B of disposing hot air supply units having exhaust nozzles on four corners of the blank, a process C of covering parts of the hot air supply units with covers and forming a closed space around the exhaust nozzles, a process D of supplying hot air into the closed space and melting a part of the sealant layer, and a process E of pressing the blank against the female mold, folding the blank, and disposing parts of the sealant layer to face each other and joining the parts.

[0013] A third aspect of the present invention is a paper container including a container main body formed by folding a blank formed of a sheet-shaped material.

[0014] The container main body includes a bottom surface section, a plurality of side surface sections standing upward from the bottom surface section, joining sections formed between the side surface sections, flange sections extending from the side surface sections toward circumferential edges of the container main body, and assistant flanges extending

from parts of the joining sections toward the circumferential edges of the container main body.

[0015] The sheet-shaped material includes a base material of paper, a sealant layer formed of polypropylene as a main ingredient on the side of a first surface of the base material, and a heat seal layer formed on at least a part of the flange section above a second surface opposite to the first surface and containing acid-modified polypropylene.

[0016] A fourth aspect of the present invention is a method for manufacturing a paper container, which is provided to manufacture the paper container according to the third aspect.

[0017] The method includes a process A of disposing the blank on a female mold, a process B of disposing hot air supply units having exhaust nozzles on four corners of the blank, a process C of covering parts of the hot air supply units with covers and forming a closed space around the exhaust nozzles, a process D' of supplying hot air into the closed space to melt a part of the sealant layer and softening the heat seal layer, and a process E' of pressing the blank against the female mold, folding the blank, disposing parts of the sealant layer to face each other and joining them, and bringing the assistant flange in contact with the heat seal layer to join it to the flange section.

[0018] A fifth aspect of the present invention is a paper container including a container main body formed by folding a blank formed of a sheet-shaped material.

[0019] The sheet-shaped material includes a base material of paper, and a coat layer formed on the base material.

[0020] The coat layer is formed of an acid-modified polypropylene resin as a main ingredient, and the melting point of polypropylene contained in the acid-modified polypropylene resin is 120 °C or more.

EFFECTS OF THE INVENTION

[0021] According to the present invention, it is possible to provide a paper container that can be efficiently manufactured and that is suitable for heating using a microwave oven, and a method for manufacturing the same.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022]

Fig. 1 is a view showing a blank for a paper container according to a first embodiment of the present invention.
Fig. 2 is a schematic cross-sectional view of the blank.
Fig. 3 is a view showing a process of manufacturing the paper container.
Fig. 4 is a view showing the process of manufacturing the paper container.
Fig. 5 is a view showing the process of manufacturing the paper container.
Fig. 6 is a view showing the process of manufacturing the paper container.
Fig. 7 is a view showing a container main body of the paper container.
Fig. 8 is a view showing the container main body to which a lid member is joined.
Fig. 9 is a view showing a blank for a paper container according to a second embodiment of the present invention.
Fig. 10 is schematic cross-sectional view of the blank.
Fig. 11 is a schematic cross-sectional view of a part of a flange section in the blank.
Fig. 12 is a view showing a process of manufacturing the paper container.
Fig. 13 is a view showing the process of manufacturing the paper container.
Fig. 14 is a view showing the process of manufacturing the paper container.
Fig. 15 is a view showing the process of manufacturing the paper container.
Fig. 16 is a view showing a container main body of the paper container.
Fig. 17 is a view showing the container main body to which a lid member is joined.
Fig. 18 is a schematic cross-sectional view of a blank for a paper container of a third embodiment of the present invention.

EMBODIMENTS FOR CARRYING OUT THE INVENTION

[0023] Hereinafter, a first embodiment of the present invention will be described with reference to Figs. 1 to 8.

[0024] A paper container of the embodiment is constituted by a container main body formed by folding and heat-welding a blank formed by punching a sheet-shaped material, and a lid member attached to the container main body. The sheet-shaped material is mainly formed of paper.

[0025] Fig. 1 shows a shape of a blank 1 according to the embodiment. The blank 1 has a rectangular parallelepiped shape, and a plurality of folding lines are formed thereon through embossing or the like. Parts of the folding lines are used for four sides, and a quadrangular bottom surface section 10 that constitutes a bottom surface of the paper container is provided at a central section thereof. Four quadrangular side surface sections 11, 12, 13 and 14 are provided around the bottom surface section 10 such that each shares one of four sides with the bottom surface section 10. Joining sections

21, 22, 23 and 24 joined through heat welding are provided between neighboring side surface sections. Each of the joining sections is constituted by two substantially rectangular shapes that are line-symmetrical to each other.

[0026] Flange sections 31, 32, 33 and 34 having substantially fixed widths are provided on sides of the side surface sections 11, 12, 13 and 14 opposite to the bottom surface section 10. One side of the triangular shapes of the joining sections have assistant flanges 21a, 22a, 23a and 24a with the same width as the flange section.

[0027] Fig. 2 shows a layer composition of the blank 1. The blank 1 includes a base material 2 made of paper, an anchor layer 3 formed on a first surface 2a of the base material 2, and a sealant layer 4 formed on the anchor layer 3. The layer composition of the blank 1 is the same as the layer composition of the sheet-shaped material.

[0028] While the lid member may be formed of a material different from that of the blank 1, when the lid member is formed of the same material as that of the blank 1, the entire paper container can be disposed of as combustible waste after use, and does not require sorting.

[0029] Various types of paper boards such as coated board, coated manila, ivory board, or the like, can be used as the base material 2. Various printing may be applied to one or both sides of the base material 2 for the purpose of improvement of design, imparting information, or the like.

[0030] The sealant layer 4 is formed of a homopolymer-type polypropylene as a main ingredient.

[0031] The polypropylene has the melting point of at least 135 °C or more such that it can sufficiently withstand heat applied during a manufacturing process, which will be described below. The melting point is preferably 150 °C or more.

[0032] A thickness of the sealant layer 4 is 20 μm or more and less than 60 μm.

[0033] The anchor layer 3 is formed of an acid-modified polypropylene resin aqueous dispersion as a main ingredient, and increases adhesion between the base material 2 and the sealant layer 4. The polypropylene contained in the anchor layer 3 has a melting point of at least 120 °C or more such that it can sufficiently withstand heat applied during a manufacturing process, which will be described below. The melting point is preferably 150 °C or more.

[0034] In the blank 1 and the lid member, a resin layer may be formed on a second surface opposite to the first surface 2a. A material of the resin layer may be appropriately set in consideration of a use or the like of the paper container, and may be the same as the sealant layer 4.

[0035] The sheet-shaped material that is a material of the blank 1 configured as described above can be manufactured by forming the anchor layer 3 through coating or the like of an acid-modified polypropylene resin aqueous dispersion on the first surface 2a of the base material 2, and then, laminating a melting resin that is a sealant layer on the anchor layer 3 through extrusion lamination. When the sheet-shaped material is punched into a predetermined shape, the blank 1 is thus completed.

[0036] A method for manufacturing a paper container according to the embodiment using the blank 1 will be described.

[0037] First, the blank 1 is disposed on a female mold having a shape corresponding to an appearance of the paper container while a surface on which the sealant layer 4 is formed is directed upward (process A). The disposition is performed by a vacuum pad, a chuck, or the like.

[0038] Next, as shown in Fig. 3, hot air supply units 101 are disposed at four corners of the blank 1 (process B), and the four corners of the blank 1 are supported by the hot air supply units 101. The hot air supply units 101 prevent the blank 1 from warping before manufacture of a box. The female mold is not shown because it is disposed below the blank 1.

[0039] Each of the hot air supply units 101 has an ejection hole (not shown). Hot air at hundreds of °C can be supplied from the exhaust nozzles. The exhaust nozzles are directed toward the joining sections 21, 22, 23 and 24 that are disposed at four corner sections of the blank 1 in the process B.

[0040] Next, as shown in Fig. 4, parts of the hot air supply units 101 are covered with covers 102 (process C). In the hot air supply units 101, the peripheries of the exhaust nozzles are closed by the covers 102, and a closed space into which hot air flows is formed to cover at least the parts of the joining sections.

[0041] Next, the hot air is ejected from the exhaust nozzles. At least a part of the sealant layer 4 in the joining sections 21, 22, 23 and 24 is melted by the hot air, and is brought into a heat-weldable state (process D). In the embodiment, the sealant layer 4 on the assistant flanges 21a, 22a, 23a and 24a is further welded, and is brought into a heat-weldable state.

[0042] Since the hot air generally stays in the closed space formed by the covers 102 and a temperature of the hot air leaking out of the closed space drops rapidly while the hot air diffuses, the sealant layer 4 other than the joining section is not melted.

[0043] Next, the covers 102 are retracted, and a male mold having a shape corresponding to an inner shape of the paper container is made to approach the blank 1 from above the blank 1. The male mold comes in contact with the blank 1 and presses the blank 1 toward the female mold (process E).

[0044] As shown in Fig. 5, the pressed blank 1 is folded along the folding line. Here, each of the joining sections 21, 22, 23 and 24 is folded along the folding line between two substantially triangular shapes. As a result, the sealant layers 4 having two substantially triangular shapes approach and join each other.

[0045] In addition, the joining sections 21, 22, 23 and 24, which were joined, are folded along one of side surface sections standing upward from the bottom surface section through folding. According to this movement, the sealant layer

4 on which the assistant flanges 21a, 22a, 23a and 24a are melted approaches a back side of the flange section of the side surface section along which the joining section is disposed, and the assistant flange and the flange section are joined to each other.

[0046] After completion of the process E, the male mold and the hot air supply units 101 are retracted. According to the sequence so far, manufacture of the first box of the container main body is terminated, and as shown in Fig. 6, a basic form 50A of the container main body is formed.

[0047] After that, when each of the flange section is folded substantially parallel to the bottom surface section by a separate male mold or the like, as shown in Fig. 7, a container main body 50 is completed.

[0048] The completed container main body 50 is carried to the next process, and the internal space is filled with contents. Finally, as shown in Fig. 8, when an upper opening of the container main body 50 is covered with a lid member 60 and a circumferential edge portion of the lid member 60 and the flange section of the container main body 50 are joined to each other throughout the circumference, a packing body filled with contents is completed. After being filled with the contents, predetermined processing such as freezing, drying, or the like, may be performed with respect to the contents at an appropriate timing.

[0049] In the paper container, a part of the sealant layer formed on the blank constitutes the innermost surface of the paper container. When the sealant layer is formed of polyethylene, since the thermal resistance is poor, the sealant layer may foam when heated in a microwave oven, and pinholes are easily generated. When pinholes are generated, seasoning ingredients, an oil content, or the like, of the food permeates into the base material, which greatly impairs the appearance.

[0050] When the sealant layer is formed of a polyester-based resin such as polyethylene terephthalate (PET), polybutylene terephthalate (PBT), or the like, and a resin material having a high melting point such as polymethylpentene (PMP) or the like, it is possible to reduce the likelihood of the generation of pinholes. However, the sealant layer formed of these materials may not melt sufficiently even when hot air is applied in the above-mentioned process D because the melting point is too high, and the production efficiency may significantly decrease. When the temperature of the hot air is increased to reliably melt the sealant layer, the base material may be charred. In addition, even when melted, the resin material may flow because the resin material is at a high temperature and move to areas other than the joining section to spoil the appearance, and instances in which a stable seal strength cannot be obtained may occur.

[0051] While polypropylene (PP) is also known as a resin that forms a sealant layer, PP has a low adhesion to the base material of the paper, and after lamination, the sealant layer may peel from the base material during punching when the blank is formed. Since the adhesion is further reduced under a high temperature atmosphere, the sealant layer may naturally peel from the base material due to heating in a microwave oven.

[0052] While there are some known anchoring agents that enhance the adhesion between PP and the base material, most of them dissolve only in organic solvents. When these anchoring agents are applied to a paper container, the odor of the organic solvent may be too strong, and it is difficult to use this when the contents are food and beverages.

[0053] The inventors repeated various examinations under the above-mentioned circumstances. The result was that, in the above-mentioned manufacturing process, a configuration in which a sealant layer can be reliably melted and efficiently manufactured was found, while reducing the probability of generation of pinholes upon manufacture of the box and heating in a microwave oven, by forming the sealant layer of a homopolymer type polypropylene having a melting point of a predetermined value or more and having a thickness of a predetermined value or more and further making the melting point of the polypropylene contained in the anchoring agent a predetermined value or more, and using an anchoring agent containing an acid-modified polypropylene resin aqueous dispersion as a main ingredient. In the paper container according to the embodiment, the adhesion between the paper base material and the sealant layer is also improved, and the probability of peeling off of the sealant layer upon formation of the blank or heating in a microwave oven is significantly reduced.

[0054] Hereinafter, some of examination data showing effects of the components of the embodiment are shown.

(Examination 1: Examination related to thickness of sealant layer formed of PP and generation of pinholes)

[0055] A sheet material for examination was formed using the following materials.

Base material: Base sheet for paper cup, (basis weight of 320 g/m^2)
Sealant layer material: Homopolymer type PP (melting point of 160 °C, MFR of 20, density of 0.9 g/cm^2)

[0056] A sealant layer material was laminated on one surface of the base material through extrusion lamination, and a plurality of types of sheet-shaped materials having different thicknesses of the sealant layer was obtained. The thicknesses of the sealant layer were the four types including 14 μm, 17 μm, 20 μm, and 50 μm. The paper container for examination was fabricated according to the above-mentioned manufacturing procedure (a hot air temperature of 520 °C, an air volume of 430 ml/min, a box manufacture speed of 50 pcs/min) using the blank obtained by punching the

sheet-shaped material.

[0057] In addition, since it is known that presence or absence of an anchoring agent has almost no effect on generation of pinholes, in Examination 1, the sealant layer was formed directly on the base material and examined.

[0058] Fried rice with mixed vegetables (300 g) was put into each paper container as contents and frozen. After that, the fried rice with mixed vegetables was heated in a microwave oven (500 W, for 6 minutes, a contents temperature of 92 to 95 °C after heating).

[0059] In each paper container, it was checked whether pinholes in the sealant layer were present upon completion of manufacture of the box and after heating in the microwave oven.

[0060] The results of Examination 1 are shown in Table 1. In the entries in the following table, ○, × and Δ indicate (good), (bad) and (fair) according to applications or the like, respectively.

(Table 1)

Sealant layer thickness	Upon completion of manufacture of box	After heating in microwave oven
14 μm	×: Pinholes present	×: A number of pinholes were generated
17 μm	○: No pinholes	×: A number of pinholes were generated
20 μm	○: No pinholes	○ : No pinholes were generated
50 μm	○: No pinholes	○: No pinholes were generated

[0061] As shown in Table 1, in the sealant layer with a thickness of 14 μm, pinholes were generated on both sides upon manufacture of the box after microwave heating. In the sealant layer with a thickness of 17 μm, while no pinholes were generated upon manufacture of the box, pinholes were generated upon microwave heating. Since the thickness of the sealant layer was equal to or greater than 20 μm, generation of pinholes on both sides upon manufacture of the box after microwave heating was minimized. While not shown in the table, although a sealant layer with a thickness of 60 μm or more had a reduced number of pinholes, folding workability was decreased, and the box manufacture speed was slightly decreased. In addition, the efficiency of lamination processing through extrusion lamination or punching upon fabrication of the blank was also low.

(Examination 2: Examination of influence of anchoring agent with reference to adhesion between sealant layer formed of PP and paper base material)

[0062] A sheet material for examination was formed using the following materials.

Base material: Base sheet for paper cup, (basis weight of 320 g/m^2)
Anchor layer material: The following three types were provided.
A1: No anchor layer
A2: Polyethyleneimine-based anchoring agent
A3: Acid-modified polypropylene resin aqueous dispersion (polypropylene melting point of 150 °C)
Sealant layer material: Homopolymer type PP (melting point of 160 °C, MFR of 20, density of 0.9 g/cm^2)

[0063] The anchor layer was formed on one surface of the base material according to any one of the above-mentioned A1 to A3. In the cases of A2 and A3, an application quantity was 0.5 g/m^2 in terms of solid content. Three types of sheet-shaped materials were obtained by laminating a sealant layer material on the anchor layer through extrusion lamination. The thickness of the sealant layer was 40 μm.

[0064] A specimen was fabricated using each sheet-shaped material, 180° peeling was performed by grasping the base material layer and the sealant layer, and the degree of adhesion was checked. Peeling conditions were the following two types.

- Room temperature (25 °C)
- Immediately after heating (100 °C for 60 minutes)

[0065] Results of Examination 2 are shown in Table 2.

[Table 2]

Anchor layer configuration	Room temperature	Immediately after heating
A1	×: No paper peeling occurred	×: No paper peeling occurred
A2	×: No paper peeling occurred	×: No paper peeling occurred
A3	○: Paper peeling occurred	○: Paper peeling occurred

[0066] "Paper peeling" in Table 2 means a phenomenon that a part of the paper base material peels off from the remaining part of the paper base material while still in close contact with the sealant layer. That is, it can be said that the adhesion between the sealant layer formed of PP and the paper base material is strong in a sheet-shaped material in which this paper peeling occurs.

[0067] In the sheet-shaped material of A1 and A2, only the sealant layer peeled from the base material without paper peeling, whereas in the sheet-shaped material of A3, paper peeling occurred under all peeling conditions.

[0068] As described above, it was shown that adhesion between the paper base material and the sealant layer formed of PP can be enhanced by configuring the anchor layer with the acid-modified polypropylene resin aqueous dispersion, and the adhesion is maintained even in a high temperature environment.

(Examination 3: Examination 1 of melting point of PP contained in acid-modified polypropylene resin aqueous dispersion)

[0069] With respect to the influence of the melting point of PP contained in acid-modified polypropylene resin aqueous dispersion on adhesion between the base material and the sealant layer, the melting point was examined using the sheet-shaped material in Examination 3.

[0070] A sheet material for examination was formed using the following materials.

Base material: Base sheet for paper cup, (basis weight of 320 g/m^2)
Anchor layer material: The following four types were prepared using an acid-modified polypropylene resin aqueous dispersion.
B1: Melting point of PP contained of 70 °C
B2: Melting point of PP contained of 90 °C
B3: Melting point of PP contained of 120 °C
B4: Melting point of PP contained of 150 °C
Sealant layer material: Homopolymer type PP (melting point of 160 °C, MFR of 20, density of 0.9 g/cm^2)

[0071] The anchor layer was formed on one surface of the base material according to all of the above-mentioned B1 to B4. In all of these cases, an application quantity was 0.5 g/m^2 in terms of solid content. The sealant layer material was laminated on the anchor layer through extrusion lamination, and four types of sheet-shaped materials were obtained. The thickness of the sealant layer was 40 μm.

[0072] A specimen was fabricated using each of the sheet-shaped materials, and 180° peeling was performed by grasping the base material layer and the sealant layer, a peeling strength was measured, and a degree of adhesion was checked. The peeling conditions were the following three types.

- Room temperature (25 °C)
- Under a 90 °C atmosphere
- Under a 110 °C atmosphere

[0073] Results of Examination 3 are shown in Table 3.

[Table 3]

Anchor layer material	Peeling strength (N/15 mm) and peeling state		
	Room temperature	90 °C	110 °C
B1	2.8 Paper peeling	0.7 No paper peeling	0.1 No paper peeling

(continued)

Anchor layer material	Peeling strength (N/15 mm) and peeling state		
	Room temperature	90 °C	110 °C
B2	3.1 Paper peeling	0.9 No paper peeling	0.1 No paper peeling
B3	3.4 Paper peeling	1.1 Sealant layer extended but did not peel.	0.3 Sealant layer extended but did not peel.
B4	3.6 Paper peeling	1.6 Sealant layer extended but did not peel.	0.3 Sealant layer extended but did not peel.

[0074] All of the sheet-shaped materials have a sufficient adhesive strength under room temperature, and paper peeling occurred. Under a high temperature atmosphere, the adhesive strength of all of the sheet-shaped materials was lower than that at room temperature. However, in the sheet-shaped material of B1 and B2, the anchor layer coagulated and fractured, and the sealant layer completely peeled from the base material, whereas, in the sheet-shaped material of B3 and B4, there was no peeling from the base material although the sealant layer was extended by the peeling operation. In Table 3, measurement values when the sealant layer was extended are shown.

[0075] In the sheet-shaped material of B3 and B4, when the sealant layer extended, this is due to the mechanical force applied. Upon actual use of the paper container, since such force is rarely applied to the sealant layer, in the sheet-shaped material of B3 and B4, it is conceivable that the close contact state between the paper base material and the sealant layer formed of PP would be preferably maintained even under a high temperature atmosphere.

(Examination 4: Examination 2 of melting point of PP contained in acid-modified polypropylene resin aqueous dispersion)

[0076] With respect to the influence of the melting point of PP contained in the acid-modified polypropylene resin aqueous dispersion on adhesion between the base material and the sealant layer, examination using the paper container was performed in Examination 4.

[0077] The paper container was fabricated under the same conditions as in Examination 1 using each of the sheet-shaped materials fabricated in Examination 3. In addition, the paper container was filled with contents and heated in a microwave oven under the same conditions as those of Examination 1.

[0078] The specimen was fabricated using the paper container immediately after manufacture of the box and the paper container after heating in a microwave oven, 180° peeling was performed by grasping the base material layer and the sealant layer, and the degree of adhesion was checked.

[0079] Results of Examination 4 are shown in Table 4.

[Table 4]

Anchor layer material	Immediately after manufacture of box	After heating in microwave oven
B1	×: No paper peeling	×: No paper peeling
B2	×: Peeled portions and unpeeled portions were present.	×: Peeled portions and unpeeled portions were present.
B3	Δ: Foaming was present and peeling was present in sealant layer.	○: New foaming does not occur and peeling is present in sealant layer.
B4	○: No forming was present but peeling was present in sealant layer.	○: No forming was present but peeling was present in sealant layer.

[0080] In the paper container formed of the sheet-shaped material of B1 and B2, paper peeling did not occur either immediately after manufacture of the box or after heating in the microwave oven; however, the adhesive strength was not sufficient. In the paper container formed of the sheet-shaped material of B3 and B4, paper peeling occurred both immediately after manufacture of the box and after heating in the microwave oven; however, the adhesive strength was sufficient.

[0081] In B3, foaming occurred in the sealant layer due to hot air in the box manufacture process. When a temperature

of the base material is increased due to hot air upon manufacture of the box or heating using a microwave oven, moisture contained in the base material becomes vapor. It is conceivable that, when an adhesive force between the base material and the sealant layer is weak, the vapor causes peeling; however, when the base material and the sealant layer are sufficiently adhered to each other, peeling does not occur and foaming occurs. In B4 in which the melting point of the PP contained in the anchor layer is higher, it is conceivable that the adhesive force between the base material and the sealant layer does not decrease even under a high temperature environment, and as a result the amount of generated vapor was minimized, and foaming did not occur. In the configuration of B4, even when the contents reach a higher temperature due to heating in a microwave oven, it can be expected that occurrence of foaming will be appropriately minimized.

[0082] Hereinabove, the effects related to the configurations of the paper container of the first embodiment have been described. In the paper container of the first embodiment, when the lid member is formed of the same sheet-shaped material as that of the blank, it is speculated that the same phenomena also occur in the sealant layer of the sheet-shaped material. That is, since the lid member is formed of the same sheet-shaped material as that of the container main body, upon opening after heating in a microwave oven, the base material and the sealant layer of the lid member can also be appropriately prevented from peeling.

[0083] A second embodiment of the present invention will be described with reference to Figs. 9 to 17.

[0084] A paper container of the embodiment is constituted by a container main body formed by folding and heat-welding a blank formed by punching a sheet-shaped material, and a lid member attached to the container main body. The sheet-shaped material is paper as a main material.

[0085] Fig. 9 shows a shape of a blank 201 according to the embodiment. The blank 201 has a substantially rectangular shape, and a plurality of folding lines are formed through embossing or the like. Parts of the folding lines are four sides and have a quadrangular bottom surface section 210 that constitutes a bottom surface of a paper container at a central section thereof. Four quadrangular side surface sections 211, 212, 213 and 214 are provided around the bottom surface section 210, each sharing one of the bottom surface section 210 and the four sides. Joining sections 221, 222, 223 and 224 joined to each other through heat welding are provided between the neighboring side surface sections. Each of the joining sections is constituted by two substantially triangular shapes that are line-symmetrical to each other.

[0086] Flange sections 231, 232, 233 and 234 having a substantially fixed width are provided at sides of the side surface sections 211, 212, 213 and 214 opposite to the bottom surface section 210. Assistant flanges 221a, 222a, 223a and 224a having the same width as that of the flange section are formed at one of the triangular shapes of each of the joining sections.

[0087] Each of the flange sections and each of the assistant flanges are disposed to extend along a circumferential edge of the container main body in the completed container main body.

[0088] Fig. 10 shows a layer composition of the blank 201. The blank 201 includes the base material 2 of the paper, the anchor layer 3 formed on the first surface 2a of the base material 2, and the sealant layer 4 formed on the anchor layer 3. A layer composition of the blank 201 is equal to a layer composition of the sheet-shaped material.

[0089] While the lid member may be formed of a material different from that of the blank 201, when the lid member is formed of the same sheet-shaped material as that of the blank 201, the entire paper container can be disposed of as combustible waste after use, and sorting is not required. In this case, the sheet-shaped material that forms the lid member may not have a heat seal layer, which will be described below.

[0090] Various types of paper boards such as coated board, coated manila, ivory board, or the like, can be used as the base material 2. Various printing may be applied to one or both sides of the base material 2 for the purpose of improvement of design, imparting information, or the like.

[0091] The sealant layer 4 is configured as a homopolymer type polypropylene as a main ingredient. The polypropylene has a melting point of at least 135 °C or more such that it can sufficiently withstand the heat acting in the manufacturing process, which will be described below. The melting point is preferably 150 °C or more.

[0092] The thickness of the sealant layer 4 is 20 μm or more and less than 60 μm.

[0093] The anchor layer 3 enhances adhesion between the base material 2 and the sealant layer 4. While the material of the anchor layer 3 can be appropriately selected, it is preferable to use the acid-modified polypropylene resin aqueous dispersion as the main ingredient. In this case, the polypropylene contained in the anchor layer 3 has a melting point of at least 120 °C or more such that it can sufficiently withstand the heat acting in the manufacturing process, which will be described below. The melting point is preferably 150 °C or more.

[0094] Fig. 11 shows a layer composition of a flange section 231. Heat seal layers 205 are formed at both end portions of the flange section 231 in the longitudinal direction on a second surface 2b opposite to the first surface 2a. The heat seal layers 205 are provided at both end portions of the longitudinal shape in the same aspect even in a flange section 233 opposite to the flange section 231 with the bottom surface section 210 sandwiched therebetween (see Fig. 9).

[0095] The heat seal layers 205 are formed of a heat sealing agent containing acid-modified polypropylene resin aqueous dispersion. The melting point of the polypropylene that constitutes the acid-modified polypropylene resin aqueous dispersion is 100 °C or more, and preferably 150 °C or more.

[0096] The sheet-shaped material that is a material of the blank 201 configured as above forms the anchor layer 3 on the first surface 2a of the base material 2 by coating or the like varnish etc that becomes an anchor layer, and then, the melting resin that becomes the sealant layer is laminated on the anchor layer 3 through extrusion lamination. In addition, the sheet-shaped material can be manufactured by coating a heat sealing agent that becomes the heat seal layers 205 on a predetermined place of the second surface 2b. When the sheet-shaped material is punched in a predetermined shape, the blank 201 is completed.

[0097] A method for manufacturing a paper container of the embodiment using the blank 201 will be described.

[0098] First, the blank 201 is disposed on a female mold having a shape corresponding to an external form of the paper container while a surface on which the sealant layer 4 is formed is directed upward (process A). The disposition is performed by a vacuum pad, a chuck, or the like.

[0099] Next, as shown in Fig. 12, the hot air supply units 101 are disposed at four corners of the blank 201 (process B), and the four corners of the blank 201 are supported by the hot air supply units 101. The hot air supply units 101 prevent the blank 201 from warping before manufacture of the box. The female mold is not shown because the female mold is disposed below the blank 201.

[0100] Each of the hot air supply units 101 has an ejection hole (not shown). Hot air of hundreds °C can be supplied from the exhaust nozzles. The exhaust nozzles are directed toward the joining sections 221, 222, 223 and 224 that are four corner sections of the blank 201 in the process B.

[0101] Next, as shown in Fig. 13, parts of the hot air supply units 101 are covered with the covers 102 (process C). In the hot air supply units 101, surroundings of the exhaust nozzles are closed by the covers 102, and a closed space into which the hot air flows is formed to cover the joining sections and surroundings thereof.

[0102] Next, the hot air is ejected from the exhaust nozzle. At least a part of the sealant layer 4 in the joining sections 221, 222, 223 and 224 are melted by the hot air, and can become a heat-weldable state (process D'). In the embodiment, the sealant layer 4 of the assistant flanges 221a, 222a, 223a and 224a is also further melted, and the heat seal layers 205 formed at back sides of the flange section 231 and 233 are also softened.

[0103] Since the hot air generally stays in the closed space formed by the covers 102 and the temperature of the hot air leaking out of the closed space is rapidly decreased with diffusion, the sealant layer 4 separated from the joining section is not melted.

[0104] Next, the covers 102 are retracted, and the male mold having the shape corresponding to the internal form of the paper container approaches the blank 201 from above the blank 201. The male mold comes in contact with the blank 201, and is directed toward the female mold to press against the blank 201 (process E').

[0105] As shown in Fig. 14, the pressed blank 201 is bent along the folding line. Here, each of the joining sections 221, 222, 223 and 224 is folded along the folding line between the two substantially triangular shapes. As a result, the sealant layers 4 of the two substantially triangular shapes approach each other and join each other.

[0106] In addition, the joining sections 221, 222, 223 and 224 that are joined to each other are folded along the side surface section 211 or 213 of the side surface sections 211, 212, 213 and 214 standing upward from the bottom surface section due to the folding. According to the movement, the sealant layer 4 on which the assistant flanges 221a, 222a, 223a and 224a are melted approaches back sides of the flange section 231 or 233 provided on the side surface section along which the joining section is provided, and comes in contact with the heat seal layers 205. Since the heat seal layer 205 is formed of a polypropylene-based material, the heat seal layer 205 is appropriately joined to the sealant layer 4 of each of the assistant flanges.

[0107] After completion of the process E', the male mold and the hot air supply units 101 are retracted. According to the procedure so far, primary box manufacture of the container main body is terminated, and as shown in Fig. 15, a basic form 250A of the container main body is formed.

[0108] After that, when the flange section is folded to be substantially parallel to the bottom surface section by a separate male mold or the like, as shown in Fig. 16, a container main body 250 is completed.

[0109] The container main body 250 that was completed is transported to the next process, and the internal space is filled with contents. Finally, as shown in Fig. 17, when the upper opening of the container main body 250 is covered with a lid member 260, and the circumferential edge portion of the lid member 260 and the flange section of the container main body 250 are joined to each other throughout the circumference, a packing body filled with the contents is completed. After filling with the contents, predetermined processing such as freezing, drying, or the like, with respect to the contents may be performed at an appropriate timing.

[0110] In the paper container, a part of the sealant layer formed on the blank constitutes the innermost surface of the paper container. In the case in which the sealant layer is formed of polyethylene, since the thermal resistance is deteriorated, the foaming occurs when heating in the microwave oven, and the pinholes are easily generated. When the pinholes are generated, a seasoning ingredient, an oil content, or the like, of the food permeates into the base material, which greatly impairs the appearance.

[0111] When the sealant layer is formed of a polyester-based resin such as polyethylene terephthalate (PET), polybutylene terephthalate (PBT), or the like, and a resin material having a high melting point such as polymethylpentene

(PMP) or the like, it is possible to reduce possibility of generating the pinholes. However, the sealant layer formed of these materials may not melt sufficiently even when hot air is applied in the above-mentioned process D' because the melting point of the sealant layer is too high, the production efficiency is significantly decreased. When the temperature of the hot air is raised to ensure that the sealant layer is melted reliably, the base material may be charred. In addition, even when the resin material was melted, the resin material flowed due to the high temperature thereof, the appearance was spoiled by moving the resin material to an area other than the joining section, and an event occurred in which stable seal strength could not be obtained.

[0112] It was found that, while polypropylene (PP) is also known as a resin that forms a sealant layer, when the sealant layer is formed of PP, there is no problem when the sealant layer is opposed to each other and fused, and the joining may be insufficient in the flange section in which the sealant layer and the base material of the paper are joined to each other.

[0113] The inventors repeated various examinations under the above-mentioned circumstances. As a result, the inventors found that the joining of the flange sections can be strengthened by providing the heat seal layer containing the acid-modified polypropylene resin aqueous dispersion on the back side of the flange section in which the sealant layers of the assistant flanges are joined to each other. In addition, the inventors have established a configuration that the joining strength of the flange section is not decreased even when the polypropylene is heated in the microwave oven after manufacture of the box by making the melting point of the polypropylene contained in the acid-modified polypropylene resin aqueous dispersion be a predetermined value or more. In the paper container of the embodiment, both of reduction in generation of the pinholes or the like in the inner surface and improvement of production efficiency due to reliable joining of the flange sections are accomplished.

[0114] Hereinafter, some of the examination data showing the effects of the configurations of the embodiment are shown.

(Examination 5: Examination of joining strength of flange sections upon manufacture of box)

[0115] A sheet-shaped material for examination using the following material was formed.

Base material: Base sheet for paper cup, (basis weight of 320 g/m^2)
Sealant layer material: Homopolymer type PP (melting point of 160 °C, MFR of 20, density of 0.9 g/cm^2)

[0116] The sealant layer material was laminated on one surface of the base material through extrusion lamination, and the sheet-shaped material having the sealant layer of a thickness of 40 μm was obtained. For the sheet-shaped material, three patterns with different configurations of flange sections were fabricated as described below.

Example of Experiment 1: No heat seal layer (base material is exposed to second surface)
Example of Experiment 2: Apply polyethyleneimine-based heat sealing agent to form heat seal layer (application quantity: solid content of 0.5 g/cm^2)
Example of Experiment 3: Apply heat sealing agent containing acid-modified polypropylene resin aqueous dispersion (polypropylene melting point of 120 °C) to form heat seal layer (application quantity: solid content of 0.5 g/cm^2)

[0117] The paper container of each example of experiment was fabricated according to the above-mentioned manufacturing procedure (a hot air temperature of 520 °C, an air volume of 430 ml/min, and a box manufacture speed of 50 pcs/min) using the blank obtained by punching the sheet-shaped material having each pattern.

[0118] The following two points were evaluated for the paper container of each example of experiment.

(Measurement of peeling strength between flange section and assistant flange)

[0119] The specimen was fabricated using each paper container, and measurement was performed by grasping the flange section and the assistant flange and performing 180° peeling.

(Visual observation of peeling area)

[0120] A state of a peeling interface was visually checked.

[0121] Results of Examination 5 are shown in Table 5.

[Table 5]

	Peeling strength (N/15mm)	Peeling area
Example 1	0.1	No paper peeling (interface peeling)
Example 2	0.2	No paper peeling (interface peeling)
Example 3	3.4	Paper peeling

[0122] As shown in Table 5, only the paper container of the example of Experiment 3 has a sufficient peeling strength, and in the examples of Experiments 1 and 2, peeling strength was decreased.

[0123] The "paper peeling" in Table 5 means a phenomenon that a part of any one of the paper base materials is peeled off from the remaining portion of the paper base material while still in close contact with the sealant layer. That is, in the paper container in which the paper peeling occurred, it can be said that the adhesion between the flange section and the assistant flange is enhanced.

[0124] In the paper container of the examples of Experiments 1 and 2, while the base material of the flange section is peeled from the sealant layer of the assistant flange at an interface therebetween and the paper peeling does not occur, the paper peeling occurred in the paper container of the example of Experiment 3.

[0125] As described above, since the heat seal layer is formed of the acid-modified polypropylene resin aqueous dispersion on the flange section, the assistant flange and the flange section having the sealant layer formed of PP can be strongly joined to each other upon manufacture of the box.

(Examination 6: Examination of flange section joining strength due to heating in microwave oven)

[0126] A sheet material for examination was formed using the following material.

Base material: Base sheet for paper cup, (basis weight of 320 g/m^2)
Sealant layer material: Homopolymer type PP used in Examination 1 (thickness 40 μm of sealant layer)
Heat seal layer material: Heat sealing agent containing acid-modified polypropylene resin aqueous dispersion (application quantity: solid content of 0.5 g/cm^2)

[0127] However, only the melting points of the polypropylene are different in the examples of the experiment as follows.

Example of Experiment 4: 70 °C
Example of Experiment 5: 90 °C
Example of Experiment 6: 100 °C
Example of Experiment 7: 120 °C
Example of Experiment 8: 150 °C

[0128] The paper container of each example of the experiment was fabricated in the same sequence as that of Examination 1, and filled with macaroni au gratin of 300g as contents. After that, the opening was covered with the lid formed by punching the sheet-shaped material, and the heat seal layers facing each other in the flange section were heat-welded to join the lid to the paper container. After that, the container and the contents were frozen, and a sealed container for each example of the experiment in which the contents were sealed in a frozen state was fabricated.

[0129] For the paper container immediately after manufacture of the box and the sealed container immediately after heating in the microwave oven, like Examination 5, "measurement of peeling strength between the flange section and the assistant flange" and "visual observation of a peeling area" were performed.

[0130] Conditions of heating in the microwave oven were output of 500 W for six minutes. When the temperature of the contents immediately after heating was measured, it was 92 °C to 95 °C.

[0131] Results of Examination 6 are shown in Table 6.

(Table 6)

	PP melting point	Immediately after manufacture of box		After heating in microwave oven	
		Peeling strength (N/15mm)	Peeling area	Peeling strength (N/15mm)	Peeling area
Example of Experiment 4	70 °C	0.1	No paper peeling (interface peeling)	0.1	No paper peeling (interface peeling)
Example of Experiment 5	90 °C	2.8	Paper peeling	0.3	No paper peeling (interface peeling)
Example of Experiment 6	100 °C	3.3	Paper peeling	3.1	Paper peeling
Example of Experiment 7	120 °C	3.5	Paper peeling	3.4	Paper peeling
Example of Experiment 8	150 °C	3.6	Paper peeling	3.6	Paper peeling

[0132] Immediately after manufacture of the box, except for the example of Experiment 4, the joining strength of the flange section was sufficient. However, in the example of Experiment 5, the joining strength of the flange sections was decreased due to heating in the microwave oven, and the interface peeling was observed between the flange section and the assistant flange. It is conceivable that the heat seal layer was softened as a result of the temperature of the filling material reaching the melting point or more of PP contained in the heat seal layer due to heating in the microwave oven.

[0133] In the paper containers of the examples of Experiments 6 to 8 in which the melting point of the PP contained in the heat seal layer is higher than the temperature of the filling material after heating in the microwave oven, strong joining between the flange section and the assistant flange even after heating in the microwave oven was maintained.

[0134] As described above, it was shown that, since the melting point of the PP contained in the heat seal layer is 100 °C or more, even after heating in the microwave oven immediately after manufacture of the box, strong joining between the flange section and the assistant flange can be maintained. The paper container of the embodiment is suitable for the purpose of accommodating the food to be heated in the microwave oven and eaten.

[0135] Fig. 18 shows a schematic cross-sectional view of a blank 301 according to a third embodiment of the present invention. The blank 301 has a coat layer 302 formed of acid-modified polypropylene as a main ingredient on the base material 2. The coat layer 302 is formed by applying the acid-modified polypropylene resin aqueous dispersion on the base material 2 and then removing solvent through drying or the like.

[0136] Since the blank 301 is processed in the same sequence as those of the first embodiment and the second embodiment, the paper container can be manufactured.

[0137] The coat layer 302 can be formed using the acid-modified polypropylene resin aqueous dispersion used when the anchor layer 3 is formed. In this case, the application quantity becomes larger than in the case in which the anchor layer 3 is formed. The application quantity is 0.1 g/cm^2 or more, for example, 0.5 to 3.0 g/cm^2 in terms of solid content.

[0138] A large amount of acid-modified polypropylene resin is disposed on the base material 2 by applying a large amount of acid-modified polypropylene resin aqueous dispersion. The acid-modified polypropylene resin is coated due to heat or the like upon removal of solvent, and the coat layer 302 is formed.

[0139] Since the coat layer 302 is a membrane-like structure formed of the acid-modified polypropylene resin as a main ingredient, a waterproof characteristic is appeared, and permeation of the contents into the base material 2 is prevented. Since the coat layer 302 functions as a sealant because it is heat-weldable. Meanwhile, since the coat layer 302 is different from the sealant layer 4 and not peeled in a layer shape, the blank 301 has a good design property.

[0140] The melting point of the polypropylene in the coat layer 302 can be appropriately set. Since the melting point of the polypropylene is increased, the blank 301 can be suitably applied to the paper container for food that is heated in the microwave oven and eaten. When the blank 301 is applied to the paper container for food that is not heated, the melting point of the polypropylene may not be high.

[0141] The coat layer 302 may be provided on both surfaces of the base material 2. In this case, the water resistance of the manufactured paper container can be further increased.

[0142] Hereinabove, while preferred embodiments of the invention have been described and illustrated above, it should be understood that these are exemplary of the invention and are not to be considered as limiting. Additions, omissions, substitutions, and other modifications can be made without departing from the spirit or scope of the present invention.

Accordingly, the invention is not to be considered as being limited by the foregoing description, and is only limited by the scope of the appended claims.

[0143] For example, the side surface sections folded along the joining section are not limited to the above-mentioned side surface sections 211 and 213 and may be appropriately set. In this case, the number of the side surface sections along which the joining sections are provided is not limited to two, and may be three or four. In the flange section of the side surface section along which the joining section is provided, the above-mentioned effects can be exhibited as long as the heat seal layer is formed at a position corresponding to the assistant flange.

INDUSTRIAL APPLICABILITY

[0144] The present invention can be applied to a paper container.

DESCRIPTION OF THE REFERENCE SYMBOLS

[0145]

1: Blank
2: Base material
2a: First surface
2b: Second surface
3: Anchor layer
4: Sealant layer
50: Container main body
60: Lid member
101: Hot air supply unit
102: Cover
201: Blank
205: Heat seal layer
221a, 222a, 223a, 224a: Assistant flange
250: Container main body
260: Lid member
301: Blank
302: Coat layer

Claims

1. A paper container comprising a container main body formed by folding a blank formed of a sheet-shaped material, wherein the sheet-shaped material comprises:

   a base material of paper;
   an anchor layer formed on the base material; and
   a sealant layer having a thickness of 20 μm or more and less than 60 μm formed on the anchor layer,
   the anchor layer is formed of an acid-modified polypropylene resin aqueous dispersion and a melting point of polypropylene contained in the acid-modified polypropylene resin aqueous dispersion is 120 °C or more, and
   the sealant layer is formed of a homopolymer type polypropylene and a melting point of the homopolymer type polypropylene is 135 °C or more.

2. The paper container according to claim 1, further comprising a lid member formed of the sheet-shaped material and joined to the container main body.

3. A method for manufacturing a paper container, which is provided to manufacture the paper container according to claim 1, the method comprising:

   a process A of disposing the blank on a female mold;
   a process B of disposing hot air supply units having exhaust nozzles on four corners of the blank;
   a process C of covering parts of the hot air supply units with covers and forming a closed space around the exhaust nozzles;

a process D of supplying hot air into the closed space and melting a part of the sealant layer; and
a process E of pressing the blank against the female mold, folding the blank, and disposing parts of the sealant layer to face each other and joining the parts.

4. A paper container comprising a container main body formed by folding a blank formed of a sheet-shaped material, wherein the container main body comprises:

a bottom surface section;
a plurality of side surface sections standing upward from the bottom surface section;
joining sections formed between the side surface sections;
flange sections extending from the side surface sections toward circumferential edges of the container main body; and
assistant flanges extending from parts of the joining sections toward the circumferential edges of the container main body,
the sheet-shaped material comprises:

a base material of paper;
a sealant layer formed of polypropylene as a main ingredient on the side of a first surface of the base material; and
a heat seal layer formed on at least a part of the flange section above a second surface opposite to the first surface and containing acid-modified polypropylene, and

a melting point of polypropylene in the heat seal layer is 100 °C or more.

5. The paper container according to claim 4, further comprising:

a base material of paper; and
a lid member formed on the side of the first surface of the base material, formed of a sheet-shaped material having a sealant layer formed of polypropylene as a main ingredient, and joined to the container main body.

6. A method for manufacturing a paper container, which is provided to manufacture the paper container according to claim 4, the method comprising:

a process A of disposing the blank on a female mold;
a process B of disposing hot air supply units having exhaust nozzles on four corners of the blank;
a process C of covering parts of the hot air supply units with covers and forming a closed space around the exhaust nozzles;
a process D' of supplying hot air into the closed space to melt a part of the sealant layer and softening the heat seal layer; and
a process E' of pressing the blank against the female mold, folding the blank, disposing parts of the sealant layer to face each other and joining them, and bringing the assistant flange in contact with the heat seal layer to join to the flange section.

7. A paper container comprising a container main body formed by folding a blank formed of a sheet-shaped material, wherein the sheet-shaped material comprises:

a base material of paper; and
a coat layer formed on the base material, and
the coat layer is formed of an acid-modified polypropylene resin as a main ingredient, and a melting point of polypropylene contained in the acid-modified polypropylene resin is 120 °C or more.

FIG. 1

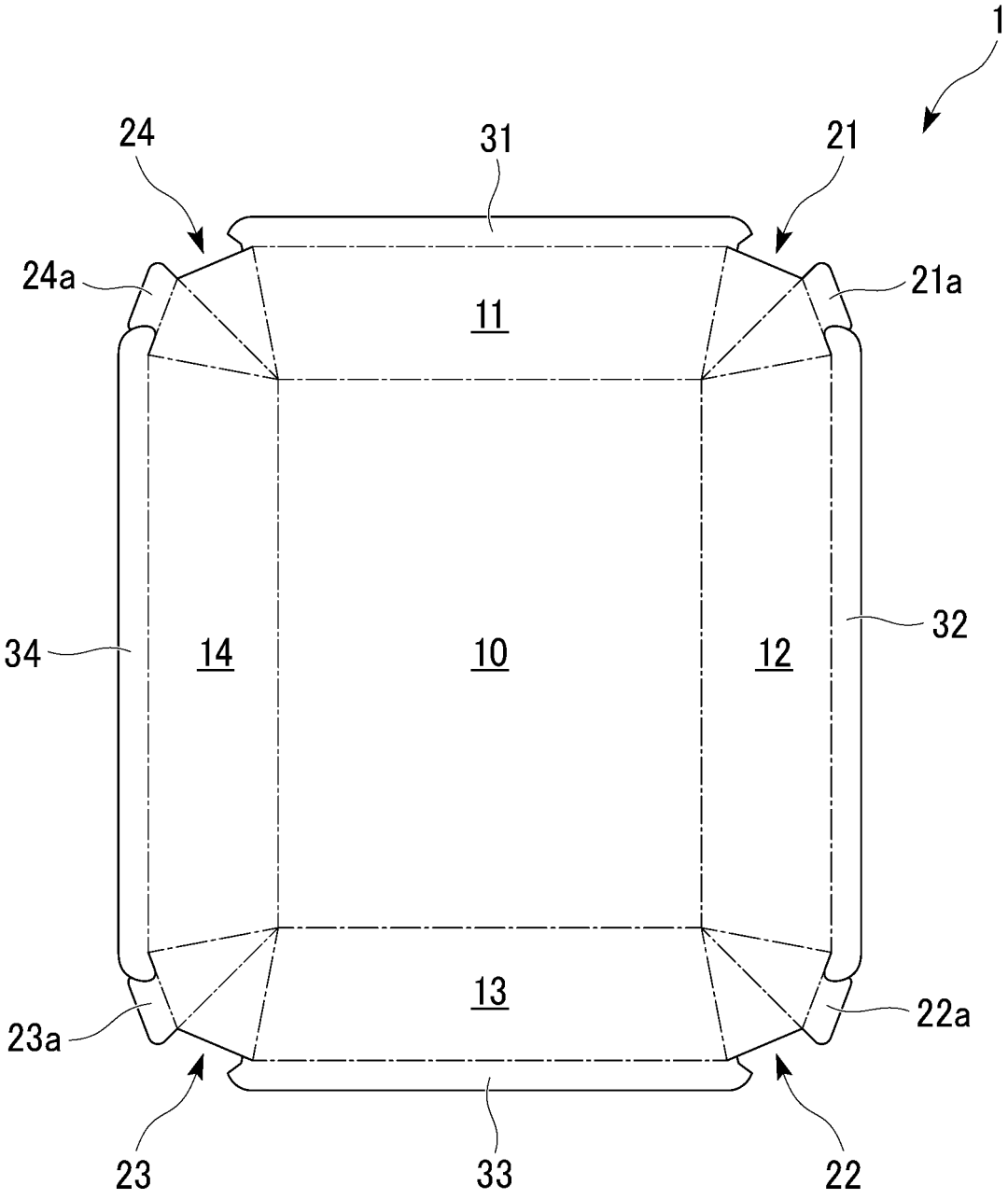


FIG. 2

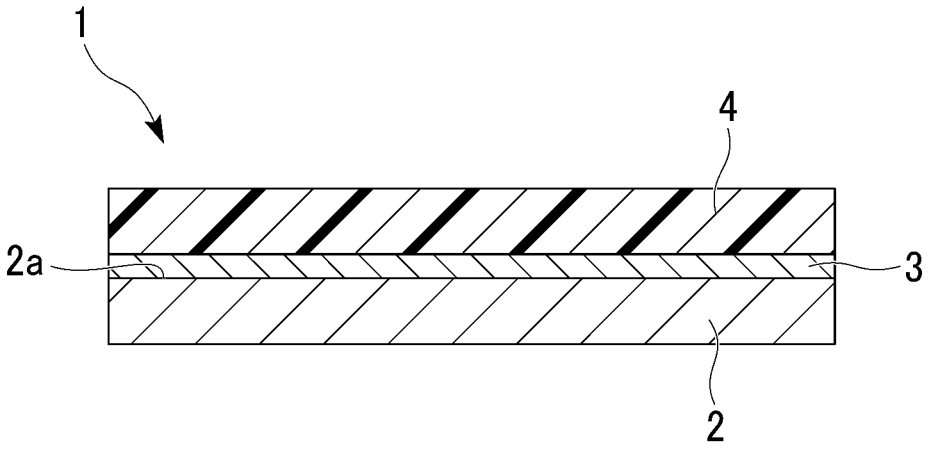


FIG. 3

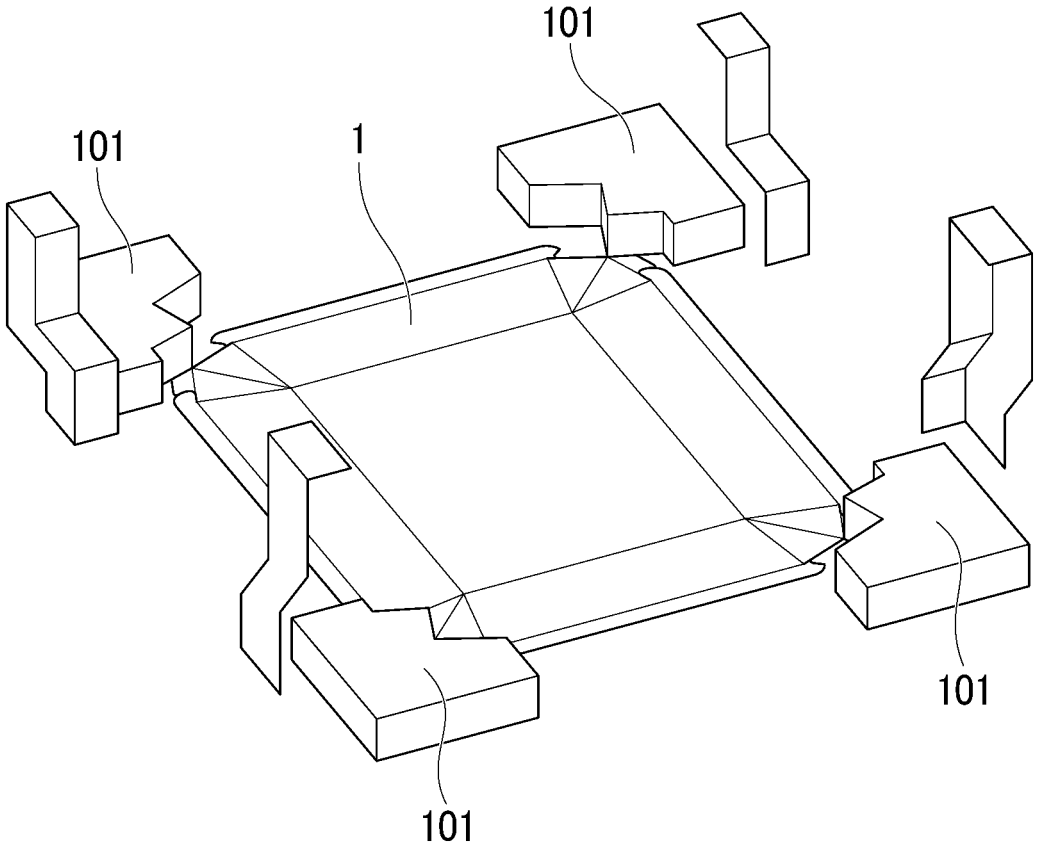


FIG. 4

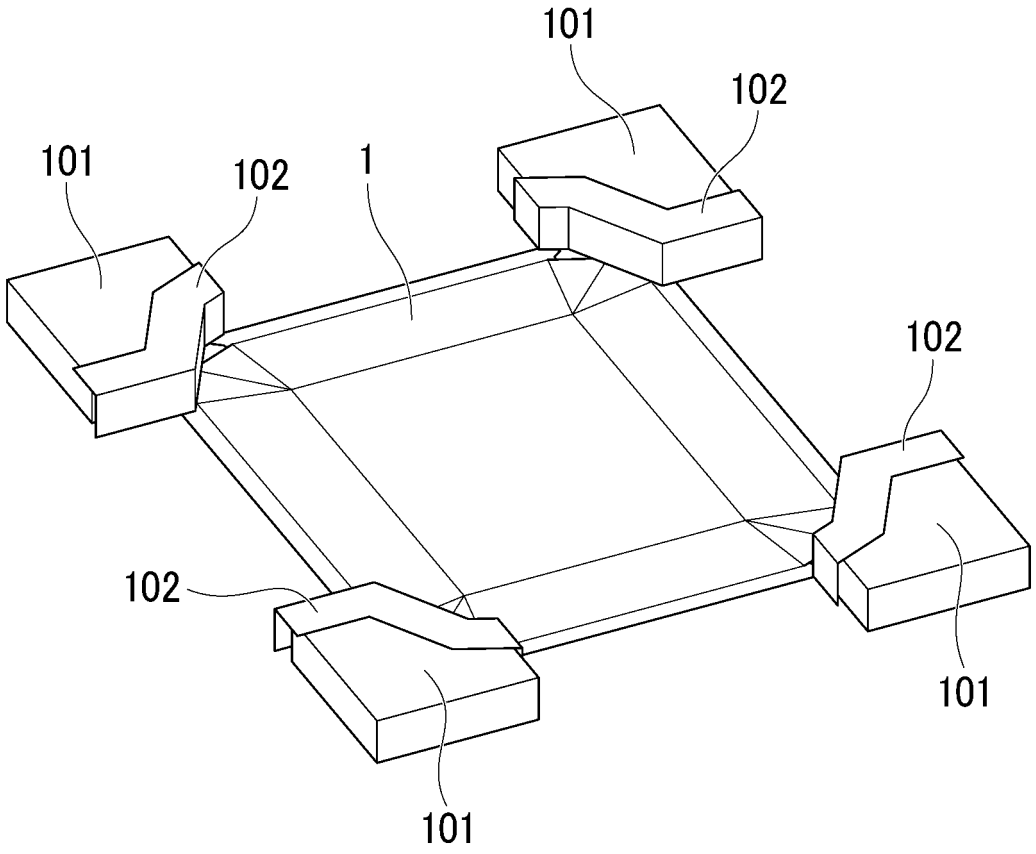


FIG. 5

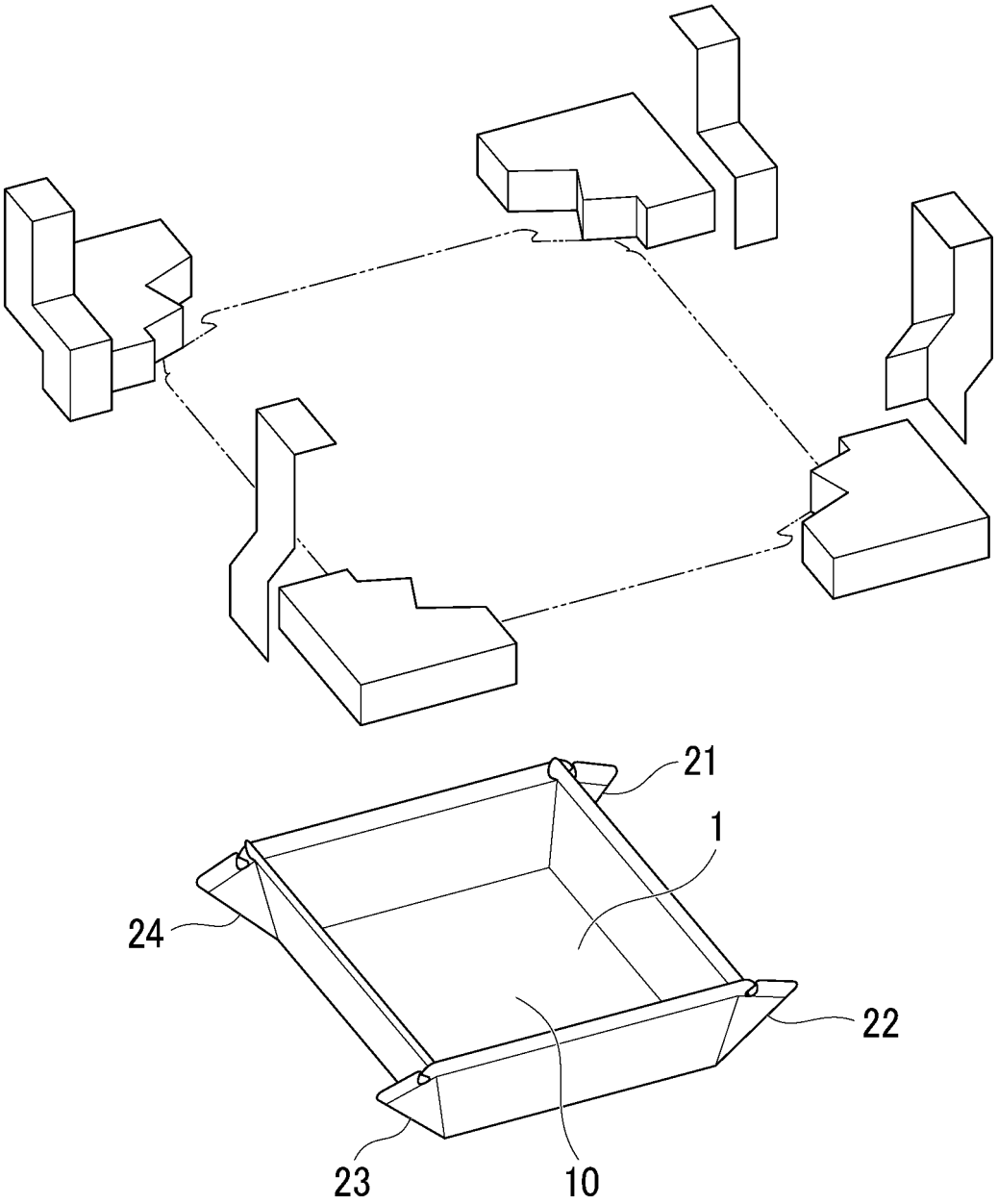


FIG. 6

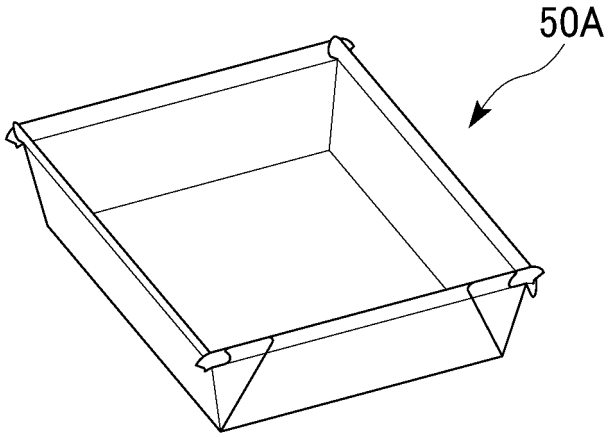


FIG. 7

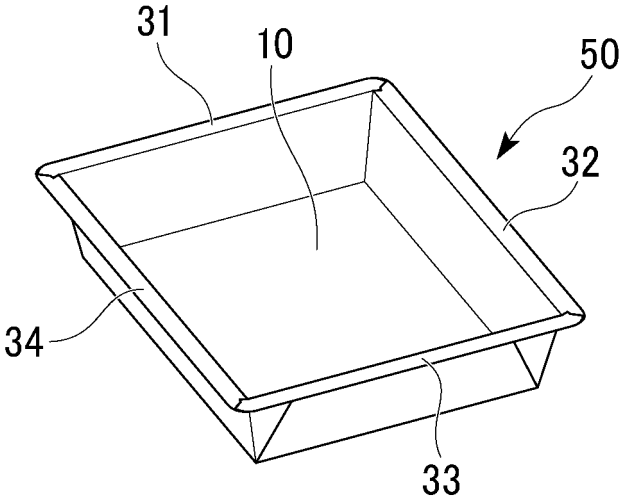
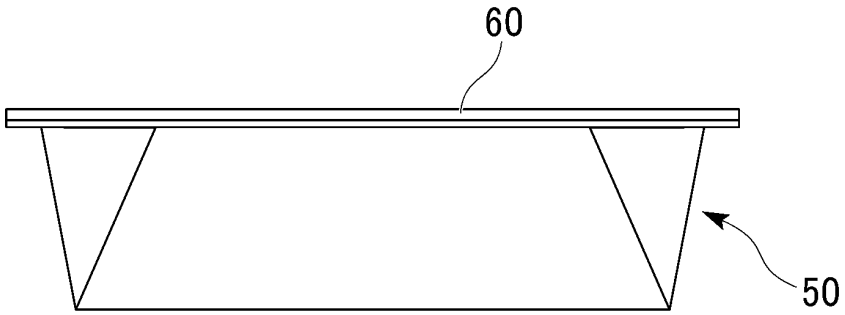


FIG. 8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50

FIG. 9

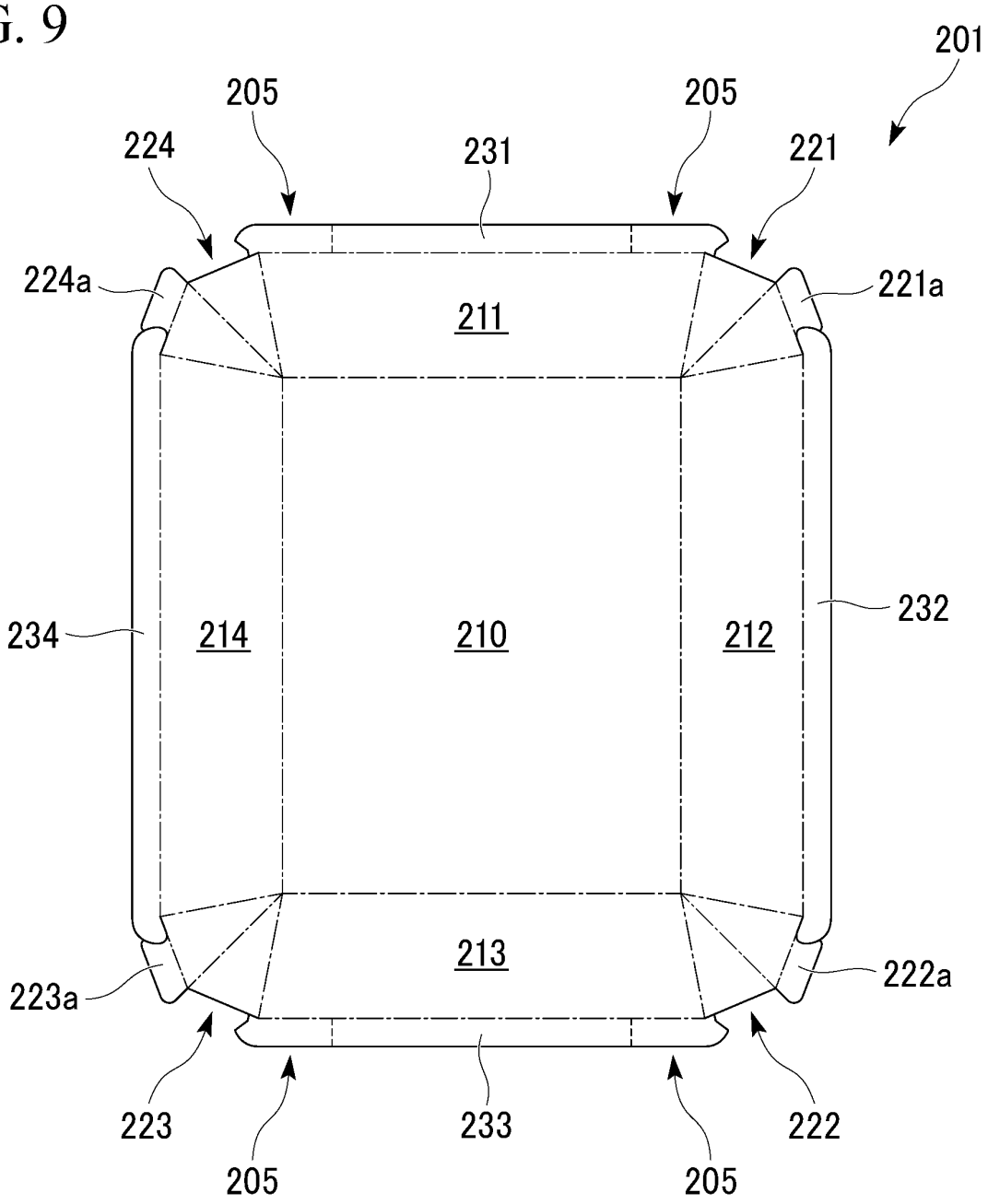

201
205
205
224
231
221
224a
221a
211
234
214
210
212
232
213
223a
222a
223
205
233
205
222

FIG. 10

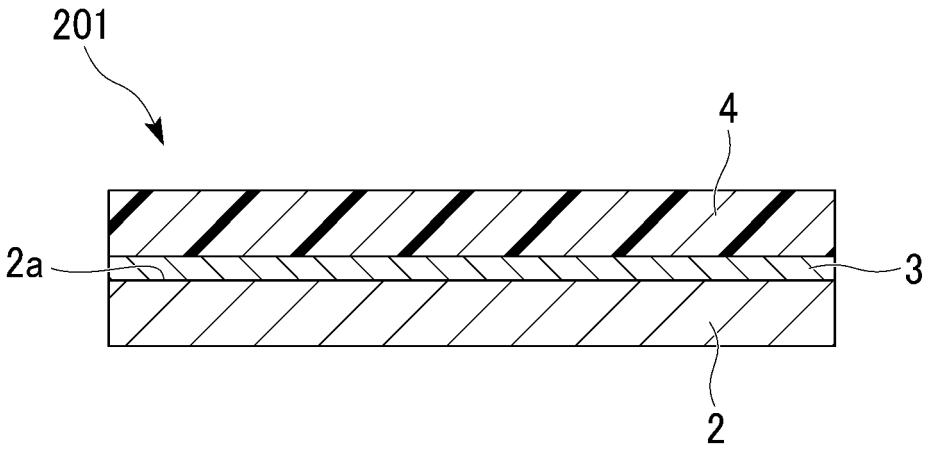


FIG. 11

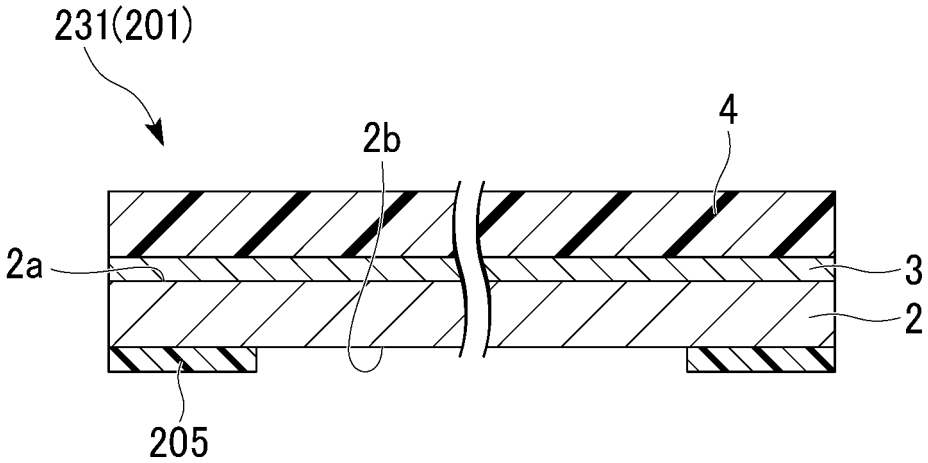


FIG. 12

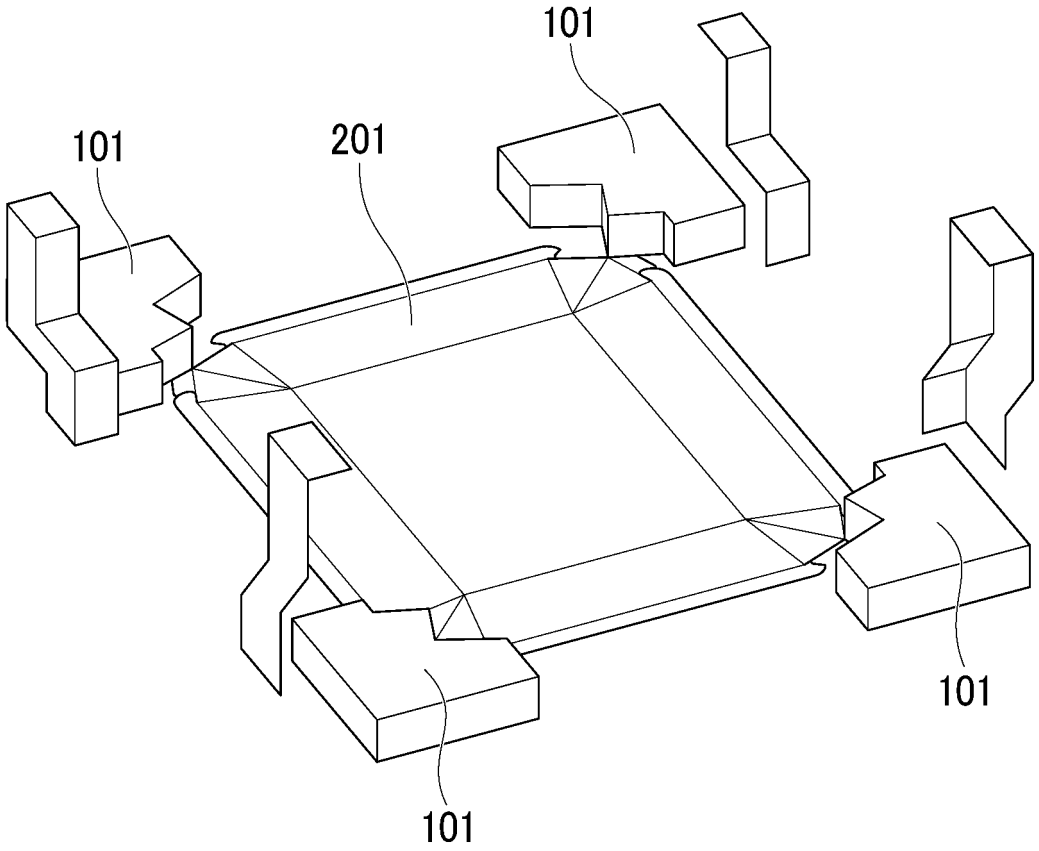


FIG. 13

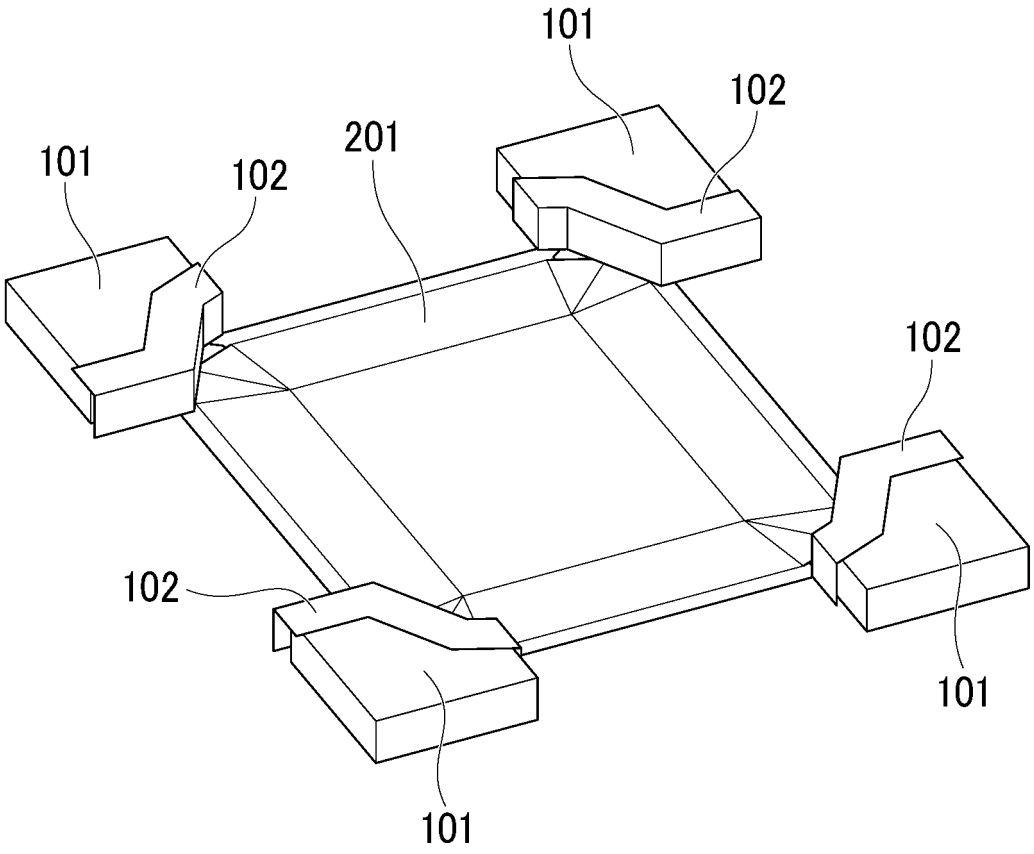
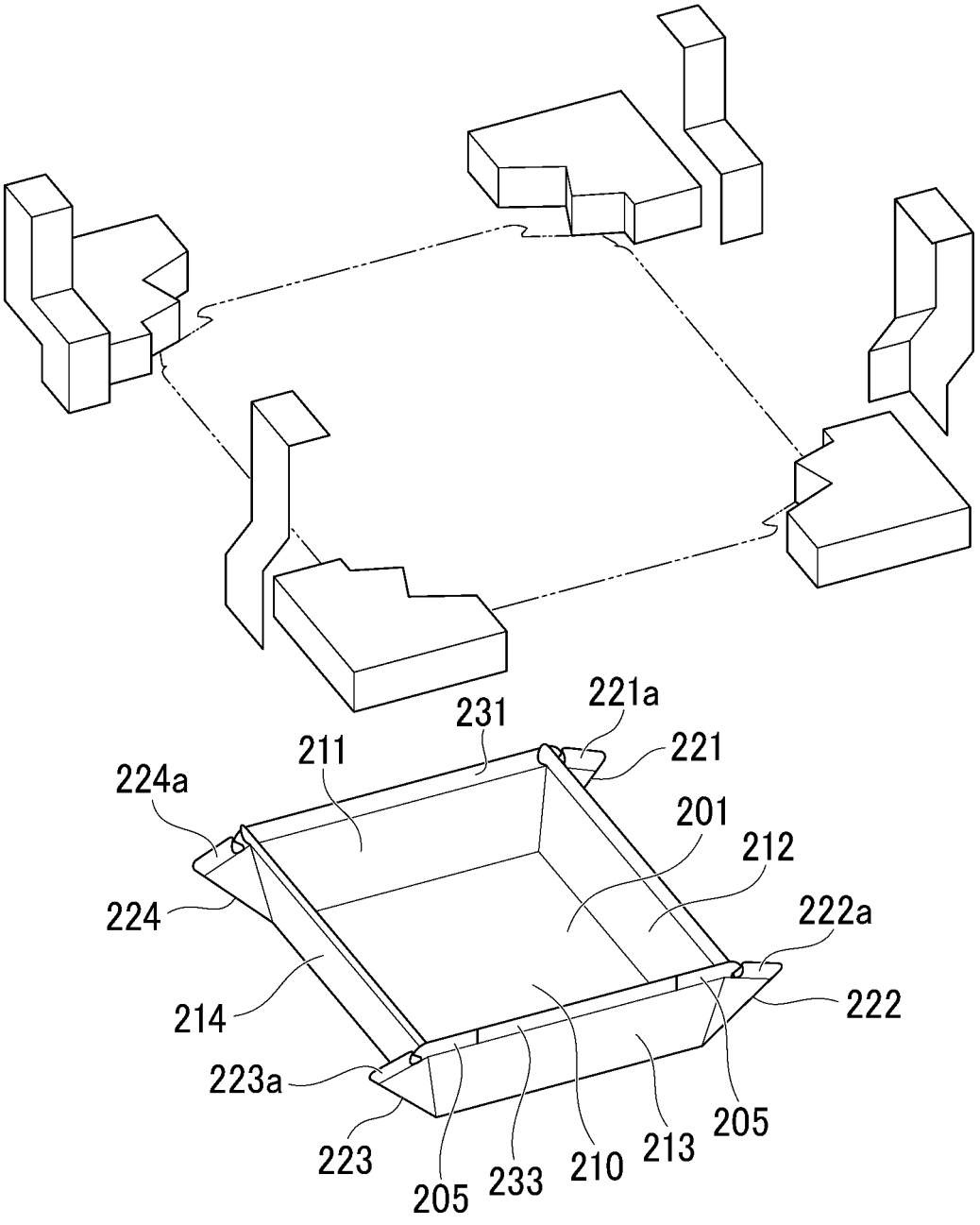


FIG. 14


231
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213
205

FIG. 15

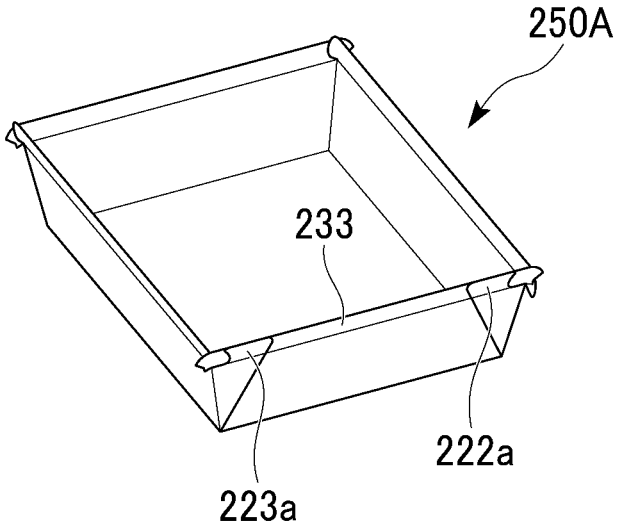


FIG. 16

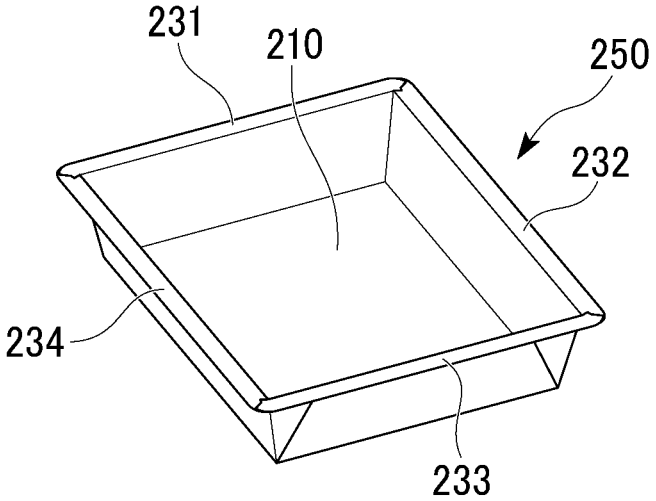


FIG. 17

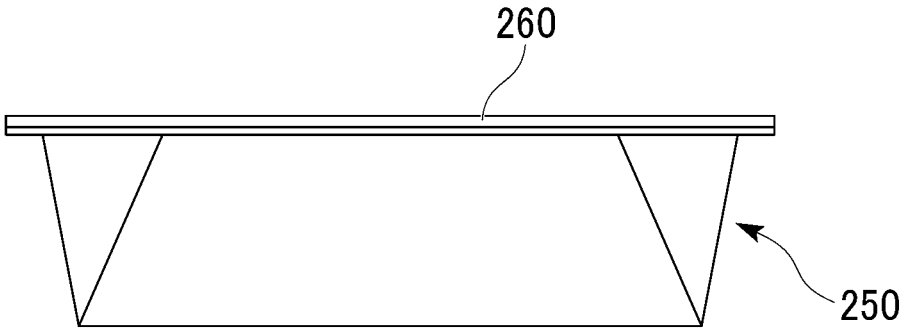
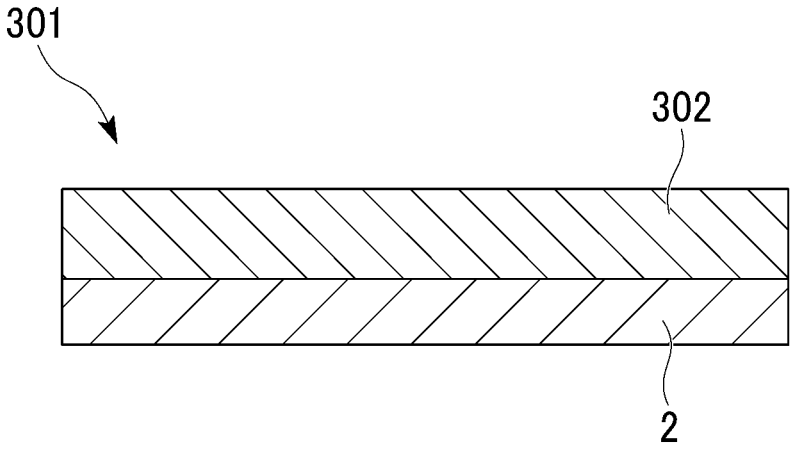


FIG. 18



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2019/030404

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl. B65D65/40(2006.01)i, B31B50/64(2017.01)i, B65D5/24(2006.01)i, B65D81/34(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)
Int.Cl. B65D65/40, B31B50/64, B65D5/24, B65D81/34, B32B1/00-43/00

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	1971-2019
Registered utility model specifications of Japan	1996-2019
Published registered utility model applications of Japan	1994-2019

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 Y A	JP 2004-17449 A (DAINIPPON PRINTING CO., LTD.) 22 January 2004, claims, paragraphs [0003], [0007], [0008], [0010], [0015], [0021]-[0023], examples (Family: none)	1, 2, 7 3 4-6
Y	JP 2010-189031 A (TOPPAN PRINTING CO., LTD.) 02 September 2010, claims, paragraphs [0017]-[0040], fig. 1-5 (Family: none)	3
Y	JP 2012-24965 A (DIXIE JAPAN LTD.) 09 February 2012, paragraphs [0011], [0015], [0048], fig. 4 (Family: none)	3

☒ 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
15 October 2019 (15.10.2019)	21 October 2019 (21.10.2019)

Name and mailing address of the ISA/	Authorized officer
Japan Patent Office 3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan	Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2019/030404

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 2001-205717 A (TOPPAN PRINTING CO., LTD.) 31 July 2001, entire text, all drawings (Family: none)	1-7
A	US 5433374 A (FORBES, Jr., Hampton E.) 18 July 1995, entire text, all drawings (Family: none)	1-7

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REFERENCES CITED IN THE DESCRIPTION

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- JP 2018151561 A **[0002]**
- JP 2018245476 A **[0002]**
- JP 3687396 B **[0004]**