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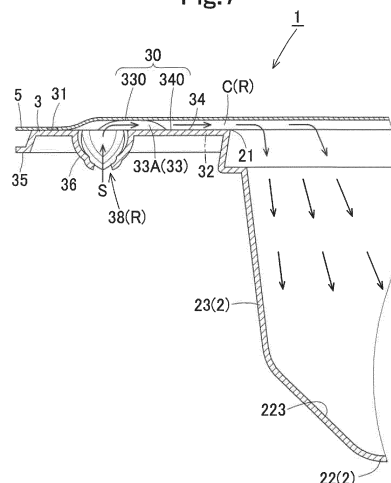
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(54) **PACKAGING CONTAINER FOR STERILIZATION**

(57) Provided in the present invention is a packaging container including a container body that includes a receiving portion and a flange. The flange includes: a primary sealing area that is primarily sealed to a lid member; a secondary sealing area that is secondarily sealed to the lid member; a flange top having its upper surface located on an uppermost side of an upper surface of the flange; a flange lower part having its upper surface located below the upper surface of the flange top; and a penetrating area that is located on an inner side of the primary sealing area and through which a through hole penetrating through the flange is provided, and when the primary sealing area is sealed, a clearance is formed between the upper surface of the flange lower part and the lid member and a flow channel through which a gas can flow between an outside and an inside of the receiving portion is formed between the flange and the lid member, and when the secondary sealing area is sealed, the

flow channel is configured to be closed.

Fig.7



Description

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims priority to Japanese Patent Application No. 2019-223878, the disclosure of which is incorporated herein by reference in its entirety.

FIELD

[0002] The present invention relates to a packaging container for sterilization treatment, and relates to a packaging container that can be suitably used for packaging for example, a food such as a prepared meal as a content and for subjecting the food to sterilization treatment.

BACKGROUND

[0003] Packaged foods include foods that are cooked or processed in, for example, a food factory, placed in molded containers each having an opening, and distributed in the containers each having a top sheet or a covering lid placed thereon. However, since the packaged foods with top sheets or covering lids are not completely sealed in the containers, outside air can enter the containers. These packaged foods therefore stay in good condition for a period of about 1 to 2 days, which is extremely short, and have a problem of an extremely high disposal loss (i.e., low product yield).

[0004] Recently, those packaged foods that stay in good condition for longer with their containers being completely sealed by, for example, heat-sealing the containers and the lids to each other have been distributed. Some packaged foods stay in good condition for more than two weeks when stored in refrigeration.

[0005] The molded containers that have been sealed by, for example, the heat-sealing are free from entry of bacteria from the outside, but still have their inside not in a completely aseptic condition. Thus, it is sufficiently conceivable that bacteria in the containers grow when the environment changes in the course of distribution. In order for the foods to stay in good condition for even longer, cleanliness is required to be strictly controlled to have the working environment in the food factory as aseptic as possible. Conventionally proposed has been a method in which a food placed in a container is sterilized, and then its container body is tightly closed with a lid member in a clean room (aseptic room) (Patent Literature 1). For example, there are some cases where the cleanliness of the working environment in which cooked or processed foods are handled is controlled to a level as high as 10000 or 1000 according to NASA clean room standards. However, introducing such a clean room causes a problem of substantial costs incurred for installing and maintaining the air-conditioning equipment.

[0006] In addition to foods, there are various other objects to be sterilized before being distributed as products to the market, and efficient sterilization treatment of these

objects is required.

CITATION LIST

5 Patent Literature

[0007] Patent Literature 1: JP H9-009937 A

SUMMARY

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Technical Problem

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[0008] It is an object of the present invention to provide a packaging container that can be suitably used for sterilizing a content, and to provide a packaging container that is suitably used for sterilizing a food as an example of a content and that can keep the food in a good condition for a long period of time.

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Solution to Problem

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[0009] A packaging container according to the present invention is a packaging container for sterilization treatment in which a content contained therein is sterilized by being exposed to a sterilizing gas, and thereafter the content is sealed therein for delivery, the packaging container including: a container body including: a receiving portion having an opening on an upper side and configured to have the content placed therein; and a flange extending outward from an opening edge of the receiving portion, in which the flange includes: a primary sealing area that is primarily sealed to a lid member for covering the opening in a primary sealing step; a secondary sealing area that is secondarily sealed to the lid member in a secondary sealing step after the primary sealing step to thereby completely seal the content in the container body; a flange top having its upper surface located on an uppermost side of an upper surface of the flange; a flange lower part having its upper surface located below the upper surface of the flange top; and at least one penetrating area that is located on an inner side of the primary sealing area and through which a through hole penetrating through the flange is provided, and when the lid member and the primary sealing area are sealed to each other, a flow channel through which a gas can flow between an outside and an inside of the receiving portion is formed between the flange lower part and the lid member supported by the flange top, and when the lid member and the secondary sealing area are sealed to each other, the flow channel is configured to be closed.

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[0010] In the packaging container, the configuration can be such that the through hole is formed by a slit formed through a part of the penetrating area.

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[0011] The configuration can be such that the penetrating area has a curved surface bulging upward, and the curved surface has an upper end serving as the flange top.

[0012] In the packaging container, the configuration

can be such that the penetrating area is a recess that is recessed downward, and the slit is formed in the recess.

[0013] In the packaging container, the configuration can be such that the flange is provided over the entire periphery of the opening edge of the receiving portion, and the penetrating area includes a plurality of penetrating areas disposed at positions opposed to each other with the receiving portion therebetween.

[0014] A packaging container of the present invention is a packaging container in which a content contained therein is sterilized by being exposed to a sterilizing gas, and thereafter the content is sealed therein for delivery, the packaging container including: a container body including: a receiving portion having an opening on an upper side and configured to have the content placed therein; and a flange extending outward from an opening edge of the receiving portion, in which the flange includes: a primary sealing area that is primarily sealed to a lid member for covering the opening in a primary sealing step; and a secondary sealing area that is sealed to the lid member in a secondary sealing step after the primary sealing step, and when the lid member and the primary sealing area are sealed to each other, a flow channel through which a gas can flow between an outside and an inside of the receiving portion is formed between the flange and the lid member, and when the lid member and the secondary sealing area are sealed to each other, the flow channel is configured to be closed.

[0015] The configuration can be such that the flange of the packaging container has at least one through hole located on an inner side of the primary sealing area and penetrating through the flange, and the through hole serves as a part of the flow channel.

[0016] In the packaging container, the configuration can be such that the through hole is formed by a slit formed through a part of the flange.

[0017] In the packaging container, the configuration can be such that the flange includes a flange top formed of a part of the flange defined by the slit as a boundary and deformed upward, and the flow channel is formed between the flange and the lid member supported by the flange top.

[0018] In the packaging container, the configuration can be such that a part of the flange deformed upward has a curved surface bulging upward.

[0019] In the packaging container, the configuration can be such that the flange includes a flange top having its upper surface located on an uppermost side of an upper surface of the flange, and the flow channel is formed between the flange and the lid member supported by the flange top.

[0020] In the packaging container, the configuration can be such that the flange is provided over the entire periphery of the opening edge of the receiving portion, and the through hole includes a plurality of through holes disposed at positions opposed to each other with the receiving portion therebetween.

[0021] In the packaging container, the configuration

can be such that the primary sealing area has its upper surface located on an uppermost side of an upper surface of the flange, the secondary sealing area has its upper surface located below the upper surface of the primary sealing area, the flange is configured to form a clearance between the upper surface of the secondary sealing area and a lower surface of the lid member when the lid member and the primary sealing area are sealed to each other, and the clearance serves as a part of the flow channel.

[0022] In the packaging container, the configuration can be such that the receiving portion includes a bottom plate on which the content is placed, and the bottom plate has its upper surface having an uneven shape.

[0023] The configuration can be such that a packaging container of the present invention further includes the lid member, and the container body and the lid member are formed of a multilayer structure including at least one gas barrier layer.

BRIEF DESCRIPTION OF DRAWINGS

[0024]

Fig. 1A is a schematic view of a packaging container according to one embodiment of the present invention, and is a plan view of the packaging container. Fig. 1B is a schematic view of the packaging container according to the one embodiment, and is a side view of the packaging container.

Fig. 2 is a cross-sectional view taken along line II-II in Fig. 1A.

Fig. 3 is a flowchart showing each step in a method for producing the packaging container.

Fig. 4A is a schematic view of the packaging container after a through hole forming step and a food containing step, and is a plan view of the packaging container.

Fig. 4B is a schematic view of the packaging container after the through hole forming step and the food containing step, and is a side view of the packaging container.

Fig. 5 is a cross-sectional view taken along line V-V in Fig. 4A.

Fig. 6A is a schematic view of the packaging container after a primary sealing step, and is a plan view of the packaging container.

Fig. 6B is a schematic view of the packaging container after the primary sealing step, and is a side view of the packaging container.

Fig. 7 is a cross-sectional view taken along line VII-VII in Fig. 6A.

Fig. 8A is a schematic view of the packaging container after a secondary sealing step, and is a plan view of the packaging container.

Fig. 8B is a schematic view of the packaging container after the secondary sealing step, and is a side view of the packaging container.

Fig. 9 is a cross-sectional view taken along line IX-

IX in Fig. 8A.

Fig. 10A is a schematic view of a packaging container according to another embodiment of the present invention, and is a plan view of the packaging container.

Fig. 10B is a schematic view of the packaging container according to another embodiment of the present invention, and is a cross-sectional view taken along line X-X in Fig. 10A.

Fig. 11A is a schematic view of the packaging container after a through hole forming step, and is a plan view of the packaging container.

Fig. 11B is a schematic view of the packaging container after the through hole forming step, and is a cross-sectional view taken along line XI-XI in Fig. 11A.

Fig. 12A is a schematic view of a packaging container according to another embodiment of the present invention after a primary sealing step, and is a plan view of the packaging container.

Fig. 12B is a schematic view of the packaging container according to another embodiment of the present invention after the primary sealing step, and is a cross-sectional view taken along line XII-XII in Fig. 12A.

Fig. 13A is a schematic view of the packaging container according to another embodiment after a secondary sealing step, and is a plan view of the packaging container.

Fig. 13B is a schematic view of the packaging container according to another embodiment after the secondary sealing step, and is a cross-sectional view taken along line XIII-XIII in Fig. 13A.

Fig. 14A is a schematic view of the packaging container shown in Fig. 12A after the secondary sealing step, and is a plan view of the packaging container.

Fig. 14B is a schematic view of the packaging container shown in Fig. 12A after the secondary sealing step, and is a cross-sectional view taken along line XIV-XIV in Fig. 14A.

Fig. 15A is a schematic view of a packaging container according to another embodiment of the present invention after the primary sealing step, and is a plan view of the packaging container.

Fig. 15B is a schematic view of the packaging container according to another embodiment of the present invention after the primary sealing step, and is a cross-sectional view taken along line XV-XV in Fig. 15A.

Fig. 16A is a schematic view of the packaging container according to another embodiment after the secondary sealing step, and is a plan view of the packaging container.

Fig. 16B is a schematic view of the packaging container according to another embodiment after the secondary sealing step, and is a cross-sectional view taken along line XVI-XVI in Fig. 16A.

Fig. 17A is a schematic view of a packaging container

according to another embodiment of the present invention, and is a plan view of the packaging container before a through hole forming step.

Fig. 17B is a schematic view of the packaging container according to another embodiment of the present invention, and is a plan view of the packaging container after the through hole forming step.

Fig. 18A is a schematic view of a packaging container according to another embodiment of the present invention after a primary sealing step, and is a plan view of the packaging container.

Fig. 18B is a schematic view of the packaging container according to another embodiment of the present invention after the primary sealing step, and is a cross-sectional view taken along line XVIII-XVIII in Fig. 18A.

Fig. 19A is a schematic view of the packaging container after a secondary sealing step, and is a plan view of the packaging container.

Fig. 19B is a schematic view of the packaging container after the secondary sealing step, and is a cross-sectional view taken along line XIX-XIX in Fig. 19A.

Fig. 20A is a schematic view of a packaging container according to another embodiment of the present invention after a primary sealing step, and is a plan view of the packaging container.

Fig. 20B is a schematic view of the packaging container according to another embodiment of the present invention after the primary sealing step, and is a cross-sectional view taken along line XX-XX in Fig. 20A.

Fig. 21A is a schematic view of a packaging container according to another embodiment of the present invention after a primary sealing step, and is a plan view of the packaging container.

Fig. 21B is a schematic view of the packaging container according to another embodiment of the present invention after the primary sealing step, and is a cross-sectional view taken along line XXI-XXI in Fig. 21A.

Fig. 22A is a schematic view of the packaging container according to another embodiment of the present invention after a primary sealing step, and is a plan view of the packaging container.

Fig. 22B is a schematic view of the packaging container according to another embodiment of the present invention after the primary sealing step, and is a cross-sectional view taken along line XXII-XXII in Fig. 22A.

Fig. 23A is a schematic view of the packaging container after a secondary sealing step, and is a plan view of the packaging container.

Fig. 23B is a schematic view of the packaging container after the secondary sealing step, and is a cross-sectional view taken along line XXIII-XXIII in Fig. 23A.

Fig. 24A is a schematic view of a packaging container

according to another embodiment of the present invention after a through hole forming step, and is a plan view of the packaging container.

Fig. 24B is a schematic view of the packaging container according to another embodiment of the present invention after the through hole forming step, and is a cross-sectional view taken along line XXIV-XXIV in Fig. 24A.

Fig. 25A is a schematic view of a packaging container according to another embodiment of the present invention after a through hole forming step, and is a plan view of the packaging container.

Fig. 25B is a schematic view of the packaging container according to another embodiment of the present invention after the through hole forming step, and is a cross-sectional view taken along line XXV-XXV in Fig. 25A.

Fig. 26A is a schematic view of a packaging container according to another embodiment of the present invention after a through hole forming step, and is a plan view of a modified example of the packaging container in Fig. 24A.

Fig. 26B is a schematic view of a packaging container according to another embodiment of the present invention after a through hole forming step, and is a partial plan view of a modified example of the packaging container in Fig. 25A.

Fig. 27A is a schematic view of a packaging container according to another embodiment of the present invention after a through hole forming step, and is a cross-sectional view of a modified example of the packaging container in Fig. 24.

Fig. 27B is a schematic view of a packaging container according to another embodiment of the present invention after a through hole forming step, and is a cross-sectional view of a modified example of the packaging container in Fig. 25A.

Fig. 28A is a schematic view of a packaging container according to another embodiment of the present invention after a through hole forming step, and is a plan view of the packaging container.

Fig. 28B is a schematic view of the packaging container according to another embodiment of the present invention after the through hole forming step, and is a cross-sectional view taken along line XXVIII-XXVIII in Fig. 28A.

Fig. 29A is a cross-sectional view of the packaging container for describing the through hole forming step, and shows the packaging container before the through hole forming step.

Fig. 29B is a cross-sectional view of the packaging container for describing the through hole forming step, and shows a step of forming a slit in a flange.

Fig. 29C is a cross-sectional view of the packaging container for describing the through hole forming step, and shows a step of forming a flange top.

Fig. 29D is a cross-sectional view of the packaging container for describing the through hole forming

step, and shows the packaging container after the flange top is formed.

Fig. 30A is a schematic view of a packaging container according to another embodiment of the present invention, and is a plan view of the packaging container before a through hole forming step.

Fig. 30B is a schematic view of the packaging container according to another embodiment of the present invention, and is a cross-sectional view of Fig. 30A.

Fig. 30C is a schematic view of the packaging container according to another embodiment of the present invention, and is a cross-sectional view after the through hole forming step.

Fig. 31A is a schematic view of a packaging container according to another embodiment of the present invention, and is a plan view of the packaging container before a through hole forming step.

Fig. 31B is a schematic view of the packaging container according to another embodiment of the present invention, and is a cross-sectional view of Fig. 31A.

Fig. 31C is a schematic view of the packaging container according to another embodiment of the present invention, and is a cross-sectional view after the through hole forming step.

Fig. 32A is a schematic view of a packaging container according to another embodiment of the present invention after a through hole forming step, and is a schematic view showing a first modified example.

Fig. 32B is a schematic view of a packaging container according to another embodiment of the present invention after a through hole forming step, and is a schematic view showing a second modified example.

Fig. 32C is a schematic view of a packaging container according to another embodiment of the present invention after a through hole forming step, and is a schematic view showing a third modified example.

DESCRIPTION OF EMBODIMENTS

[0025] Hereinafter, a description will be given on one embodiment of the present invention with reference to Fig. 1 to Fig. 9. Fig. 1 and Fig. 2 are views showing one embodiment of a packaging container according to the present invention. Fig. 3 is a view for explaining one embodiment of a method for producing a packaged food according to the present invention, and Fig. 4 to Fig. 9 are views sequentially showing steps of the producing method.

[0026] First, a description will be given on the packaging container according to one embodiment of the present invention. The packaging container according to this embodiment is a packaging container for sterilization treatment that is used when a food as an example of a content contained therein is sterilized by being exposed to heated steam as an example of a sterilizing gas, and

thereafter the content (e.g., food) is sealed therein for delivery as a packaged food. As shown in Fig. 1 and Fig. 2, a packaging container 1 includes a container body 4 including: a receiving portion 2 having an opening 20 on its upper side; and a flange 3 extending outward from an opening edge 21 of the receiving portion 2.

[0027] Hereinafter, a vertical direction of the packaging container 1 coincides with a vertical direction in each of Fig. 1, Fig. 2, and Fig. 4 to Fig. 9. Further, inner and outer sides of the flange 3 coincide respectively with close and far sides of the flange 3 from the opening edge 21.

[0028] As shown in Fig. 1A and Fig. 1B, the container body 4 is configured to be closable with a lid member. The container body 4 of this embodiment has a tray shape, but can have any shape such as a cup shape or a bottle shape. The container body 4 is made of a synthetic resin. The thickness of the container body 4 varies depending on its portions, but can be the same at any portions. In the container body 4 of this embodiment, the thickness of the flange 3 is larger than the thickness of the receiving portion 2. In the container body 4 of this embodiment, the receiving portion 2 and the flange 3 are formed of a single member. Specifically, the container body 4 is formed by molding a single sheet.

[0029] The lid member of this embodiment has flexibility. The lid member is formed of, for example, a film member made of synthetic resin. Specifically, the film material that forms the lid member is a biaxially oriented plastic film member.

[0030] The receiving portion 2 is a portion in which food is contained. The receiving portion 2 of this embodiment includes a bottom plate 22 located at its bottom. The receiving portion 2 includes a side wall 23 extending upward from the outer peripheral edge of the bottom plate 22.

[0031] The bottom plate 22 has, for example, a rectangular plate shape with its corners rounded. The bottom plate 22 also has a bottom plate upper surface 220 configured to be in contact with food, and a bottom plate lower surface 221 configured to be in contact with a receiving surface when the container body 4 is placed on this receiving surface.

[0032] The bottom plate upper surface 220 has an uneven shape. Specifically, the bottom plate upper surface 220 has a central portion except the four corners in which a plurality of bottom plate protrusions 222 protrude upward from the bottom plate upper surface 220. Each of the four corners of the bottom plate upper surface 220 is formed of a bottom plate inclined surface 223 in which a portion closer to the peak of the corner is located at a higher position.

[0033] The bottom plate protrusions 222 are arranged at substantially equal or unequal intervals from each other. A steam flowing part through which steam flows is formed between each pair of the bottom plate protrusions 222. Each of the bottom plate protrusions 222 is configured to support the content contained in the container body 4 in, for example, a point contact manner or line

contact manner. Further, the bottom plate protrusion 222 is designed to minimize the contact area between the bottom plate protrusion 222 and the content.

[0034] In the embodiment shown in Fig. 1A, a plurality of steam flowing parts formed between each two bottom plate protrusions 222 are disposed at substantially equal intervals. With such a configuration, when a content (e.g., food) contained in the container body 4 is sterilized with steam, steam can flow to not only the top surface and the side surfaces but also the bottom surface of the content through steam flowing channels formed at the bottom. This makes it possible to more uniformly and efficiently sterilize the content with steam.

[0035] There is no particular limitation on the height of the bottom plate protrusions 222, and the height thereof from the inner lowermost surface of the container bottom portion (i.e., a lowermost position of the inner surface of the container body 4) is, for example, 2 mm or more, 3 mm or more, or 4 mm or more. Moreover, there is no particular limitation on the height of the bottom plate protrusions 222, and the height thereof from the inner lowermost face of the container bottom is, for example, 15 mm or less, 13 mm or less, or 10 mm or less. Since the height of the protrusions 222 is within such a range, steam is more likely to flow into the steam flowing channels, thus making it possible to more effectively sterilize the bottom surface side of the content with steam.

[0036] The height of the bottom plate protrusions 222 is preferably 10% or more and 40% or less of a depth of the container body 4 (i.e., a distance from the opening 20 of the container body 4 to the lowermost portion of the inner surface in the vertical direction). With this configuration, the cross-sectional area of each steam flowing channel increases, and therefore, steam is more likely to flow into the steam flowing channels, thus making it possible to more effectively sterilize the bottom surface side of the content with steam.

[0037] The bottom plate inclined surfaces 223 are disposed to eliminate corners of the receiving portion 2. For example, when food contained in the receiving portion 2 is taken out, the bottom plate inclined surfaces 223 prevent the food from accumulating around the corners of the bottom plate 22 to allow the food to be easily taken out of the receiving portion 2. Further, the bottom plate inclined surfaces 223 are each disposed with a clearance from each bottom plate protrusion 222.

[0038] The side wall 23 is formed, for example, to spread out in plan view as it advances upward. The side wall 23 has an upper end edge that serves as the opening edge 21 of the receiving portion 2.

[0039] The flange 3 is to be sealed to the lid member. The flange 3 is provided, for example, over the entire periphery in a peripheral direction of the opening edge 21. The flange 3 of this embodiment has a substantially plate shape, and is disposed annularly so as to surround the receiving portion 2 in plan view. Specifically, the flange 3 has an annular shape having four corners in plan view.

[0040] As shown in Fig. 2, the flange 3 has a flange upper surface 30 facing upward, and a flange lower surface 35 facing downward. Further, the flange 3 includes a primary sealing area 31 that is sealed to the lid member for covering the opening 20 in a primary sealing step, and a secondary sealing area 32 that is sealed to the lid member in a secondary sealing step. The flange 3 includes a flange top 33 and a flange lower part 34. The flange top 33 has a flange top upper surface 330 located on an uppermost side of the flange upper surface 30. The flange lower part 34 has a flange lower part upper surface 340 located below the flange top upper surface 330.

[0041] The flange 3 of this embodiment has a penetrating area 36 through which a through hole penetrating through the flange 3 is formed (see Fig. 1A). In this embodiment, the penetrating hole, that is, the penetrating area 36 is located on an inner side of the primary sealing area 31. The through hole formed through the penetrating area 36 penetrates through a portion between the flange lower surface 35 and the flange upper surface 30. The flange 3 of this embodiment includes a plurality of the penetrating areas 36.

[0042] The flange 3 can have one penetrating area 36, but preferably has a plurality of penetrating areas 36 since the flange 3 preferably has both a through hole through which a gas flows in through the flange 3 and a through hole through which the gas flows out through the flange 3. Specifically, this flange 3 has the penetrating areas 36 in the same number as the number of corners of the flange 3 (e.g., four in this embodiment).

[0043] The primary sealing area 31 is a part of the flange 3, and is an area for temporarily sealing the lid member and the flange part 3 to each other in the primary sealing step. The primary sealing step is performed after food is contained in the receiving portion 2 and before the food contained therein is sterilized.

[0044] The primary sealing area 31 of this embodiment is located in an outer peripheral portion of the flange 3. Further, the primary sealing area 31 continues in the peripheral direction of the opening edge 21. Specifically, the primary sealing area 31 is located on an inner side of an outer peripheral edge of the outer peripheral portion of the flange 3, and extends continuously in the peripheral direction. More specifically, the primary sealing area 31 is located on the inner side of the outer peripheral edge of the outer peripheral portion of the flange 3, and extends continuously over the entire periphery in the peripheral direction of the opening edge 21.

[0045] The secondary sealing area 32 is an area in which the lid member and the flange 3 are sealed to each other in the secondary sealing step as a hermetically sealing step. The secondary sealing step is performed after the food contained in the receiving portion 2 is sterilized. The secondary sealing area 32 is at least a part of the flange 3. Further, the secondary sealing area 32 can include an area that overlaps (i.e., coincides with) the primary sealing area 31. The secondary sealing area

32 of this embodiment is the entire area of the flange 3.

[0046] The upper surface 30 of the flange 3 lies at varying positions (heights) in the vertical direction since the flange 3 includes the flange top 33 and the flange lower part 34 (see Fig. 1B).

[0047] The flange top 33 is a portion having its upper surface located relatively upward. The flange top upper surface 330 of this embodiment is located, for example, 1 mm or more above the flange lower part upper surface 340. The flange top 33 is configured to be able to support the lid member above the flange lower part upper surface 340 after the primary sealing step and before the secondary sealing step.

[0048] Specifically, the flange top 33 is a projection formed by partially extruding the flange 3 upward from below. Thus, the flange top upper surface 330 protrudes upward. The flange top 33 of this embodiment is hollow, but can be solid.

[0049] The flange portion 3 of this embodiment has the flange tops 33 having different shapes. Specifically, as shown in Fig. 1A, the flange tops 33 include a first flange top 33A having an elliptical shape in plan view, and a second flange top 33B having a circular shape in plan view. Each of the first flange top 33A and the second flange top 33B is a projection with its flange top upper surface 330 having a curved shape. Further, each of the first flange top 33A and the second flange top 33B is a projection having a smaller height (dimension in the vertical direction) than its outer diameter in plan view.

[0050] Each of the flange tops 33 of this embodiment is disposed near each corresponding one of the penetrating areas 36. For example, at least one of the flange tops 33 is disposed on an inner side of the penetrating area 36. In this embodiment, all of the flange tops 33 are disposed on the inner sides of the penetrating areas 36. Specifically, a plurality (for example, a pair) of flange tops 33 are disposed on the inner side of each penetrating area 36. One flange top 33 can be disposed on the inner side of each penetrating area 36 so as to correspond thereto, but a plurality of flange tops 33 are preferably disposed since the lid member is preferably supported by a plurality of flange tops 33 after the primary sealing step.

[0051] The flange lower part 34 has an upper surface located relatively downward. The flange lower part 34 of this embodiment is a portion of the flange 3 excluding the flange tops 33.

[0052] The penetrating areas 36 are disposed at, for example, positions opposed to each other with the receiving portion 2 therebetween. In the case where the flange 3 has an annular shape having four corners, it is preferable that the flange 3 have one penetrating area 36 at each corner in plan view, and four penetrating areas 36 in total. The penetrating areas 36 preferably share the same shape.

[0053] In this embodiment, each of the penetrating areas 36 is a recess that is recessed downward. Further, the penetrating area 36 has a circular shape in plan view.

Specifically, the penetrating area 36 is a recess that is recessed downward into a substantially hemispherical shape.

[0054] The recess of the penetrating area 36 in this embodiment further has a groove 360. Specifically, an upper surface 361 of the penetrating area 36 is recessed downward, and the groove 360 recessed downward is provided in the upper surface 361.

[0055] The groove 360 has, for example, a cross shape crossing at a lowermost point located on the lowermost side of the penetrating area 36 (e.g., a cross shape substantially orthogonal at this lowermost point). In other words, the groove 360 has such a shape as to extend radially from the center of the penetrating area 36 in plan view. The width of the groove 360 (dimension in a direction orthogonal to the direction in which the groove 360 extends) is, for example, 0.5 mm.

[0056] Next, a description will be given on a method for sterilizing an object to be processed using the packaging container according to the present invention. In the method for sterilizing in one embodiment, food is a content, and the method includes, as the main steps, a food containing step, a through hole forming step, a primary sealing step, a sterilizing step, and a secondary sealing step, which are performed in this order. More specifically, as shown in Fig. 3, the food containing step, the through hole forming step, the primary sealing step, a deaerating step, the sterilizing step, a cooling step, a gas displacement step, and the secondary sealing step are performed in this order. A description will be hereinafter given on each of the steps in this embodiment. As a method of this embodiment, a description will be given by taking the case where the packaging container 1 of the aforementioned embodiment is used.

[0057] First, as shown in Fig. 4A and Fig. 4B, after the food containing step of placing the food F in the packaging container 1, performed is the through hole forming step of forming the through hole 38 that penetrates through the corresponding one of the penetrating areas 36 on the inner side of the primary sealing area 31 of the flange 3. As the food F, any food including, for example, daily delivered food, that is, a food cooked and processed in, for example, a food factory and a chilled processed food can be employed.

[0058] As shown in Fig. 5, the through hole 38 of this embodiment is formed when a slit 380 is formed in a part of the penetrating area 36. In the through hole forming step of this embodiment, the penetrating area 36 is located below a surrounding area of the penetrating area 36 of the flange 3 in the state where an outer peripheral edge 363 of the penetrating area 36 is continuous with the surrounding area. In other words, the penetrating area 36 is located below the surrounding area of the penetrating area 36 of the flange 3 with the outer peripheral edge 363 of the penetrating area 36 serving as a boundary.

[0059] In the through hole forming step of this embodiment, the slit 380 is formed by tearing the penetrating

area 36 from above. In forming the slit 380, employed can be, for example, a method in which a perforation jig (not shown) provided with a perforation needle at its tip is used to pierce the penetrating area 36 with the perforation needle. The perforation needle is guided by the groove 360 in the penetrating area 36 to pierce the lowermost point of the penetrating area 36, so that the penetrating area 36 is torn along the groove 360. As a result, the penetrating area 36 is divided into four segments along the cross-shaped slit 380 serving as the boundary.

[0060] Subsequently, as shown in Fig. 6A, Fig. 6B, and Fig. 7, after the primary sealing step of sealing the lid member 5 for covering the opening 20 of the receiving portion 2 and the primary sealing area 31 of the flange 3 to each other, performed is the sterilizing step of sterilizing the food F with heated steam S that enters the inside of the receiving portion 2 through a flow channel R formed between the flange 3 and the lid member 5 to have the food F exposed to the heated steam S (see Fig. 7). The primary sealing step of this embodiment is a step of sealing the primary sealing area 31, which is the outer peripheral portion of the flange 3, and the lid member 5 to each other in a line form in the peripheral direction of the outer peripheral portion of the flange 3 (see Fig. 6A). In this primary sealing step, the lid member 5 is thermally welded to the primary sealing area 31 using, for example, a heat sealing machine (not shown).

[0061] In this embodiment, a description will be given on the case where the sterilizing step is carried out using a rapid preparation sterilizer RIC (hereinafter simply referred to also as RIC) manufactured by HISAKA WORKS, LTD. The rapid preparation sterilizer RIC (not shown) includes: a processing tank capable of placing a food in a container to be processed; a steam feeder configured to supply steam into the processing tank; a decompressor configured to discharge air from the processing tank to make the tank in a vacuum state; and a heater configured to heat the inside of the processing tank.

[0062] In this embodiment, the deaerating step of deaerating from the receiving portion 2 is performed before the sterilizing step. When performing the deaerating step, a plurality of packaging containers 1 each containing the food F and having the lid member 5 primarily sealed are arranged on a tray, and a plurality of such trays stacked in multiple stages in the vertical direction are put into the processing tank of the RIC. After a lid of the processing tank is closed to seal the processing tank, the processing tank is deaerated to a vacuum state. When the processing tank is deaerated to a vacuum state, the receiving portion 2 is also deaerated through the flow channel R to the same vacuum state as the processing tank.

[0063] In the sterilizing step, the heated steam S is supplied into the processing tank and the temperature in the processing tank is raised to, for example, 100 °C to 145 °C. The heated steam S supplied into the processing tank flows within the receiving portion 2 from below the flange 3 through the flow channel R (the through hole 38 and a clearance C). Thus, the food F contained in the

receiving portion 2 is sterilized with the heated steam S.

[0064] In this embodiment, the cooling step of cooling the food F is performed after the sterilizing step. In the cooling step, the food F is cooled by reducing the pressure in the processing tank to discharge the heated steam S therefrom, and further making the processing tank in a vacuum state to thereby cause water to evaporate and draw latent heat from the food F.

[0065] Further, after the cooling step, the lid of the processing tank is opened to take out the packaging containers 1 each in which the food F is contained along with the trays.

[0066] Thereafter, the gas displacement step is preferably performed. In the gas displacement step, an inert gas such as nitrogen gas or carbon dioxide gas is supplied into the receiving portion 2 through the flow channel R.

[0067] The gas displacement step and the secondary sealing step of this embodiment are performed with the packaging container 1 placed on a die of a heat sealing machine. The die has a supply channel capable of supplying an inert gas through the through hole 38 formed in the container body 4 when the packaging container 1 is placed. In the gas displacement step of this embodiment, an inert gas is supplied to any one of the four through holes 38 through the supply channel of the die. The die also has air discharging channels at positions corresponding to the remaining three through holes 38, and air within the packaging container 1 is pushed by the supplied inert gas and discharged to the outside through the discharging channels.

[0068] After the gas displacement step, performed is the secondary sealing step of sealing the lid member 5 and the secondary sealing area 32 to each other, as shown in Fig. 8A and Fig. 8B. Thus, a packaged food 6 including the packaging container 1, the lid member 5, and the food F is obtained.

[0069] The secondary sealing step of this embodiment is a step of sealing the secondary sealing area 32, which is the outer peripheral portion of the flange 3, and the lid member 5 to each other so as to be in surface contact with each other. In the secondary sealing step, the lid member 5 is thermally welded to the secondary sealing area 32 using a heat sealing machine (not shown).

[0070] In this embodiment, the heat sealing machine includes the die (support die) on which the container body 4 is placed for gas displacement, and a die (heat sealing die) configured to hold the lid member 5 from above. In the secondary sealing step, sealing is quickly performed with the packaging container left placed on the support die after gas placement, and thus the oxygen concentration in packaging container 1 can be maintained in a very low condition.

[0071] Since the secondary sealing area 32 of the packaging container 1 corresponds to the entire area on the flange 3, the entire area of the flange 3 is pressed in the vertical direction at the time of secondary sealing to close the through holes 38 and crush the flange tops 3

to close the clearance C as well, as shown in Fig. 9. In the packaging container 1 of this embodiment, the through holes 38 of the packaging container 1 after secondary sealing are closed only by the lid member 5, but the configuration can be such that the entire area of the flange 3 is pressed in the vertical direction with the flange 3 placed on a die having a flat top surface at the time of secondary sealing to thereby have the through holes 38 closed by the deformed (crushed) penetrating areas 36 in addition to the lid member 5. Further, at the time of secondary sealing, the entire area of the flange 3 except the flange tops 33 can be pressed in the vertical direction. In this case, the clearance C is closed with the flange tops 33 retained without being crushed.

[0072] The packaging container 1 as described above can be suitably used as the packaging container 1 for the packaged food 6 formed by, for example, containing the food F in the receiving portion 2; forming the through holes 38 through the respective penetrating areas 36 of the flange 3; thereafter sealing the lid member 5 and the primary sealing area 31 of the flange 3 to each other; further sterilizing the food F with the heated steam S flowing into the receiving portion 2 through the flow channel R; and then sealing the lid member 5 and the secondary sealing area 32 of the flange 3 to each other.

[0073] In this packaging container 1, when any through hole 38 is disposed on the inner side of the primary sealing area 31, that through hole 38 serves as a part of the flow channel R. Further, when the primary sealing area 31 and the lid member 5 are sealed to each other, the clearance C is formed between the flange lower part 34 and the lid member 5, and the clearance C serves as a part of the flow channel R. Thus, the food F within the receiving portion 2 can be sterilized with the heated steam S that flows within the receiving portion 2 from below the flange 3 through the flow channel R formed of the through holes 38 and the clearance C when the food F is sterilized.

[0074] In particular, since this packaging container 1 has the flange top upper surfaces 330 located above the flange lower part upper surface 340, the flange tops 33 retain the presence of the clearance C as part of the flow channel R when the food F is sterilized. This configuration enables the heated steam S to flow within the receiving portion 2 in the state where the flange tops 33 reliably keep the clearance C unclosed.

[0075] Further, since the packaging container 1 has the lid member 5 located above the flow channel R, that is, has the flow channel R not exposed on the lid member 5, falling bacteria hardly enter the packaging container 1 through the flow channel R. Since the flow channel R is configured to be closed by sealing the secondary sealing area 32 and the lid member 5 to each other, the packaging container 1 can completely seal the food F therein through the secondary sealing between the lid member 5 and the container body 4.

[0076] In the packaging container 1 of this embodiment, when the through hole 38 is formed by forming the

slit 380 in a part of each of the penetrating areas 36 (see Fig. 5), no part of the flange 3 breaks with no fragment of the flange 3 formed when the through hole 38 is formed. This configuration can prevent entry of fragments of the flange 3 into the receiving portion 2.

[0077] In the packaging container 1 of this embodiment in which the penetrating area 36 is recessed downward (see Fig. 2), the recessed penetrating area 36 is pierced with the perforation needle when the through hole 38 is formed, so that the perforated portion of the penetrating area 36 is kept located below other areas of the flange 3 (see Fig. 5) and hardly returns upward from the low position. This makes it possible to prevent the through hole 38 from being closed, and to maintain the penetrating state of the through hole 38 until the secondary sealing area 32 of the flange 3 and the lid member 5 are sealed to each other.

[0078] Further, in the packaging container 1 of this embodiment, since the penetrating areas 36 are positioned to have the receiving portion 2 sandwiched therebetween (see Fig. 1A), the through holes 38 disposed at these positions can cause a gas to flow therethrough from both sides of the receiving portion 2 (see Fig. 4A) to thereby suppress uneven heating of the food F.

[0079] It is preferable that the container body 4 and the lid member 5 used in this embodiment have a gas barrier layer. That is, it is preferable that the container body 4 and the lid member 5 be formed of a multilayer structure including at least one oxygen barrier layer. The configuration that the container body 4 and the lid member 5 include the gas barrier layer can more efficiently suppress the growth of aerobic bacteria after sterilization to thereby keep the food in a good condition achieved in each embodiment for a longer period of time. As the gas barrier layer, an oxygen barrier layer is conceivable.

[0080] The oxygen barrier layer is a layer having a function of preventing gas permeation, and, for example, has an oxygen permeability of 100 cc·20 $\mu\text{m}/(\text{m}^2\cdot\text{day}\cdot\text{atm})$ or less, preferably 50 cc·20 $\mu\text{m}/(\text{m}^2\cdot\text{day}\cdot\text{atm})$ or less, more preferably 10 cc·20 $\mu\text{m}/(\text{m}^2\cdot\text{day}\cdot\text{atm})$ or less, when the oxygen permeability is measured under the conditions of 20 °C and 65%RH in accordance with JIS-K7126-2 (2006) Part 2 (isopiestic method). Here, the oxygen permeability of "10 cc·20 $\mu\text{m}/(\text{m}^2\cdot\text{day}\cdot\text{atm})$ " means that an amount of oxygen passing through a 20 μm barrier material (constituting a single oxygen barrier layer) per day in an oxygen atmosphere of 1 atmospheric pressure of oxygen is 10 cc.

[0081] The oxygen barrier layer includes a gas barrier material such as an ethylene-vinyl alcohol copolymer (also referred to as "EVOH" hereinafter), a composite structure containing phosphorus and a polyvalent metal element, modified starch, polyamide, polyester, polyvinylidene chloride, an acrylonitrile copolymer, polyvinylidene fluoride, polychlorotrifluoroethylene, polyvinyl alcohol, an inorganic layered compound, an inorganic deposited layer, or a metal foil. In particular, it is preferable that the oxygen barrier layer contains EVOH, polyamide, modi-

fied starch, or a combination thereof because these compounds have favorable oxygen barrier properties and favorable molten moldability, and it is more preferable that the oxygen barrier layer contains EVOH because EVOH has particularly excellent molten moldability.

(EVOH)

[0082] EVOH can be obtained through saponification of an ethylene-vinyl ester copolymer, for example. An ethylene-vinyl ester copolymer can be manufactured and saponified using a known method. Examples of vinyl ester that can be used in this method include fatty acid vinyl esters such as vinyl acetate, vinyl formate, vinyl propionate, vinyl pivalate, and vinyl versatate.

[0083] In the present invention, the ethylene unit content in EVOH is preferably 20 mol% or more, 22 mol% or more, or 24 mol% or more, for example. Moreover, the ethylene unit content in EVOH is preferably 60 mol% or less, 55 mol% or less, or 50 mol% or less, for example. If the ethylene unit content is 20 mol% or more, the molten moldability and the oxygen barrier properties at high temperatures are likely to improve. If the ethylene unit content is 60 mol% or less, the oxygen barrier properties are likely to improve. Such an ethylene unit content in EVOH can be measured using a nuclear magnetic resonance (NMR) technique, for example.

[0084] In the present invention, the saponification degree of the vinyl ester component in EVOH is preferably 80 mol% or more, 90 mol% or more, or 99 mol% or more, for example. If the saponification degree is 80 mol% or more, the oxygen barrier properties of the oxygen barrier layer can be improved, for example. On the other hand, the saponification degree of the vinyl ester component in EVOH can be 100% or less, or 99.99% or less, for example. The saponification degree of EVOH can be calculated by measuring the peak area of hydrogen atoms contained in the vinyl ester structure and the peak area of hydrogen atoms contained in the vinyl alcohol structure through $^1\text{H-NMR}$ measurement. Since the saponification degree of EVOH is within the abovementioned range, favorable oxygen barrier properties can be provided to the oxygen barrier layer included in the container body 4 and the lid member 5.

[0085] EVOH can also include a unit derived another monomer other than ethylene, vinyl ester, and saponified products thereof as long as the object of the present invention is not inhibited. When EVOH includes another monomer unit as mentioned above, the other monomer unit content in all of the structural units of EVOH is 30 mol% or less, 20 mol% or less, 10 mol% or less, or 5 mol% or less, for example. Furthermore, when EVOH includes the unit derived from the other monomer, the content thereof is 0.05 mol% or more or 0.1 mol% or more, for example.

[0086] Examples of such another monomer that can be included in EVOH include alkenes such as propylene, butylene, pentene, and hexene; ester group-containing

alkenes such as 3-acyloxy-1-propene, 3-acyloxy-1-butene, 4-acyloxy-1-butene, 3,4-diacyloxy-1-butene, 3-acyloxy-4-methyl-1-butene, 4-acyloxy-1-butene, 3,4-diacyloxy-1-butene, 3-acyloxy-4-methyl-1-butene, 4-acyloxy-2-methyl-1-butene, 4-acyloxy-3-methyl-1-butene, 3,4-diacyloxy-2-methyl-1-butene, 4-acyloxy-1-pentene, 5-acyloxy-1-pentene, 4,5-diacyloxyl-pentene, 4-acyloxy-1-hexene, 5-acyloxy-1-hexene, 6-acyloxy-1-hexene, 5,6-diacyloxy-1-hexene, and 1,3-diacetoxy-2-methylenepropene, or saponified products thereof; unsaturated acids such as acrylic acid, methacrylic acid, crotonic acid, and itaconic acid, or anhydrides, salts, monoalkyl esters, or dialkyl esters thereof; nitriles such as acrylonitrile and methacrylonitrile; amides such as acrylamide and methacrylamide; olefin sulfonic acid such as vinyl sulfonic acid, allyl sulfonic acid, and methallyl sulfonic acid, or salts thereof; vinylsilane compounds such as vinyltrimethoxysilane, vinyltriethoxysilane, vinyltri(β -methoxyethoxy)silane, and γ -methacryloxypropylmethoxysilane; alkyl vinyl ethers, vinyl ketones, N-vinylpyrrolidone, vinyl chloride, and vinylidene chloride.

[0087] EVOH can be modified through techniques such as urethanation, acetalation, cyanoethylation, and oxyalkylation. The thus-modified EVOH is likely to improve the molten moldability of the oxygen barrier layer.

[0088] A combination of two or more types of EVOH that differs in the ethylene unit content, the saponification degree, the copolymer component, whether or not they are modified, the modification type, or the like may be used as EVOH.

[0089] EVOH can be obtained using a known technique such as bulk polymerization, solution polymerization, suspension polymerization, or emulsion polymerization. In one embodiment, bulk polymerization or solution polymerization in which polymerization can be performed using no solvent or in a solution such as alcohol is used.

[0090] There is no particular limitation on a solvent used in solution polymerization, and examples thereof include alcohols, preferably lower alcohols such as methanol, ethanol, and propanol. It is sufficient that the amount of a solvent used in a polymerization reaction solution is selected in consideration of the viscosity-average polymerization degree of target EVOH or the chain transfer of the solvent, and the ratio (solvent / total monomers) between the mass of the solvent contained in the reaction solution and the total mass of monomers contained therein is 0.01 to 10, for example, and preferably 0.05 to 3.

[0091] Examples of a catalyst used in the above-mentioned polymerization include azo-based initiators such as 2,2-azobisisobutyronitrile, 2,2-azobis-(2,4-dimethylvaleronitrile), 2,2-azobis-(4-methoxy-2,4-dimethylvaleronitrile), and 2,2-azobis-(2-cyclopropylpropionitrile); and organic peroxide-based initiators such as isobutyryl peroxide, cumyl peroxyneodecanoate, diisopropyl peroxydicarbonate, di-n-propyl peroxydicarbonate, t-butyl peroxyneodecanoate, lauroyl peroxide, benzoyl peroxide, and t-butyl hydroperoxide.

[0092] The polymerization temperature is preferably 20 °C to 90 °C, more preferably 40 °C to 70 °C. The polymerization time is preferably 2 hours to 15 hours, more preferably 3 hours to 11 hours. The polymerization rate is preferably 10% to 90%, and more preferably 30% to 80%, in terms of vinyl ester prepared for the polymerization. The resin content in the solution after the polymerization is preferably 5% to 85%, more preferably 20% to 70%.

[0093] In the above-mentioned polymerization, after polymerization is performed for a predetermined period of time or a predetermined polymerization rate is obtained, a polymerization inhibitor is added as needed, unreacted ethylene gas is removed through evaporation, and unreacted vinyl ester can be removed.

[0094] Then, an alkaline catalyst is added to the copolymer solution, and the copolymer is saponified. A continuous saponification method or batch saponification method can be employed. Examples of the alkaline catalyst that can be added include sodium hydroxide, potassium hydroxide, and alkali metal alcoholates.

[0095] EVOH that has been subjected to saponification reaction contains the alkaline catalyst, by-product salts such as sodium acetate and potassium acetate, and other impurities. Accordingly, it is preferable to remove these compounds as needed through neutralization or washing. Here, when EVOH that has been subjected to saponification reaction is washed with water (e.g., ion-exchanged water) that is substantially free of predetermined ions (e.g., metal ions and chloride ions), by-product salts such as sodium acetate and potassium acetate need not be entirely removed, and a portion thereof can remain.

[0096] EVOH can contain another thermoplastic resin, a metal salt, an acid, a boron compound, a plasticizer, a filler, an anti-blocking agent, a lubricant, a stabilizer, a surfactant, a coloring agent, an ultraviolet absorber, an antistatic agent, a drying agent, a cross-linking agent, a reinforcing material such as various fibers, and other components. It is preferable that EVOH contain a metal salt and an acid because the oxygen barrier layer has favorable thermal stability and favorable adhesiveness to another resin.

[0097] The metal salt is preferably an alkali metal salt from the viewpoint of improving the interlayer adhesiveness, and is preferably an alkali earth metal salt from the viewpoint of improving the thermal stability. When EVOH contains a metal salt, the metal salt content in EVOH is 1 ppm or more, 5 ppm or more, 10 ppm or more, or 20 ppm or more, for example, in terms of the metal atom in the metal salt. Moreover, when EVOH contains a metal salt, the metal salt content in EVOH is 10000 ppm or less, 5000 ppm or less, 1000 ppm or less, or 500 ppm or less, for example, in terms of the metal atom in the metal salt. When the metal salt content is within the range from the lower limit to the upper limit mentioned above, it is likely that the thermal stability of EVOH is favorably maintained when the container body 4 is recycled, while the

interlayer adhesiveness of the oxygen barrier layer is favorably maintained.

[0098] Examples of the acid include carboxylate compounds and phosphate compounds. These acids are useful because they can improve the thermal stability, so that EVOH is stable even when subjected to molten molding. When EVOH contains a carboxylate compound, the carboxylic acid content (i.e., the carboxylic acid content in a dry composition of the EVOH-containing oxygen barrier layer) is 1 ppm or more, 10 ppm or more, or 50 ppm or more, for example. Moreover, the carboxylate compound content is 10000 ppm or less, 1000 ppm or less, or 500 ppm or less, for example. When EVOH contains a phosphate compound, the phosphoric acid content (i.e., the phosphate compound content in the oxygen barrier layer that includes EVOH, in terms of phosphate radical) is 1 ppm or more, 10 ppm or more, or 30 ppm or more, for example. Moreover, the phosphate compound content is 10000 ppm or less, 1000 ppm or less, or 300 ppm or less, for example. When EVOH contains a carboxylate compound or phosphate compound in an amount within the above-mentioned range, it is likely that EVOH has favorable thermal stability and is thus stable even when subjected to molten molding.

[0099] When EVOH contains a boron compound, the boron compound content (i.e., the boron compound content in a dry composition of the oxygen barrier layer that includes EVOH, in terms of boron) is 1 ppm or more, 10 ppm or more, or 50 ppm or more, for example. Moreover, the boron compound content is 2000 ppm or less, 1000 ppm or less, or 500 ppm or less, for example. When EVOH contains a boron compound or phosphate compound in an amount within the above-mentioned range, it is likely that that EVOH has favorable thermal stability and is thus stable even when subjected to molten molding.

[0100] There is no particular limitation on a method for producing the EVOH-containing oxygen barrier layer that contains the carboxylate compound, phosphate compound, or boron compound, and, for example, the above-mentioned compound can be added to and mixed with an EVOH-containing composition before pellets of the EVOH-containing composition are formed. There is no particular limitation on a method for adding the carboxylate compound, phosphate compound, or boron compound, and examples thereof include a method in which dry powder of the compound is added, a method in which a paste obtained by impregnating the compound with a predetermined solvent is added, a method in which a suspension obtained by suspending the compound in a predetermined liquid is added, a method in which a solution obtained by dissolving the compound in a predetermined solvent is added, and a method in which immersion into a predetermined solution is performed. In particular, it is preferable to employ the method in which a solution obtained by dissolving the compound in a predetermined solvent is added, or a method in which immersion into a predetermined solution is performed be-

cause the above-mentioned compound can be uniformly dispersed in EVOH. A solvent to be used in such methods is not particularly limited, but is preferably water in consideration of the solubility of the compound to be added as an additive, the cost, the handleability, the work environment safety, and the like.

[0101] When the oxygen barrier layer in the multilayer structure contains EVOH as a main component, the ratio of EVOH in the oxygen barrier layer is 60 mass% or more, 70 mass% or more, 80 mass% or more, 90 mass% or more, or 100 mass%, for example. Here, the term "the main component of the oxygen barrier layer" as used herein refers to a component whose ratio (mass%) in the oxygen barrier layer is the largest.

[0102] When the oxygen barrier layer in the multilayer structure contains EVOH as a main component, the average thickness of the oxygen barrier layers is 3 μm or more, 5 μm or more, or 10 μm or more, for example, and the average thickness of the oxygen barrier layers is 100 μm or less or 50 μm or less, for example. Here, the term "the average thickness of the oxygen barrier layers" as used herein refers to a value obtained by dividing the total thickness of all of the oxygen barrier layers that contain EVOH as a main component and that are included in the multilayer structure by the number of the oxygen barrier layers. When the average thickness of the oxygen barrier layers is within the above-mentioned range, the container body 4 and the lid member 5 included in the packaging container of the present invention are likely to have favorable durability, flexibility, and appearance properties.

Composite Structure Containing Phosphorus and Polyvalent Metal Element

[0103] A composite structure containing phosphorus and a polyvalent metal element includes a barrier layer formed through reaction between a phosphorus compound and a polyvalent metal compound. This structure can be formed by mixing a solution containing a phosphorus compound and a solution or dispersion liquid containing a polyvalent metal compound to prepare a coating agent, applying the coating agent onto a substrate, and reacting the polyvalent metal compound and the phosphorus compound. Here, a bond represented as M-O-P, where M represents the polyvalent metal atom, is formed between the polyvalent metal atom M and a phosphorus atom. The characteristic band of the M-O-P bond can be observed in a region between 1080 cm^{-1} and 1130 cm^{-1} in an infrared absorption spectrum, and the maximum absorption wave number in a region between 800 cm^{-1} and 1400 cm^{-1} in the infrared absorption spectrum of the composite structure is preferably within a range of 1080 cm^{-1} to 1130 cm^{-1} . When the maximum absorption wave number of the composite structure is within the above-mentioned range, the composite structure is likely to have excellent oxygen barrier properties.

[0104] There is no particular limitation on the substrate

onto which the coating agent is to be applied, and examples thereof include resins such as thermoplastic resins and thermosetting resins; fiber assemblies such as fabrics and papers; wood; and glass. In particular, thermoplastic resins and the fiber assemblies are preferable, and the thermoplastic resins are more preferable. There is no particular limitation on the shape of the substrate, and the substrate may be a film, a sheet, or the like having a layer shape. The substrate is more preferably made of a thermoplastic resin film or paper, and even more preferably made of a thermoplastic resin film. The thermoplastic resin film is preferably made of polyester, and is more preferably made of polyethylene terephthalate because favorable mechanical strength can be imparted to the composite structure.

[0105] There is no particular limitation on the polyvalent metal element as long as two or more molecules of a phosphorus compound can react with the polyvalent metal element, and any polyvalent metal element can be used. For example, the polyvalent metal element can be a polyvalent semimetal. Examples of the polyvalent metal element include elements such as magnesium, calcium, zinc, aluminum, silicon, titanium, and zirconium. Aluminum is particularly preferable.

[0106] There is no particular limitation on the polyvalent metal element compound as long as it can react with a phosphorus compound to produce a composite structure, and any polyvalent metal element compound can be used. A solution obtained by dissolving the polyvalent metal compound in a solvent or a dispersion liquid obtained by dispersing minute particles of the polyvalent metal compound in a solvent can be used as the polyvalent metal compound, and an aqueous solution containing aluminum nitrate as the polyvalent metal compound can be used.

[0107] Furthermore, a dispersion liquid obtained by dispersing minute particles of the polyvalent metal compound in water or an aqueous solvent can be used. Such a dispersion liquid is preferably a dispersion liquid containing minute particles of aluminum oxide. In general, minute particles of a polyvalent metal oxide include hydroxy groups on their surfaces, and hydroxy groups present thereon can react with the phosphorus compound to form the above-mentioned bond. Minute particles of a polyvalent metal oxide can be synthesized as follows, for example: a compound in which a hydrolyzable characteristic group binds to a metal atom is prepared as a raw material and is then hydrolyzed, and the obtained hydrolysis product is condensed. Examples of the raw material include aluminum chloride, aluminum triethoxide, and aluminum isopropoxide. Examples of a method for condensing the hydrolysis product include liquid phase synthesis methods such as a sol-gel method. The minute particles of the polyvalent metal oxide preferably have a spherical shape, a flat shape, a polyhedral shape, a fiber-like shape, or a needle-like shape, for example, and more preferably have a fiber-like shape or a needle-like shape because the oxygen barrier prop-

erties can be improved. Furthermore, the average particle diameter of the minute particles of the polyvalent metal oxide is preferably set to 1 nm or more and 100 nm or less in order to improve the oxygen barrier properties and transparency.

[0108] There is no particular limitation on the phosphorus compound as long as it can react with a polyvalent metal compound to form the above-mentioned bond, and any phosphorus compound can be used. Examples of the phosphorus compound include phosphoric acid-based compounds and derivatives thereof. Specific examples thereof include phosphoric acid, polyphosphoric acid, phosphorous acid, and phosphonic acid. Examples of the polyphosphoric acid include pyrophosphoric acid, triphosphoric acid, and polyphosphoric acid obtained through condensation of four or more molecules of phosphoric acid. Examples of the derivatives of the phosphoric acid-based compound include phosphates, esters (e.g., trimethyl phosphate), halides, and hydrates (e.g., phosphorus pentoxide).

[0109] A solution containing the phosphorus compound can be used, and examples thereof include aqueous solutions containing water as a solvent, and solutions such as lower alcohol solutions containing a hydrophilic organic solvent.

[0110] The coating agent can be obtained by mixing a solution or dispersion liquid of the polyvalent metal compound and a solution of the phosphorus compound. Other components can be added to the coating agent. Examples of the other components include macromolecular compounds, metal complexes, viscosity compounds, cross-linking agents, plasticizers, antioxidants, ultraviolet absorbers, and flame retardants. Examples of the macromolecular compounds include polyvinyl alcohol, partially saponified polyvinyl acetate, polyhydroxyethyl (meth)acrylate, polysaccharides (e.g., starch), acrylic polymers (e.g., polyacrylic acid, polymethacrylic acid, and acrylic acid-methacrylic acid copolymers) and salts thereof, ethylene-vinyl alcohol copolymers, ethylene-maleic anhydride copolymers, styrene-maleic anhydride copolymers, isobutylene-maleic anhydride alternating copolymers, ethylene-acrylic acid copolymers, and saponified ethylene-ethyl acrylate copolymers.

[0111] The composite structure containing phosphorus and a polyvalent metal element can be formed as follows: a coating film is obtained by applying the above-mentioned coating agent and then removing a solvent through drying, and the above-mentioned bond is formed by heating the coating film, for example, to react the polyvalent metal compound and the phosphorus compound. The heat treatment is preferably performed at a temperature of 110 °C or higher, more preferably 120 °C or higher, even more preferably 140 °C or higher, particularly preferably 170 °C or higher. If the heat treatment is performed at a low temperature, more time will be required to form a sufficient amount of the bonds, and the productivity may be reduced. The upper limit of a temperature at which the heat treatment is performed varies depend-

ing on the type of substrate film, and is 240 °C or 220 °C, for example. The time required for the heat treatment is 0.1 seconds or more, 1 second or more, or 5 seconds or more, for example. The time required for the heat treatment is 0.1 seconds or more, 1 second or more, or 5 seconds or more, for example. It should be noted that such heat treatment may be performed under an air atmosphere, a nitrogen atmosphere, or an argon atmosphere.

[0112] The lower limit of the average thickness of a single oxygen barrier layer containing, as a main component, the composite structure containing phosphorus and a polyvalent metal element is 0.05 μm or more or 0.1 μm or more, for example. The average thickness of a single oxygen barrier layer containing, as a main component, the composite structure containing phosphorus and a polyvalent metal element is 4 μm or less or 2 μm or less, for example. It should be noted that the term "the average thickness of a single oxygen barrier layer containing, as a main component, the composite structure containing phosphorus and a polyvalent metal element" as used herein refers to a value obtained by dividing the total thickness of all of the oxygen barrier layers that contain the composite structure as a main component and that are included in the multilayer structure by the number of the oxygen barrier layers. If the average thickness of a single oxygen barrier layer is smaller than the lower limit, it will be difficult to form layers having a uniform thickness, and thus the durability of the obtained multilayer structure may be deteriorated. If the average thickness of a single oxygen barrier layer is larger than the upper limit, the flexibility, extensibility, heat moldability, and the like of the obtained multilayer structure may be deteriorated.

Modified Starch

[0113] There is no particular limitation on starch that can be used as a raw material of modified starch, and examples thereof include starch derived from raw materials such as wheat, corn, tapioca, potatoes, rice, oats, arrowroot, and peas. Starch is preferably high-amylose starch, more preferably high-amylose cornstarch or high-amylose tapiocastarch.

[0114] It is preferable that the modified starch is prepared by chemically modifying the above-mentioned starch such that a hydroxy group is substituted by a functional group such as an ether group, an ester group, or a combination thereof. The modified starch is preferably prepared by modifying the above-mentioned starch such that the starch includes a hydroxyalkyl group having 2 to 6 carbon atoms, or by modifying the above-mentioned starch through reaction with a carboxylic anhydride. When the modified starch is prepared by modifying the above-mentioned starch such that the starch includes a hydroxyalkyl group having 2 to 6 carbon atoms, it is preferable that a substituent for the modified starch includes a functional group having 2 to 4 carbon atoms, such as

a hydroxyethyl group or hydroxybutyl group from which a hydroxy ether substituent can be produced. When the modified starch is prepared by modifying the above-mentioned starch through reaction with a carboxylic anhydride, the functional group is preferably a butanoic ester or a lower homologue, more preferably an acetic ester. Dicarboxylic anhydrides such as a maleic anhydride, a phthalic anhydride, and an octenyl succinic anhydride can also be used to manufacture ester derivatives.

[0115] The modified starch is preferably hydroxypropylated amylose starch that includes a hydroxypropyl group, more preferably hydroxypropylated high-amylose starch.

[0116] The substitution degree of modified starch is represented as the average number of substituents per anhydroglucose unit, and the maximum value thereof is generally 3. The substitution degree of the modified starch is preferably 0.05 or more and less than 1.5.

[0117] The modified starch can include another starch. An example of the other starch is a mixture of high-amylose starch and low-amylose starch.

[0118] The modified starch may contain water. Water can serve as a plasticizer for modified starch. The water content is 20 mass% or less or 12 mass% or less, for example. In general, the water content of the oxygen barrier layer containing the modified starch as a main component is an equilibrium water content at a relative humidity in the usage environment.

[0119] The modified starch can contain one or more water-soluble polymers. There is no particular limitation on the water-soluble polymer, and examples thereof include polyvinyl acetate, polyvinyl alcohol, and a combination thereof. In particular, polyvinyl alcohol is preferable. The content of one or more water-soluble polymers is 20 mass% or less or 12 mass% or less, for example. The content of one or more water-soluble polymers is 1 mass% or more or 4 mass% or more, for example.

[0120] The modified starch can contain one or more plasticizers. The plasticizer is not particularly limited, but is preferably a polyol. Examples of the polyol include sorbitol, glycerol, maltitol, xylitol, and combinations thereof. The content of one or more plasticizers in the modified starch is 20 mass% or less or 12 mass% or less, for example.

[0121] The modified starch can include a lubricant. Examples of the lubricant include fatty acids having 12 to 22 carbon atoms, fatty acid salts having 12 to 22 carbon atoms, and combinations thereof. The content of the lubricant in the modified starch is 5 mass% or less, for example.

[0122] The average thickness of a single oxygen barrier layer containing the modified starch as a main component is 10 μm or more or 100 μm or more, for example. The average thickness of a single oxygen barrier layer containing the modified starch as a main component is 1000 μm or less or 800 μm or less, for example. It should be noted that the term "the average thickness of a single oxygen barrier layer containing the modified starch as a

main component" as used herein refers to a value obtained by dividing the total thickness of all of the oxygen barrier layers that contain the modified starch as a main component and that are included in the multilayer structure by the number of the oxygen barrier layers. If the average thickness of a single oxygen barrier layer is smaller than the lower limit, it will be difficult to form layers having a uniform thickness, and thus the durability of the obtained multilayer structure may be deteriorated. If the average thickness of a single oxygen barrier layer is larger than the upper limit, the flexibility, extensibility, heat moldability, and the like of the obtained multilayer structure may be deteriorated.

Inorganic Layered Compound

[0123] The barrier layer that includes the inorganic layered compound is, for example, a layer that is made of a thermoplastic resin in which the inorganic layered compound is dispersed and that exhibits barrier properties caused by the inorganic layered compound. There is no particular limitation on the thermoplastic resin to be used in the barrier layer that includes the inorganic layered compound, and examples thereof include polyamides, and ethylene-vinyl alcohol copolymers.

[0124] Examples of the inorganic layered compound include inorganic layered compounds such as expansive mica, clay, montmorillonite, smectite, and hydrotalcite. The inorganic layered compound may also be an organic-modified inorganic layered compound obtained through organic treatment.

[0125] The inorganic layered compound is constituted by plate crystals, for example, and has any external shape such as a circular shape, noncircular shape, elliptical shape, substantially oblong shape, or substantially cocoon shape. It is preferable that the average length of the long sides of the plate crystals included in the inorganic layered compound that can be measured using an electron microscope is within a predetermined range.

[0126] The average length of the long side of the inorganic layered compound is preferably 70 nm or more, more preferably 80 nm or more, and even more preferably 90 nm or more. The inorganic layered compound is oriented in a film plane due to stress generated during expansion, but if the average length of the long side of the inorganic layered compound is less than 70 nm, the orientation degree is insufficient, and thus sufficient oxygen permeability cannot be obtained in some cases. On the other hand, the average length of the long side of the inorganic layered compound may also be 2000 nm or less.

[0127] It is also preferable that the inorganic layered compound do not contain a bulk substance having a thickness of more than 2 μm . If the inorganic layered compound contains a bulk substance having a thickness of more than 2 μm , transparency and extensibility may be deteriorated.

[0128] The content of the inorganic layered compound

in the barrier layer containing the inorganic layered compound is preferably 0.3 to 20 mass% relative to the mass of the barrier layer.

Inorganic Deposited Layer

[0129] The inorganic deposited layer is a barrier layer obtained by depositing an inorganic substance on a substrate, for example. Examples of the substrate that can be used for the inorganic deposited layer include resins such as thermoplastic resins and thermosetting resins; fiber assemblies such as fabrics and papers; wood; and glass. Thermoplastic resins and the fiber assemblies are preferable, and the thermoplastic resins are more preferable. When the above-mentioned resins are used to form the substrate, the substrate is preferably a film, a sheet, or the like having a layer shape.

[0130] Examples of the thermoplastic resins to be used for the substrate include polyolefin-based resins such as polyethylene and polypropylene; polyester-based resins such as polyethylene terephthalate (PET), polyethylene-2,6-naphthalate, polybutylene terephthalate, and copolymers thereof; polyamide-based resins such as nylon-6, nylon-66, and nylon-12; hydroxy group-containing polymers such as polyvinyl alcohol and ethylene-vinyl alcohol copolymers; polystyrene; poly(meth)acrylic esters; polyacrylonitrile; polyvinyl acetate; polycarbonate; polyarylate; regenerated cellulose; polyimide; polyetherimide; polysulfone; polyethersulfone; polyether ether ketone; and ionomer resins. At least one thermoplastic resin selected from the group consisting of polyethylene, polypropylene, polyethylene terephthalate, nylon-6, and nylon-66 is preferable.

[0131] When a film made of a thermoplastic resin is used as the substrate, the substrate may be a stretched film or an unstretched film. A stretched film is preferable because the resultant multilayer structure has excellent processing suitability (for printing or laminating), and a biaxially stretched film is more preferable. The biaxially stretched film may be a biaxially stretched film manufactured using any of a simultaneous biaxial stretching method, a successive biaxial stretching method, and a tubular stretching method.

[0132] Examples of papers to be used for the substrate include kraft paper, high-quality paper, simili paper, glassine paper, parchment paper, synthetic paper, white paperboards, manilla boards, milk-carton boards, cup base paper, and ivory boards.

[0133] When the substrate has a layer shape, the thickness thereof is preferably 1 μm to 1,000 μm , more preferably 5 μm to 500 μm , even more preferably 9 μm to 200 μm , because the resultant multilayer structure has favorable mechanical strength and processability.

[0134] Examples of the inorganic substance include metals such as aluminum, zinc, indium, nickel, titanium, and chromium; metal oxides such as silicon oxide and aluminum oxide; metal nitrides such as silicon nitride; metal oxynitrides such as silicon oxynitride; and metal

carbonitrides such as silicon carbonitride. It is preferable that the inorganic deposited layer be formed of any of aluminum, aluminum oxide, silicon oxide, magnesium oxide, and silicon nitride, or a combination thereof because the inorganic deposited layer has excellent barrier properties against oxygen or water vapor.

[0135] There is no particular limitation on a method for forming the inorganic deposited layer, and examples thereof include physical vapor deposition methods such as vacuum deposition methods (e.g., a resistance heating deposition method, an electron beam deposition method, and a molecular beam epitaxy method), an ion plating method, and sputtering methods (e.g., a dual magnetron sputtering); and chemical vapor deposition methods such as thermochemical vapor deposition methods (e.g., a catalytic chemical vapor deposition method), photochemical vapor deposition methods, plasma chemical vapor deposition methods (e.g., a capacitive coupled plasma method, an inductive coupled plasma method, a surface wave plasma method, and an electron cyclotron resonance plasma method), atomic layer deposition methods, and organic metal vapor deposition methods.

[0136] Although the thickness of the inorganic deposited layer varies depending on the types of components included in the inorganic deposited layer, the thickness thereof is preferably 0.002 μm to 0.5 μm , more preferably 0.005 μm to 0.2 μm , even more preferably 0.01 μm to 0.1 μm . A thickness with which favorable barrier properties and mechanical properties are provided to the multilayer structure can be selected from this range. If the thickness of the inorganic deposited layer is less than 0.002 μm , the inorganic deposited layer is less likely to reproducibly exhibit barrier properties against oxygen and water vapor, and the inorganic deposited layer does not exhibit sufficient barrier properties in some cases. If the thickness of the inorganic deposited layer is more than 0.5 μm , it is likely that the barrier properties of the inorganic deposited layer is deteriorated when the multilayer structure is stretched or bent.

Metal Foil

[0137] A metal foil is a single-layer or multilayer structure made of a metal having excellent ductility. An example of the metal included in the metal foil is aluminum. The metal foil is in the form of an aluminum foil or aluminum tape, for example.

[0138] According to the packaging container including the gas barrier layer as described above, the entry of oxygen can be prevented, and the quality of a sterilized content contained therein can be maintained for an even longer period of time.

[0139] It is a matter of course that the packaging container of the present invention is not limited to the aforementioned embodiment, and various modifications can be made without departing from the gist of the present invention. For example, a configuration of an embodi-

ment may be added to a configuration of another embodiment, and part of a configuration of an embodiment may be replaced by a configuration of another embodiment. Further, part of a configuration of an embodiment may be deleted.

[0140] The aforementioned embodiment has been described by taking, for example, the case where each of the flange tops 33A, 33B is a projection having a smaller height (dimension in the vertical direction) than its outer diameter in plan view, without limitation thereto. As shown in Fig. 10 and Fig. 11, it is conceivable that the flange 3 include a third flange top 33C having a height substantially equal to its outer diameter in plan view. The third flange tops 33 each have a circular shape in plan view.

[0141] The aforementioned embodiment has been described by taking, for example, the case where the through hole 38 is formed by piercing the corresponding one of the penetrating areas 36 of the flange 3 with a perforation needle (that is, by breaking the penetrating area 36), without limitation thereto. For example, it is conceivable that the through hole 38 be formed by punching off the penetrating area 36 of the flange 3.

[0142] When the through hole 38 is formed by punching off the penetrating area 36 of the flange 3 in the through hole forming step, the penetrating area 36 is removed from the flange 3, as shown in Fig. 12A and Fig. 12B. In this configuration, no gas flow through the through hole 38 is blocked by the penetrating area 36 after the through hole forming step is performed and before the secondary sealing area 32 is sealed; thus, the heated steam S can smoothly flow through the through hole 38.

[0143] In the packaging container 1 of the aforementioned embodiment, the flange tops 33 are located on the inner side of the respective penetrating areas 36 and the primary sealing area 31 is located on the outer side of the penetrating areas 36, that is, the flange tops 33 and the primary sealing area 31 are separated from each other, but the flange tops 33 can also serve as the primary sealing area 31. Since the primary sealing area 31 needs to be located on the outer side of the penetrating areas 36, at least one of the plurality of flange tops 33 is to be located on the outer side of the penetrating areas 36 in this configuration. For example, it is conceivable that the flange tops 33 have a fourth flange top 33D located on the outer side of the penetrating areas 36 and also serving as the primary sealing area 31.

[0144] The flange top 33 can be the fourth flange top 33D being a ridge. Further, the flange top 33 can have an upper surface (flange top upper surface 330) being a flat surface as in the upper surface of the fourth flange top 33D (see Fig. 12B). When the flange top 33 is a ridge, for example, the flange top 33 can be provided continuously in the peripheral direction of the opening edge 21. Specifically, it is conceivable that the flange top 33 be a ridge provided continuously over the entire periphery in the peripheral direction of the opening edge 21.

[0145] In the packaging container 1 of the aforemen-

tioned embodiment, the secondary sealing area 32 is provided over the entire area on the flange 3 in the packaging container 1 of the aforementioned embodiment, but can be provided on a part of the flange 3. As shown in Fig. 13A and Fig. 13B showing the state after the secondary sealing step in the aforementioned configuration that the flange top 33 also serves as the primary sealing area 31 (see Fig. 12A and Fig. 12B), it is conceivable that an area of the flange lower part 34 located on the inner side of the primary sealing area 31 also serve as the secondary sealing area 32.

[0146] Further, in the packaging container 1 of the aforementioned embodiment, surface sealing is performed in the secondary sealing step, but line sealing continuous over the entire periphery in the peripheral direction of the opening edge 21 can also be performed. For example, the line sealing can be performed as shown in Fig. 14A and Fig. 14B. In this case, it is conceivable that the secondary sealing area 32 be a ridge protruding upward.

[0147] In this case, the upper surface of the secondary sealing area 32 is located below the flange top upper surface 330 (i.e., the upper surface of the fourth flange top 33D also serving as the primary sealing area 31). Further, the flange 3 is configured to have the clearance C formed between the upper surface of the secondary sealing area 32 and the lower surface of the lid member 5 when the lid member 5 and the primary sealing area 31 are sealed to each other. Thus, after the primary sealing step and before the secondary sealing step, that is, when the food F is sterilized, the clearance C is formed between the lid member 5, which is supported by the flange top upper surface 330, and the flange lower part upper surface 340, and the first flange upper surface 230 retains this clearance C and reliably keeps the clearance C unclosed to thereby cause the heated steam S to flow within the receiving portion 2 through the flow channel R.

[0148] In the aforementioned embodiment, the flange 3 has projections as the flange tops 33, but can have a recess that is recessed downward, and as shown in Fig. 15A and Fig. 15B, the flange 3 can have a groove 39 as the flange lower part 34. For example, it is conceivable that the groove 39 be continuous in the peripheral direction along the opening edge 21. Specifically, it is conceivable that the groove 39 be continuous over the entire periphery in the peripheral direction of the opening edge 21.

[0149] In such a configuration that the flange 3 has a recess as described above, the recess can be provided with the penetrating area 36. For example, it is conceivable that the penetrating area 36 be provided in the groove 39 of the flange 3. Specifically, it is conceivable that, in the groove 39 continuous over the entire periphery in the peripheral direction of the opening edge 21, a pair of sides opposed to each other with the receiving portion 2 therebetween respectively have the penetrating areas 36. In this case, the penetrating areas 36 provided on the pair of sides are disposed at, for example, positions

opposed to each other with the receiving portion 2 therebetween. In this configuration, the through holes 38 are formed in the groove 39 of the flange 3 when the through hole forming step is performed.

[0150] In this case, it is conceivable that the primary sealing area 31 be located outward of the groove 39 of the flange 3 (i.e., the flange top 33) and provided continuously in the peripheral direction of the opening edge 21. Specifically, it is conceivable that the primary sealing area 31 be continuous over the entire periphery in the peripheral direction of the opening edge 21.

[0151] In the aforementioned configuration that the penetrating areas 36 are provided in the groove 39 of the flange 3 (see Fig. 15A and Fig. 15B), it is conceivable that, as shown in Fig. 16A and Fig. 16B, the secondary sealing area 32 be located on the inner side of the groove 39 of the flange 3 and provided continuously in the peripheral direction along the opening edge 21. Specifically, it is conceivable that the secondary sealing area 32 be continuous over the entire periphery in the peripheral direction of the opening edge 21. In the flange 3 configured as above, the groove 39 in which the penetrating areas 36 are provided is disposed on the inner side of the primary sealing area 31, and the secondary sealing area 32 is further disposed on the inner side of the groove 39.

[0152] The penetrating areas 36 can be provided only at some of the plurality of corners of the flange 3. For example, as shown in Fig. 17A, only a pair of penetrating areas 36 can be provided respectively at those corners of the flange 3 located to have the receiving portion 2 therebetween. In this case, as shown in Fig. 17B, the through holes 38 are provided only at a pair of corners of the flange 3 located to have the receiving portion 2 therebetween.

[0153] Further, the flange tops 33 can be fifth flange tops 33E that are projections each having a mound shape like a hemispherical shape. Each of the flange tops 33 can have a conical shape, a truncated conical shape, a cylindrical shape, a polygonal prism shape, a polygonal pyramid shape, and other shapes.

[0154] The bottom plate 22 of the receiving portion 2 of the aforementioned embodiment has a substantially rectangular plate shape, but it is conceivable that the bottom plate 22 have a substantially square plate shape. The bottom plate 22 can have other polygonal plate shapes or a disc shape, in addition to the quadrangular plate shape.

[0155] In the packaging container 1 of the aforementioned embodiment, the penetrating areas 36 are provided in the flange 3 and the through holes 38 are formed through the flange 3 by performing the through hole forming step, but the configuration can be such that no penetrating area 36 is provided in the flange 3. Conceivable examples of such a configuration include the configurations in Fig. 18 to Fig. 21.

[0156] For example, as shown in Fig. 18A and Fig. 18B, it is conceivable that the flange 3 have the primary sealing area 31 to be sealed to the lid member 5 in the primary

sealing step, and that the flange 3 be configured to have the flow channel R formed between the lid member 5 and the primary sealing area 31 to enable a gas to flow there-through into and out of the receiving portion 2 when the lid member 5 and the primary sealing area 31 are sealed to each other. In this configuration, the flange tops 33 are ridges disposed away from the four corners of the flange 3 and extending in an elongated shape in the peripheral direction of the opening edge 21. The flange tops 33 also serve as the primary sealing area 31. Further, as shown also in Fig. 19A and Fig. 19B, a portion of the flange lower part 34 provided continuously over the entire periphery in the peripheral direction of the opening edge 21 also serves as the secondary sealing area 32.

[0157] In this case, the upper surface of the primary sealing area 31 (e.g., the flange top upper surface 330) is located on the uppermost side of the flange upper surface 30, and the upper surface of the secondary sealing area 32 (e.g., the portion of the flange lower part upper surface 340 provided continuously over the entire periphery in the peripheral direction of the opening edge 21) is located below the upper surface of the primary sealing area 31 (e.g., the flange top upper surface 330). The flange 3 is configured such that, when the lid member 5 and the primary sealing area 31 are sealed to each other, the clearance C is formed between the upper surface of the secondary sealing area 32 (e.g., the flange lower part upper surface 340) and the lower surface of the lid member 5 and serves as a part of the flow channel R.

[0158] In the packaging container 1 of the aforementioned embodiment, the primary sealing step is performed by line sealing, but can be performed by spot sealing in which at least one point is sealed. For example, as shown in Fig. 20A and Fig. 20B, it is conceivable that the flange 3 have a plurality of projections as sixth flange tops 33F, and the sixth flange tops 33F also serve as the primary sealing areas 31. Each of the flange tops 33F has, for example, a truncated conical shape. Further, it is conceivable that each of the flange tops 33F be provided at each of the four corners of the flange 3 and the center of each of the sides of the flange 3. When the plurality of primary sealing areas 31 are provided at intervals from each other in the peripheral direction of the opening edge 21 as described above, the heated steam S flows within the receiving portion 2 through clearances between adjacent ones of the primary sealing areas 31 in the peripheral direction after the primary sealing step. This configuration enables a sufficient amount of the heated steam S to flow within the receiving portion 2.

[0159] For example, as shown in Fig. 21A and Fig. 21B, a plurality of recesses as the flange lower parts 34 can be provided in the flange 3. It is conceivable that the flange lower parts 34 be disposed at intervals from each other in the peripheral direction of the opening edge 21, and be, for example, located at the respective four corners of the flange 3. In this case, the flange tops 33 are located on the respective sides of the flange 3. In this configuration, the flange tops 33 also serve as the primary

sealing areas 31. Further, in this configuration, the clearance C is formed between the lower surface of the lid member 5 and the flange lower part upper surface 340 to be located at the respective four corners of the flange 3 after the primary sealing step; thus, the heated steam S flows within the receiving portion 2 through the four corners of the flange 3.

[0160] In the packaging container 1 of the aforementioned embodiment, the through holes 38 formed in the flange 3 share the same shape and size, but can have different shapes and/or sizes. For example, as shown in Fig. 22A and Fig. 22B, it is conceivable that through holes 38A be provided respectively at a pair of corners adjacent to each other among the four corners of the flange 3, and through holes 38B having a different size from the through holes 38A be provided respectively at the remaining pair of corners other than the pair of corners adjacent to each other among the four corners of the flange 3. Each of the through holes 38A has a larger diameter than the diameter of each of the through holes 38B.

[0161] The flange tops 33 can each be a ridge having a U shape or an arc shape in plan view. For example, it is conceivable that a seventh flange top 33G located on the outer side of each of the through holes 38A be a ridge having a U shape in plan view. The seventh flange top 33G is provided along an outer side portion of the outer periphery of the through hole 38A. On the inner side of the through hole 38A, a plurality of (e.g., three) fifth flange tops 33E are provided along the opening edge 21. In this packaging container 1, the primary sealing area 31 is the outer peripheral edge of the flange 3.

[0162] As described above, since the flange tops 33 are provided both on the inner side and the outer side of the through hole 38A on the inner side of the primary sealing area 31, the flange top upper surfaces 330 are configured to support the lid member 5 both on the inner side and the outer side of the through hole 38A to keep the clearance C present between the through hole 38A and the lid member 5 and thereby prevent the through hole 38A from being closed.

[0163] In the aforementioned embodiment, the flange 3 has the groove 39 as the recess, but can have a recess 39 having a spot-like shape. For example, it is conceivable that the recess 39 be provided on each of the four corners of the flange 3. Each of the through holes 38B can be provided in the bottom of the recess 39.

[0164] Further, a part of the flange 3 including the through hole 38 can be removed after the secondary sealing step. For example, in the aforementioned configuration that the through hole 38 is provided on each of the four corners of the flange 3 (see Fig. 22A and Fig. 22B), it is conceivable that, as shown in Fig. 23A and Fig. 23B, the secondary sealing area 32 be provided between the flange tops 33E and the through hole 38, and the flange 3 be cut along a cutting line L extending between the through hole 38 and the secondary sealing area 32 after the secondary sealing step. In the configuration that the

through hole 38 is located between the primary sealing area 31 and the secondary sealing area 32, water droplets tend to accumulate around the through hole 38 of the flange 3, but the removal of a part of the flange 3 including the through hole 38 can prevent the water droplets from affecting the packaging container 1.

[0165] In Fig. 23, the cutting line L is provided to cut off each corresponding one of the four corners of the flange 3, but can extend between the through hole 38 and the secondary sealing area 32 and be provided to cut off continuously over the entire periphery in the peripheral direction of the opening edge 21. That is, the cutting line L can be provided to cut off the outer peripheral portion including the through holes 38 of the flange 3.

[0166] The penetrating areas 36 of the aforementioned embodiment each have a circular shape in plan view, but can each have, for example, an elongated shape such as an oval shape, in which case it is conceivable that the through holes 38 each have, for example, a slit shape. Each of the through holes 38 of the aforementioned embodiment is formed by forming the slit 380 through the corresponding one of the penetrating areas 36 provided with the groove 360 having a cross shape, or by punching off the penetrating area, but can be formed by other methods.

[0167] As shown in Fig. 24A and Fig. 24B, it is conceivable that each through hole 38 be formed by forming the slit 380 having a U shape in plan view in the flange 3. In this configuration, the flange 3 includes an eighth flange top 33H formed of a part of the flange 3 defined by the slit 380 as a boundary (e.g., penetrating area 36) by being deformed upward, the eighth flange top 33H having its upper surface located on the uppermost side of the upper surface 30 of the flange 3. The flow channel R is formed by the eighth flange top 33H between the lid member 5 and the flange 3, specifically, the slit 380 having a U shape is formed through the penetrating area 36 and an inner portion of the flange 3 defined by the U-shaped slit 380 is bent to be located at a higher position than other portions thereof along, as a boundary, a straight line 381 connecting the ends of the slit 380, so that the through hole 38 is formed and the eighth flange top 33H is formed. Further, the second flange tops 33B can be provided close to the through hole 38.

[0168] As shown in Fig. 25A and Fig. 25B, it is conceivable that each through hole 38 be formed by forming the slit 380 having a single line shape through the flange 3. In this configuration, the penetrating area 36 defined by a pair of straight lines 381 as boundaries extending from the respective ends of the slit 380 is lifted above those portions of the flange 3 other than the penetrating area 36, so that the through hole 38 is formed and the eighth flange top 33H is formed.

[0169] In the aforementioned configuration that the through hole 38 is formed by deforming the penetrating area 36 to be located above those portions of the flange 3 other than the penetrating area 36, the heated steam S easily keeps the penetrating area 36 lifted up and can

easily keep the through hole 38 open when the heated steam S flows into the receiving portion 2 from below the flange 3.

[0170] As shown in Fig. 26A and Fig. 26B, in the configuration that the penetrating area 36 is located above those portions of the flange 3 other than the penetrating area 36 to thereby form the through hole 38 and form the eighth flange top 33H, the third flange tops 33C can be provided close to the through hole 38.

[0171] Further, as shown in Fig. 27A and Fig. 27B, when the penetrating area 36 is deformed upward, it is preferable that a dent be formed along a boundary 382 between the flange 3 and the penetrating area 36 from above using a jig, and the penetrating area 36 be deformed upward with the dent as a deformation starting point. This configuration allows the boundary 382 of the flange 3 to be easily bent, and easily keeps the penetrating area 36 lifted up.

[0172] According to such a configuration, a portion of the flange 3 defined by the slit 380 as a boundary is deformed to thereby form the eighth flange top 33H, and the eighth flange top 33H forms the flow channel R to thereby allow the heated steam S to flow into the receiving portion 2 through the flow channel R.

[0173] Further, as shown in Fig. 28A and Fig. 28B, in the case of the configuration that the eighth flange top 33H is formed when the through hole 38 is formed, only the eighth flange top 33H can be provided on the flange 3 as the flange top 33. According to such a configuration, the flow channel R through which the heated steam S flows can be formed only by forming the slit 380 to form the through hole 38 through the flange 3 even when no flange tops 33 but the eighth flange top 33H is formed on the flange 3.

[0174] In the configuration that the penetrating area 36 serves as the eighth flange top 33H when the through hole 38 is formed, the through hole 38 can be formed by, for example, steps as follows. First, a position at which the slit 380 is to be formed is determined on the flange 3 as shown in Fig. 29A, and the slit 380 is formed using a shearing jig as shown in Fig. 29B. Further, a jig for forming a dent is driven into the boundary 382 of the penetrating area 36 as shown in Fig. 29C, and its shock causes the penetrating area 36 to be deformed upward to thereby enable the through hole 38 to be formed as shown in Fig. 29D.

[0175] As shown in Fig. 30A and Fig. 30B, the configuration can be such that the penetrating area 36 is a projection projecting upward, and an upper end of the projection serves as the eighth flange top 33H. Also, it is conceivable that the penetrating area 36 have, for example, a curved surface bulging upward. In this penetrating area 36, the upper end of the curved surface serves as the eighth flange top 33H. The penetrating area 36 of this embodiment has a bowl shape. The entire upper surface of this penetrating area 36 is a curved surface. The outer peripheral edge of the penetrating area 36 includes a portion having an arc shape, and a portion having a linear

shape. In the outer peripheral edge of the penetrating area 36 of this embodiment, the portion having an arc shape is disposed on the inner side of the portion having a linear shape. In this configuration, the slit 380 is formed in a portion of the outer peripheral edge of the penetrating area 36 (e.g., the portion having an arc shape) and the penetrating area 36 is deformed upward, so that the penetrating area 36 is formed to have a curved surface projecting upward, as shown in Fig. 30C.

[0176] In the case where the penetrating area 36 is a projection projecting upward, the projection can have the entire upper surface being an inclined surface that is not curved, or can have only a part of the upper surface being a curved surface. For example, as shown in Fig. 31A and Fig. 31B, the configuration can be such that the penetrating area 36 is a projection having an upper part of its upper surface having a curved surface that bulges upward, and that the upper end of the curved surface serves as the eighth flange top 33H. The lower part of the upper surface of the penetrating area 36 is an inclined surface. The outer peripheral edge of the penetrating area 36 has a quadrangular shape with rounded corners. In this configuration, the slit 380 is formed in a portion of the outer peripheral edge of the penetrating area 36 (e.g., a portion of the outer peripheral edge without a side located on the outer side, that is, three sides and a pair of corners of the outer peripheral edge having a quadrangular shape) and the penetrating area 36 is deformed upward, so that the penetrating area 36 is formed to have a curved surface bulging upward, as shown in Fig. 31C.

[0177] In the configuration that a part of the flange 3 to be deformed upward (e.g., the penetrating area 36) has a curved surface bulging upward as described above, the curved surface having a projecting shape that is formed by forming the slit 380 in the flange 3 and bent upward can stably support the lid member 5 without damage when the primary sealing area 31 and the lid member 5 are sealed to each other.

[0178] In the aforementioned embodiments, each of the packaging containers 1 in Fig. 24 to Fig. 31 has the penetrating area 36 defined by the slit 380 and located above the other portions of the flange 3, but can have the penetrating area 36 located therebelow to form the through hole 38. In this case, a portion of the flange 3 other than the penetrating area 36 can serve as the flange top 33.

[0179] In each of the packaging containers 1 of the aforementioned embodiments, the through holes 38 are disposed at corners of the flange 3, but can be disposed in an area other than the corners of the flange 3, as shown in Fig. 32A. The packaging container 1 of each of the aforementioned embodiments includes one receiving portion 2, but can include a plurality of receiving portions 2 as shown in Fig. 32B to Fig. 32C. In this case, it is conceivable that the through holes 38 be disposed between each adjacent receiving portions 2 (i.e., in an area between the receiving portions 2).

[0180] In the packaging container 1 of each of the

aforementioned embodiments, the penetrating areas 36 are provided in the flange 3, but the through holes 38 can be initially provided through the flange 3 in substitution for the respective penetrating areas 36. In this case, the method for producing the packaged food 6 does not include the through hole forming step, but includes the food containing step, the primary sealing step, the sterilizing step, and the secondary sealing step.

[0181] In the method for producing the packaged food of the aforementioned embodiments, the food containing step, the through hole forming step, the primary sealing step, the sterilizing step, and the secondary sealing step are carried out in this order, but the food containing step can be carried out after the through hole forming step. The packaging container 1 can be suitably used also as the packaging container 1 for the packaged food 6 formed by forming the through holes 38 through the respective penetrating areas 36 of the flange 3 and placing the food F in the receiving portion 2; thereafter sealing the lid member 5 and the primary sealing area 31 of the flange 3 to each other; further sterilizing the food F with the heated steam S flowing into the receiving portion 2 through the flow channel R; and then sealing the lid member 5 and the secondary sealing area 32 of the flange 3 to each other.

[0182] Each of the flanges 3 of the aforementioned embodiments is provided over the entire periphery in the peripheral direction of the opening edge 21, but can be provided intermittently (at intervals from each other) in this peripheral direction.

[0183] In each of the packaging containers 1 of the aforementioned embodiments, the receiving portion 2 and the flange 3 are formed of a single member, but can be formed of separate members. For example, it is conceivable that the container body 4 be formed such that the receiving portion 2 and the flange 3 are formed as separate members, and caused to adhere to each other using an adhesive to be thereby connected to each other.

[0184] In the present invention, various contents can be contained as objects to be sterilized. The contents are articles not desired to be in contact with bacteria, contaminants such as dust, and oxygen during storage or transport, for example, and food, cosmetics, pharmaceutical products, quasi-pharmaceutical products, medical equipment, sanitary products, physiochemical products, bio-related products, and the like are encompassed. Among these, food is preferable, and food whose appearance and quality can be maintained even when steam sterilization is performed at a high temperature and high pressure (e.g., food that is contained in the solid form) is particularly preferable.

[0185] As the sterilizing gas used in the present invention, heated steam is used in the aforementioned embodiments, but other gases having sterilizing action, such as ozone gas, ethylene oxide, formaldehyde, acetic acid, ethylene oxide, or chlorine dioxide can be used depending on the contents.

[0186] As described above, according to the present

invention, a packaging container that can be suitably used for sterilizing contents therein, and can maintain the quality of the sterilized contents for a long period of time can be provided.

[0187] A packaging container according to the present invention is a packaging container for sterilization treatment in which a content contained therein is sterilized by being exposed to a sterilizing gas, and thereafter the content is sealed therein for delivery, the packaging container including: a container body including: a receiving portion having an opening on an upper side and configured to have the content placed therein; and a flange extending outward from an opening edge of the receiving portion, in which the flange includes: a primary sealing area that is primarily sealed to a lid member for covering the opening in a primary sealing step; a secondary sealing area that is secondarily sealed to the lid member in a secondary sealing step after the primary sealing; a flange top having its upper surface located on an uppermost side of an upper surface of the flange; a flange lower part having its upper surface located below the upper surface of the flange top; and at least one penetrating area that is located on an inner side of the primary sealing area and through which a through hole penetrating through the flange is provided, and when the lid member and the primary sealing area are sealed to each other, a flow channel through which a gas can flow between an outside and an inside of the receiving portion is formed between the flange lower part and the lid member supported by the flange top, and when the lid member and the secondary sealing area are sealed to each other, the flow channel is configured to be closed.

[0188] The packaging container configured as above is suitable as a container used, for example, when the lid member and the primary sealing area of the flange are sealed to each other after a content is placed in the receiving portion and the through hole is formed through the penetrating area of the flange or after the through hole is formed through the penetrating area of the flange and a food is placed in the receiving portion, and further the lid member and the secondary sealing area of the flange are sealed to each other after the content is sterilized with the sterilizing gas flowing into the receiving portion through the flow channel.

[0189] In this packaging container, when the through hole is disposed on the inner side of the primary sealing area of the flange, the through hole serves as a part of the flow channel. Further, when the primary sealing area and the lid member are sealed to each other, a clearance is formed between the flange lower part of the flange and the lid member, and the clearance serves as a part of the flow channel. Thus, the content in the receiving portion can be sterilized with the sterilizing gas flowing from below the flange into the receiving portion through the flow channel formed by the through hole and the clearance when the content is sterilized.

[0190] In particular, since this packaging container has the upper surface of the flange top located above the

upper surface of the flange lower part, the flange top configured to support the lid member reliably maintains the unclosed state of the clearance forming the flow channel to allow the sterilizing gas to flow into the receiving portion when the content is sterilized.

[0191] Further, since this packaging container has the lid member located above the flow channel, that is, has the flow channel not exposed on the lid member, falling bacteria hardly enter the packaging container through the flow channel even after sterilization with the sterilizing gas. Since the flow channel is configured to be closed by sealing the secondary sealing area and the lid member to each other, the packaging container can completely seal the food therein through the sealing between the lid member and the container body.

[0192] In the packaging container, the configuration can be such that the through hole is formed by a slit formed through a part of the penetrating area.

[0193] According to such a configuration, no part of the flange breaks with no fragment of the flange formed when the through hole is formed through the penetrating area. This configuration can prevent entry of fragments into the receiving portion.

[0194] The configuration can be such that the penetrating area has a curved surface bulging upward, and the curved surface has an upper end serving as the flange top.

[0195] According to such a configuration, the curved surface can support the lid member without damaging the lid member when the primary sealing area and the lid member are sealed to each other.

[0196] In the packaging container, the configuration can be such that the penetrating area is a recess that is recessed downward, and the slit is formed in the recess.

[0197] According to such a configuration, the penetrating area recessed downward is perforated from above when the through hole is formed, so that the perforated portion of the penetrating area easily keeps being directed below other areas of the flange, and can thereby prevent the through hole from being closed.

[0198] In the packaging container, the configuration can be such that the flange is provided over the entire periphery of the opening edge of the receiving portion, and the penetrating area includes a plurality of penetrating areas disposed at positions opposed to each other with the receiving portion therebetween.

[0199] According to such a configuration, since the penetrating areas are disposed at opposed positions with the receiving portion therebetween, the through holes disposed at these positions can cause a gas to flow there-through from both sides of the receiving portion to thereby suppress uneven heating of the food.

[0200] A packaging container of the present invention is a packaging container in which a content contained therein is sterilized by being exposed to a sterilizing gas, and thereafter the content is sealed therein for delivery, the packaging container including: a container body including: a receiving portion having an opening on an up-

per side and configured to have the content placed therein; and a flange extending outward from an opening edge of the receiving portion, in which the flange includes: a primary sealing area that is primarily sealed to a lid member covering the opening in a primary sealing step; and a secondary sealing area that is sealed to the lid member in a secondary sealing step after the primary sealing, and when the lid member and the secondary sealing area are sealed to each other, a flow channel through which a gas can flow between an outside and an inside of the receiving portion is formed between the flange and the lid member, and the flow channel is configured to be closed.

[0201] The packaging container configured as above can be suitably used as a container in which a content is placed in the receiving portion, the lid member and the primary sealing area of the flange are sealed to each other, further the content is sterilized with the sterilizing gas flowing into the receiving portion through the flow channel, and thereafter the lid member and the secondary sealing area of the flange are sealed to each other.

[0202] In this packaging container, once the primary sealing area and the lid member are sealed to each other, the content in the receiving portion can be sterilized by the sterilizing gas flowing from below the flange into the receiving portion through the flow channel when the content is sterilized.

[0203] Further, since this packaging container has the lid member located above the flow channel, that is, has the flow channel not exposed on the lid member, falling bacteria hardly enter the packaging container through the flow channel even after sterilization with the sterilizing gas. Since the flow channel is configured to be closed by sealing the secondary sealing area and the lid member to each other, the packaging container can completely seal the food therein through the sealing between the lid member and the container body.

[0204] The configuration can be such that the flange of the packaging container has at least one through hole located on an inner side of the primary sealing area and penetrating through the flange, and the through hole serves as a part of the flow channel.

[0205] According to such a configuration, the food within the receiving portion can be sterilized with the sterilizing gas flowing from below the flange into the receiving portion through the through hole serving as a part of the flow channel in the state after the primary sealing step.

[0206] In the packaging container, the configuration can be such that the through hole is formed by a slit formed through a part of the flange.

[0207] According to such a configuration, no part of the flange breaks with no fragment of the flange formed when the through hole is formed. This configuration can prevent entry of fragments of the flange into the receiving portion.

[0208] In the packaging container, the configuration can be such that the flange includes a flange top formed of a part of the flange defined by the slit as a boundary and deformed upward, and the flow channel is formed

between the flange and the lid member supported by the flange top.

[0209] According to such a configuration, the through hole and the flange top can be formed at the same time by forming the slit in the flange.

[0210] In the packaging container, the configuration can be such that a part of the flange deformed upward has a curved surface bulging upward.

[0211] According to such a configuration, the curved surface can support the lid member without damaging the lid member when the primary sealing area and the lid member are sealed to each other.

[0212] In the packaging container, the configuration can be such that the flange includes a flange top having its upper surface located on an uppermost side of an upper surface of the flange, and the flow channel is formed between the flange and the lid member supported by the flange top.

[0213] According to such a configuration, the lid member is supported by the flange top after the primary sealing step and before the secondary sealing step, that is, when the content is sterilized; thus, the sterilizing gas can more reliably flow into the receiving portion through the formed flow channel.

[0214] In the packaging container, the configuration can be such that the flange is provided over the entire periphery of the opening edge of the receiving portion, and the through hole includes a plurality of through holes disposed at positions opposed to each other with the receiving portion therebetween.

[0215] According to such a configuration, the through holes disposed at the positions with the receiving portion therebetween can cause a gas to flow therethrough from both sides of the receiving portion to thereby suppress uneven heating of the food.

[0216] In the packaging container, the configuration can be such that the primary sealing area has its upper surface located on an uppermost side of an upper surface of the flange, the secondary sealing area has its upper surface located below the upper surface of the primary sealing area, the flange is configured to form a clearance between the upper surface of the secondary sealing area and a lower surface of the lid member when the lid member and the primary sealing area are sealed to each other, and the clearance serves as a part of the flow channel.

[0217] According to such a configuration, the upper surface of the primary sealing area is located above the upper surface of the secondary sealing area after the primary sealing step and before the secondary sealing step, that is, when the content is sterilized; thus, the primary sealing area retains the clearance serving as a part of the flow channel and thereby reliably maintains the unclosed state of the clearance to allow a gas to flow into the receiving portion through the through hole.

[0218] In the packaging container, the configuration can be such that the receiving portion includes a bottom plate on which the content is placed, and the bottom plate has its upper surface having an uneven shape.

[0219] According to such a configuration, a gap is formed below the content placed on the receiving portion; thus, the sterilizing gas flowing into the receiving portion flows not only above the content but also below the content. This configuration allows the sterilizing gas to sterilize the content both from thereabove and from therebelow.

[0220] The configuration can be such that a packaging container of the present invention further includes the lid member, and the container body and the lid member are formed of a multilayer structure including at least one gas barrier layer.

[0221] According to such a configuration in which the container body and the lid member include the gas barrier layer, the sterilized state within the packaging container can be maintained for a longer period of time.

[0222] As described above, according to the present invention, a packaging container that can be suitably used for sterilizing contents therein, and can maintain the quality of the sterilized contents for a long period of time can be provided.

REFERENCE SIGNS LIST

[0223]

- 1: Packaging container
- 2: Receiving portion
- 3: Flange
- 4: Container body
- 5: Lid member
- 6: Packaged food
- 20: Opening
- 21: Opening edge
- 22: Bottom plate
- 23: Side wall
- 30: Flange upper surface
- 31: Primary sealing area
- 32: Secondary sealing area
- 33: Flange top
- 33A: First flange top
- 33B: Second flange top
- 33C: Third flange top
- 33D: Fourth flange top
- 33E: Fifth flange top
- 33F: Sixth flange top
- 33G: Seventh flange top
- 33H: Eighth flange top
- 34: Flange lower part
- 35: Flange lower surface
- 36: Penetrating area
- 38, 38A, 38B: Through hole
- 39: Groove (recess)
- 220: Bottom plate upper surface
- 221: Bottom plate lower surface
- 222: Bottom plate protrusion
- 223: Bottom plate inclined surface
- 230: First flange upper surface

- 330: Flange top upper surface
- 340: Flange lower part upper surface
- 360: Groove
- 361: Upper surface
- 362: Lower surface
- 363: Outer peripheral edge
- 380: Slit
- 381: Straight line
- 382: Boundary
- C: Clearance
- F: Food
- L: Cutting line
- R: Flow channel
- S: Heated steam

Claims

1. A packaging container for sterilization treatment in which a content contained therein is sterilized by being exposed to a sterilizing gas, and thereafter the content is sealed therein for delivery, the packaging container comprising:

a container body comprising: a receiving portion having an opening on an upper side and configured to have the content placed therein; and a flange extending outward from an opening edge of the receiving portion, wherein the flange comprises:

a primary sealing area that is primarily sealed to a lid member for covering the opening in a primary sealing step;

a secondary sealing area that is secondarily sealed to the lid member in a secondary sealing step after the primary sealing step to thereby completely seal the content in the container body;

a flange top having its upper surface located on an uppermost side of an upper surface of the flange;

a flange lower part having its upper surface located below the upper surface of the flange top; and

at least one penetrating area that is located on an inner side of the primary sealing area and through which a through hole penetrating through the flange is provided, and when the lid member and the primary sealing area are sealed to each other, a flow channel through which a gas can flow between an outside and an inside of the receiving portion is formed between the flange lower part and the lid member supported by the flange top, and when the lid member and the secondary sealing area are sealed to each other, the flow channel is configured

- to be closed.
2. The packaging container according to claim 1, wherein the through hole is formed by a slit formed through a part of the penetrating area. 5
 3. The packaging container according to claim 2, wherein

the penetrating area has a curved surface bulging upward, and
the curved surface has an upper end serving as the flange top.
 4. The packaging container according to claim 2, wherein the penetrating area is a recess that is recessed downward, and the slit is formed in the recess. 10
 5. The packaging container according to any one of claims 1 to 4, wherein

the flange is provided over the entire periphery of the opening edge of the receiving portion, and the penetrating area comprises a plurality of penetrating areas disposed at positions opposed to each other with the receiving portion therebetween.
 6. A packaging container in which a content contained therein is sterilized by being exposed to a sterilizing gas, and thereafter the content is sealed therein for delivery, the packaging container comprising:

a container body comprising: a receiving portion having an opening on an upper side and configured to have the content placed therein; and a flange extending outward from an opening edge of the receiving portion, wherein the flange comprises:

a primary sealing area that is primarily sealed to a lid member for covering the opening in a primary sealing step; and
a secondary sealing area that is secondarily sealed to the lid member in a secondary sealing step after the primary sealing step, and
when the lid member and the primary sealing area are sealed to each other, a flow channel through which a gas can flow between an outside and an inside of the receiving portion is formed between the flange and the lid member, and when the lid member and the secondary sealing area are sealed to each other, the flow channel is configured to be closed.
 7. The packaging container according to claim 6, wherein

the flange has at least one through hole located on an inner side of the primary sealing area and penetrating through the flange, and the through hole serves as a part of the flow channel.
 8. The packaging container according to claim 7, wherein the through hole is formed by a slit formed through a part of the flange.
 9. The packaging container according to claim 8, wherein

the flange comprises a flange top formed of a part of the flange defined by the slit as a boundary and deformed upward, and
the flow channel is formed between the flange and the lid member supported by the flange top.
 10. The packaging container according to claim 9, wherein a part of the flange deformed upward has a curved surface bulging upward.
 11. The packaging container according to any one of claims 6 to 8, wherein

the flange comprises a flange top having its upper surface located on an uppermost side of an upper surface of the flange, and
the flow channel is formed between the flange and the lid member supported by the flange top.
 12. The packaging container according to any one of claims 7 to 11, wherein

the flange is provided over the entire periphery of the opening edge of the receiving portion, and the through hole comprises a plurality of through holes disposed at positions opposed to each other with the receiving portion therebetween.
 13. The packaging container according to claim 7, wherein

the primary sealing area has its upper surface located on an uppermost side of an upper surface of the flange,
the secondary sealing area has its upper surface located below the upper surface of the primary sealing area,
the flange is configured to form a clearance between the upper surface of the secondary sealing area and a lower surface of the lid member when the lid member and the primary sealing area are sealed to each other, and

the clearance serves as a part of the flow channel.

14. The packaging container according to any one of claims 1 to 13, wherein 5

the receiving portion comprises a bottom plate on which the content is placed, and the bottom plate has its upper surface having an uneven shape. 10

15. A packaging container, wherein

the packaging container according to any one of claims 1 to 14 further comprises the lid member, and 15
the container body and the lid member are formed of a multilayer structure comprising at least one gas barrier layer. 20

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Fig.1A

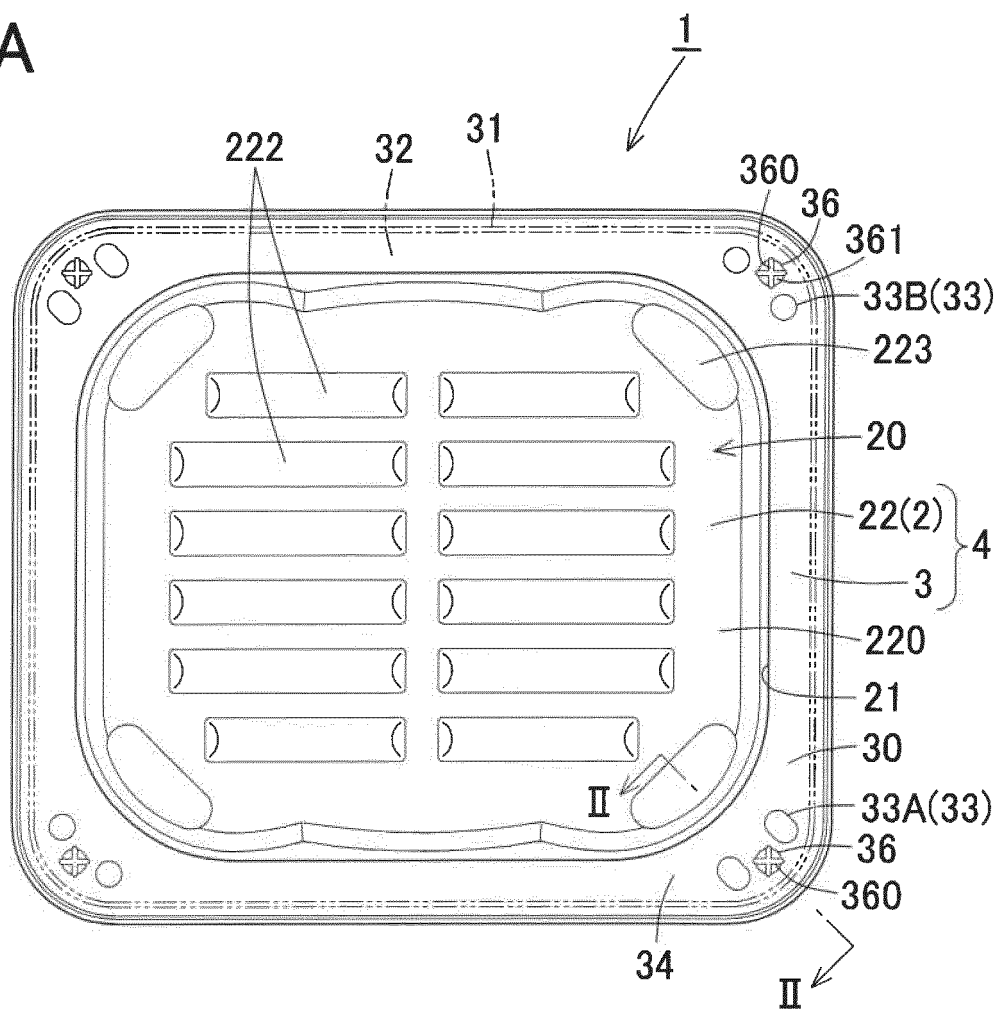


Fig.1 B

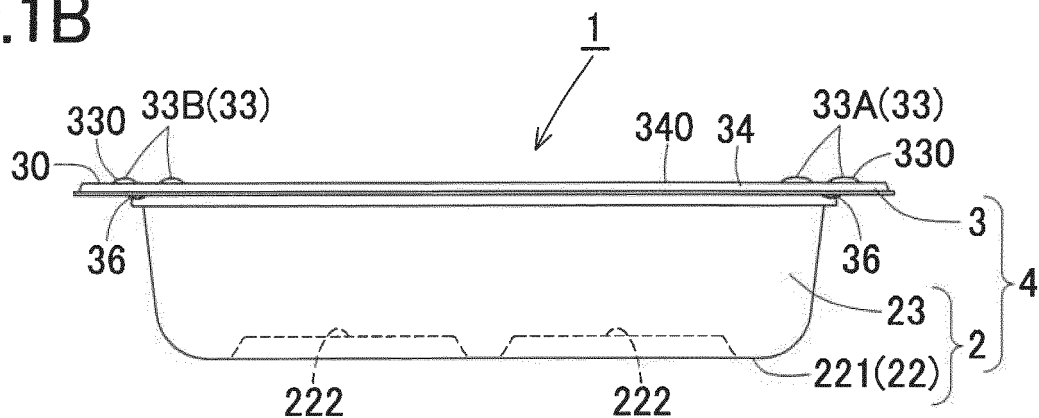


Fig.2

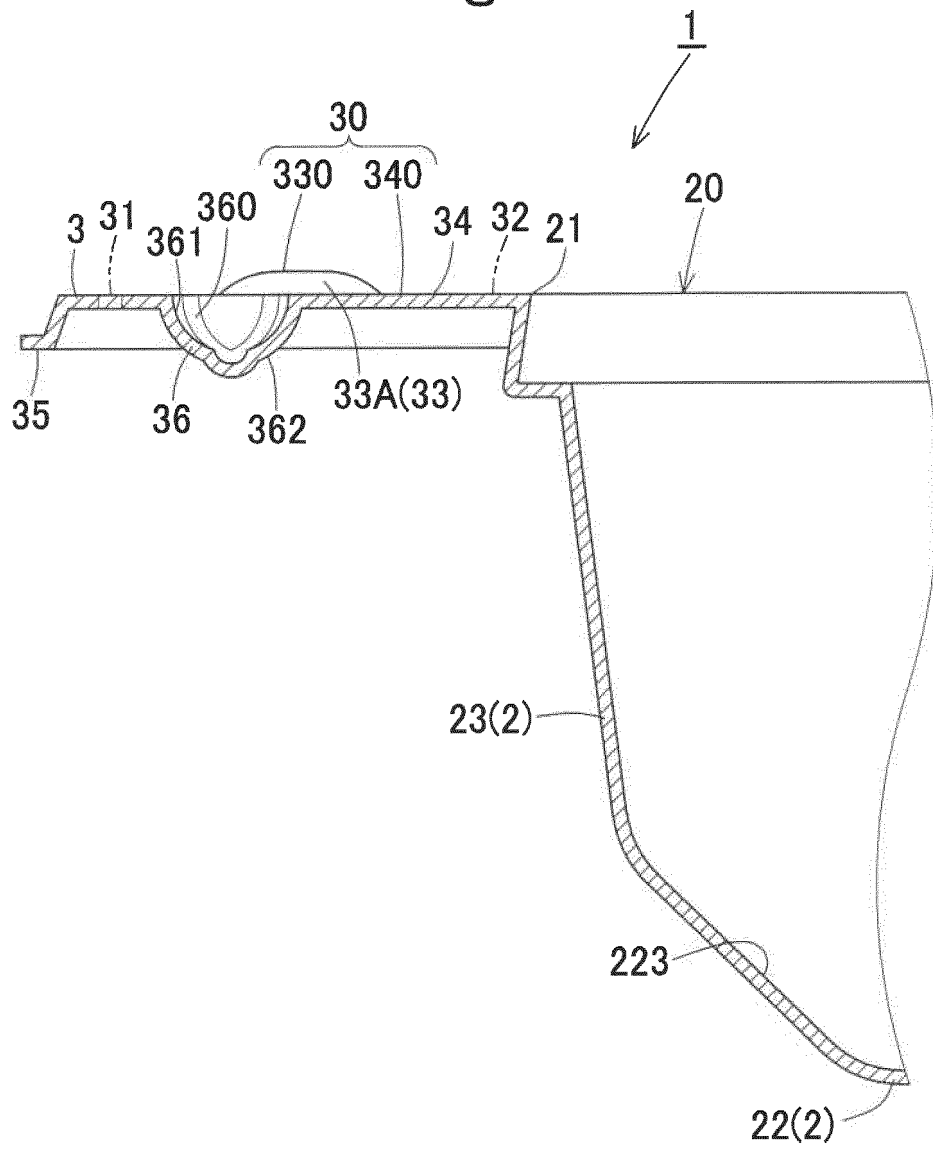


Fig.3

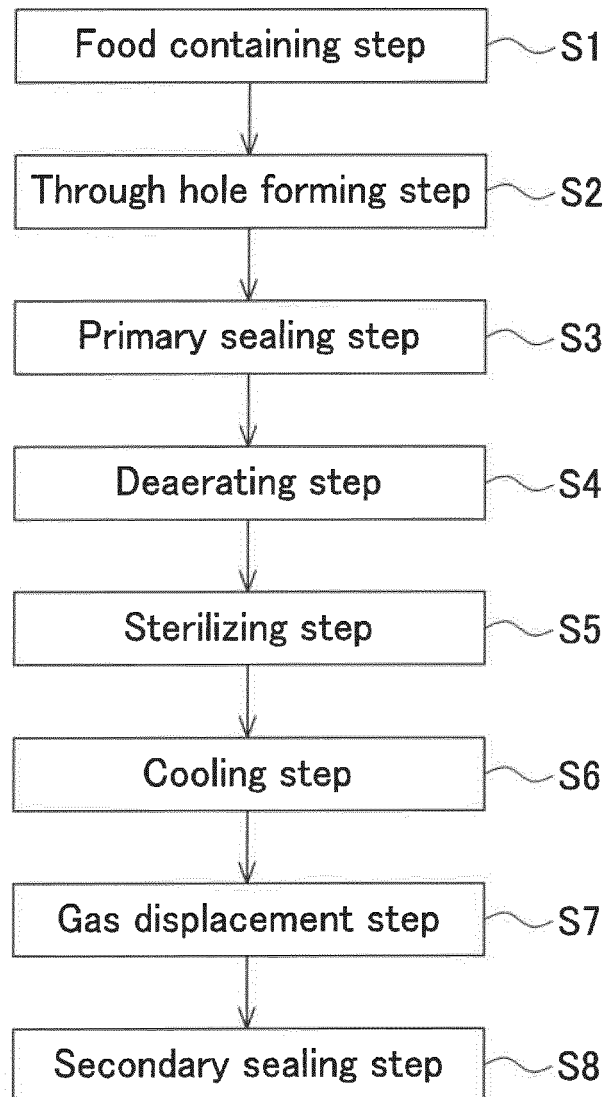


Fig.4A

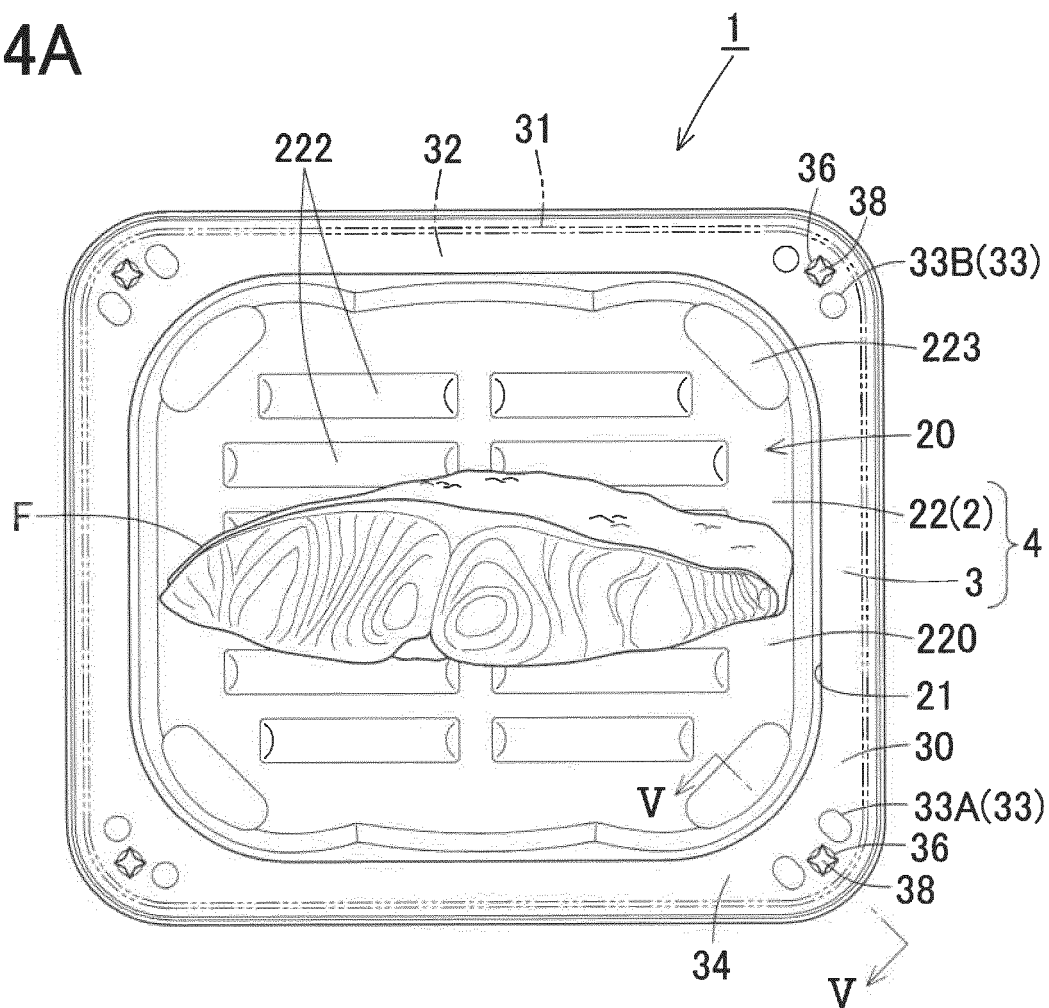


Fig.4B

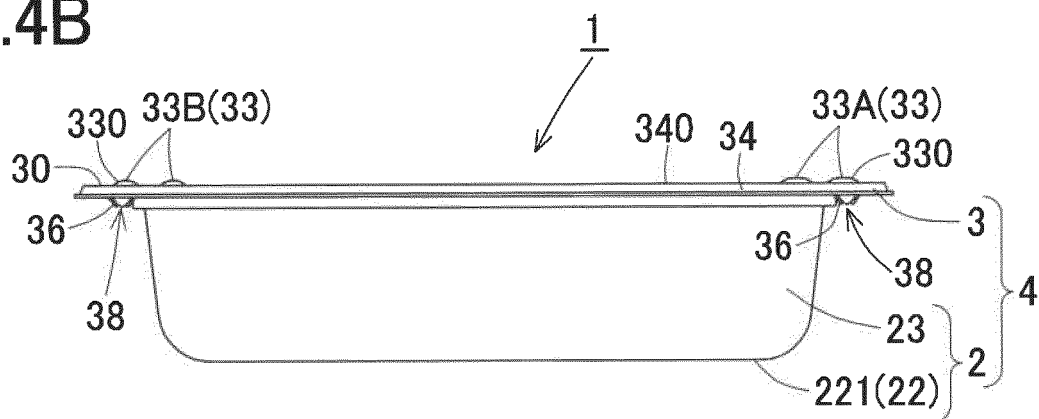


Fig.5

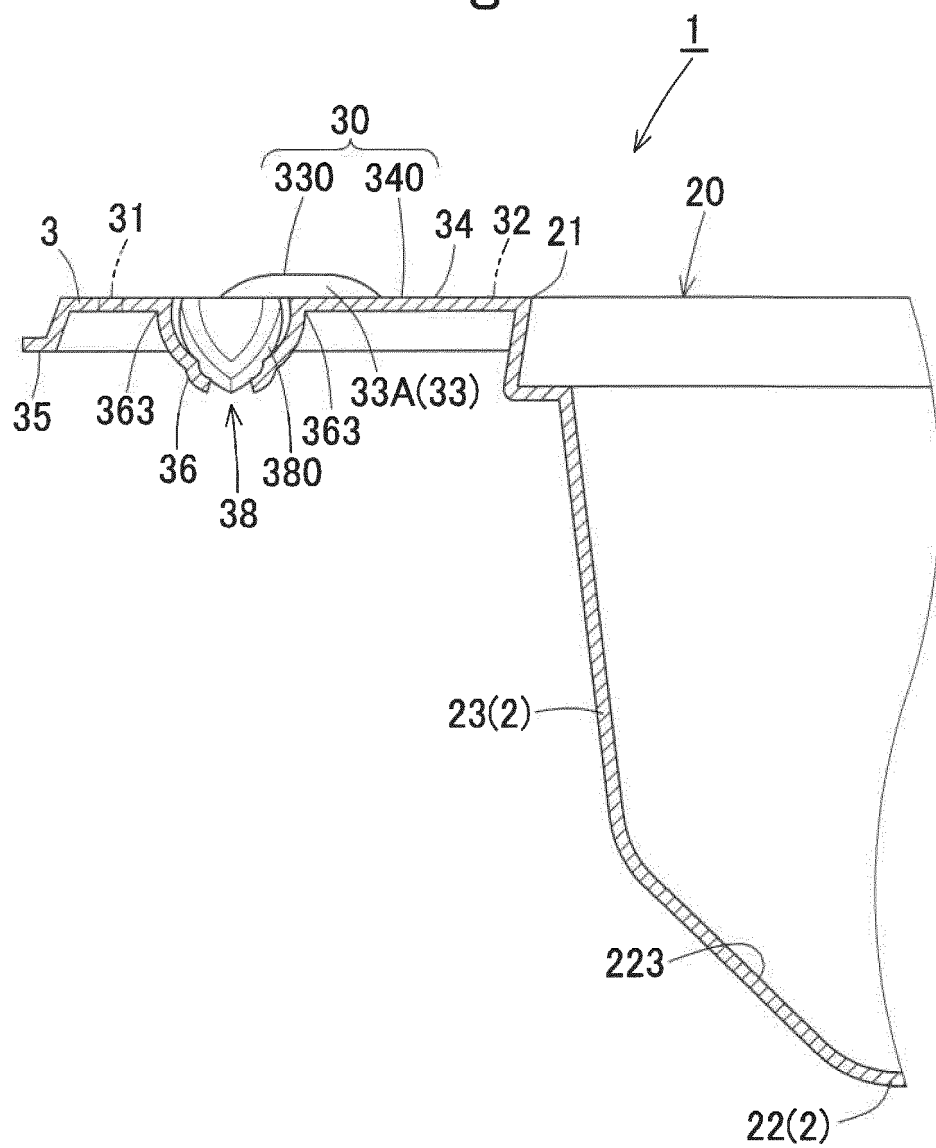


Fig.7

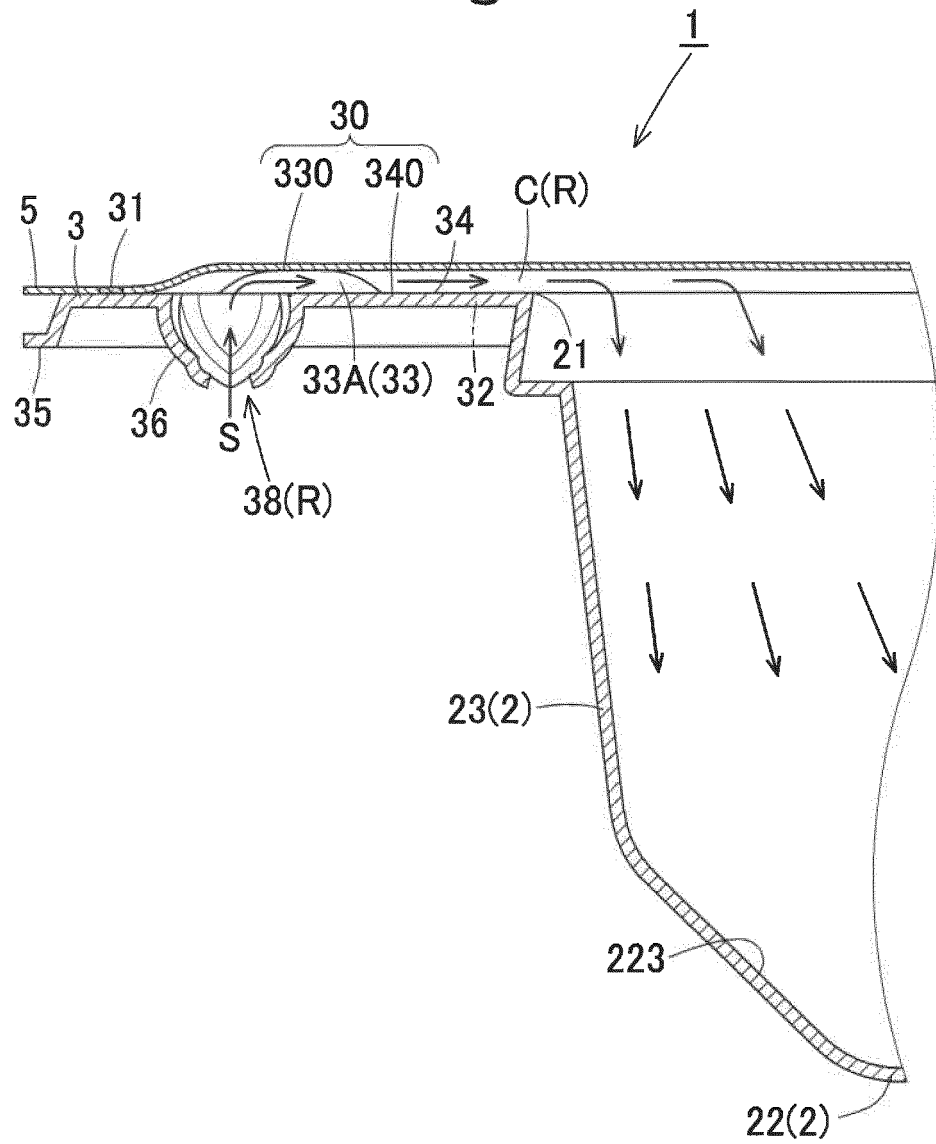


Fig.9

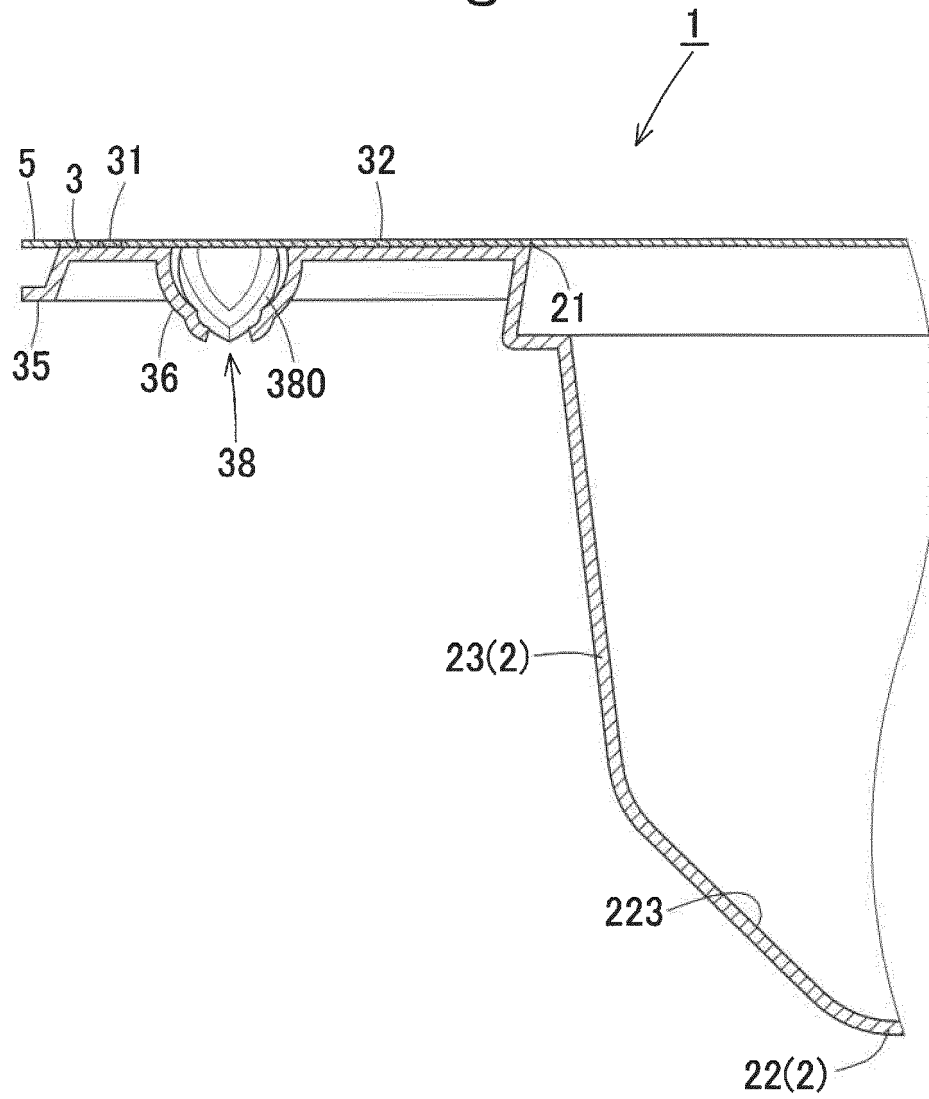


Fig. 10A

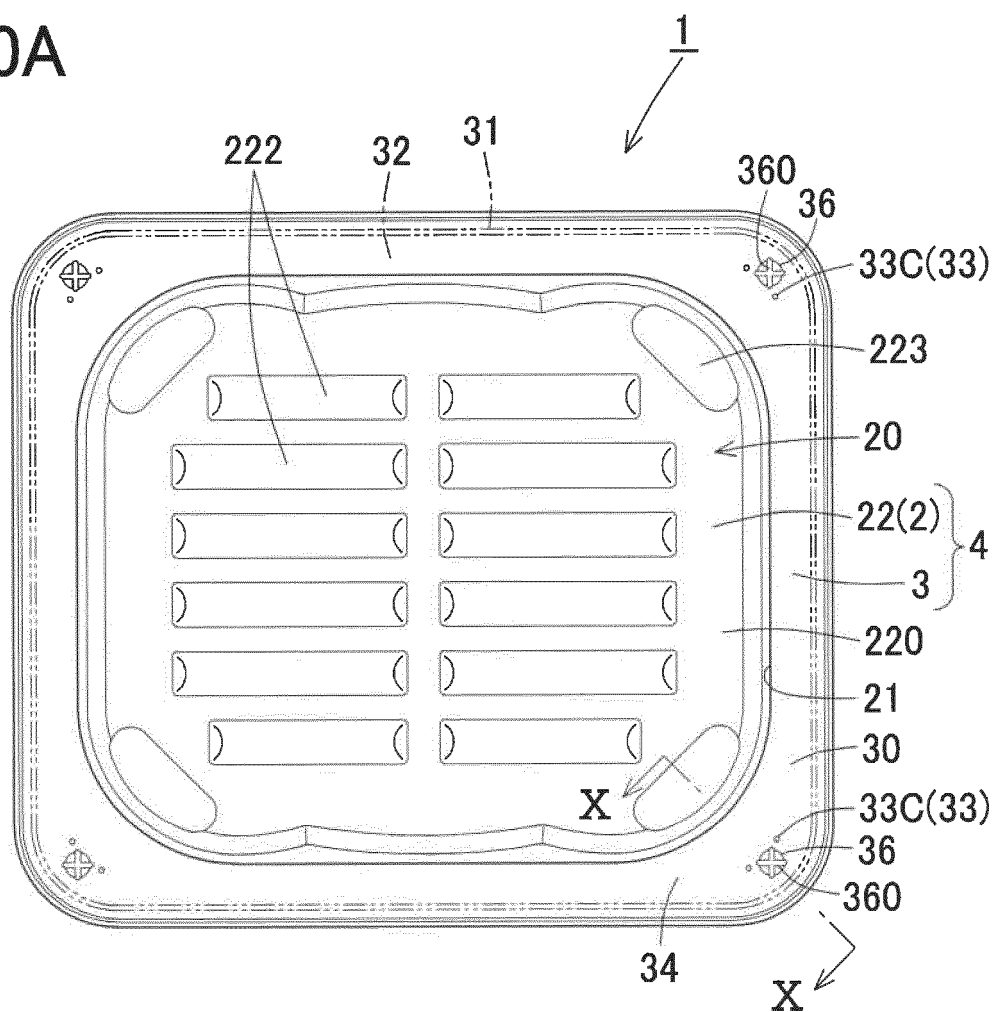


Fig.10B

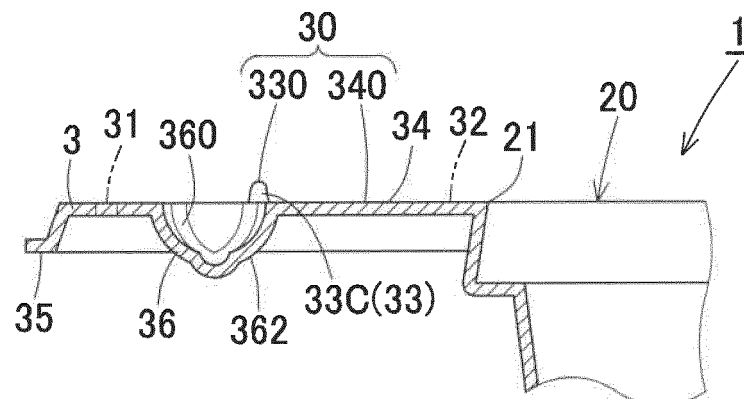


Fig.11A

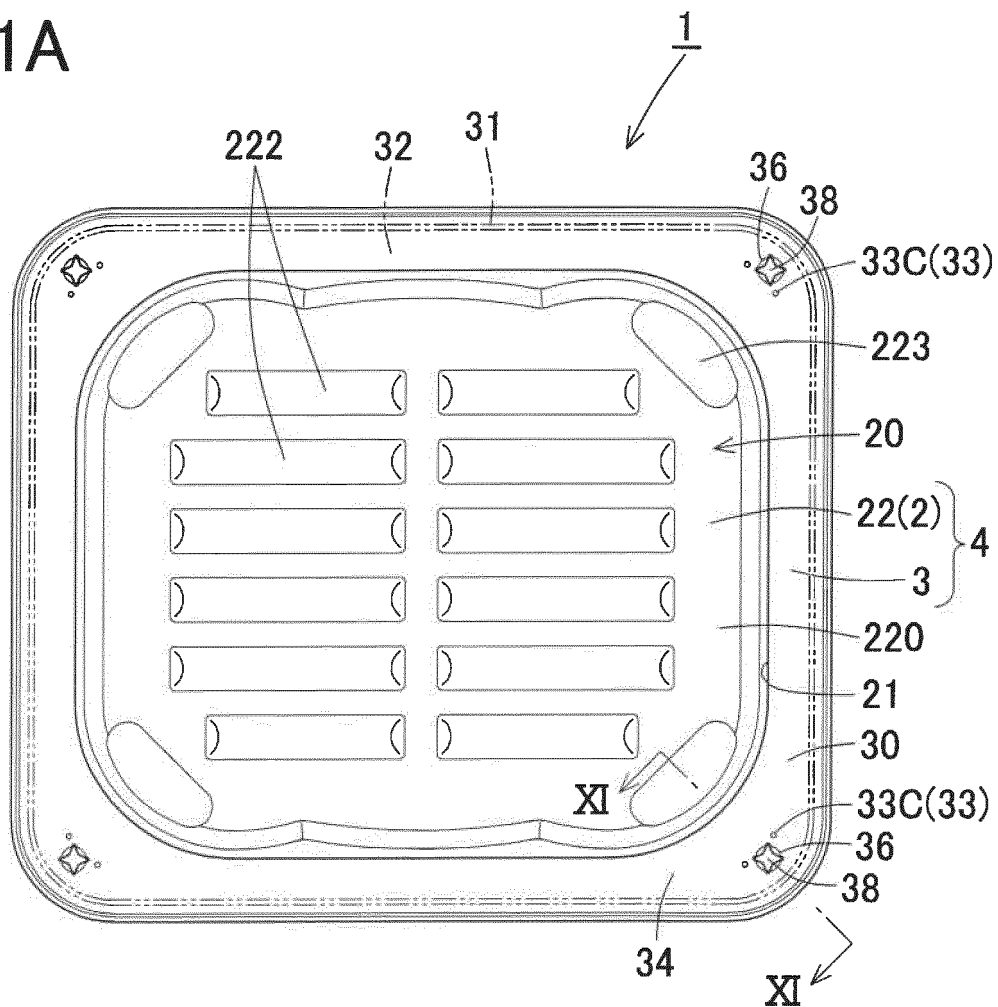


Fig.11B

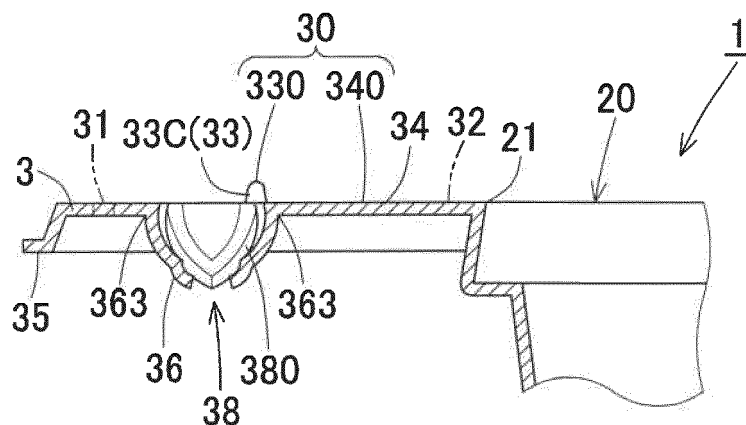


Fig.12A

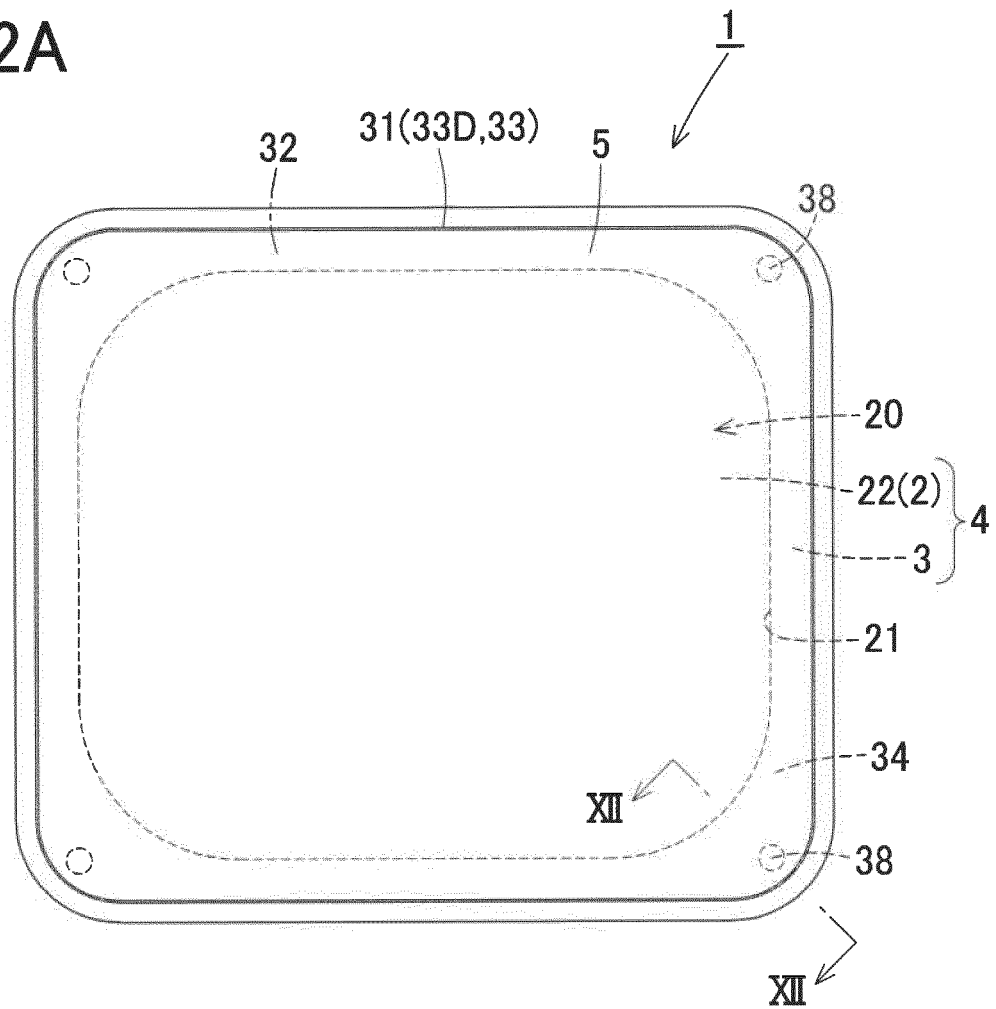


Fig.12B

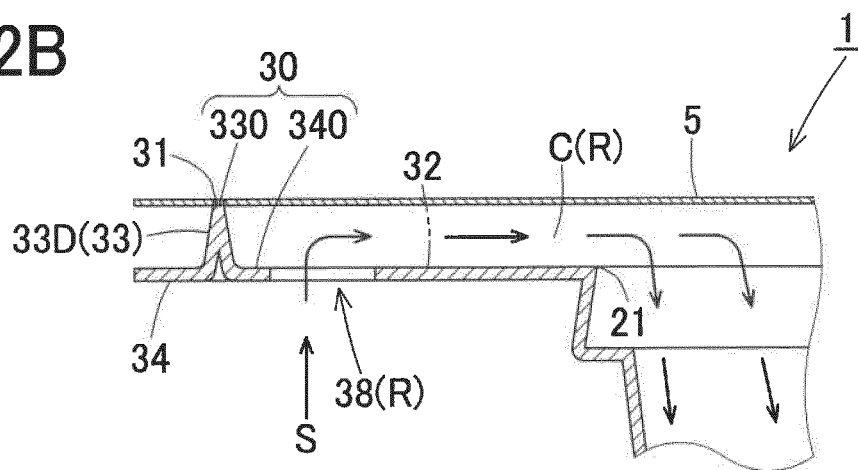


Fig.13A

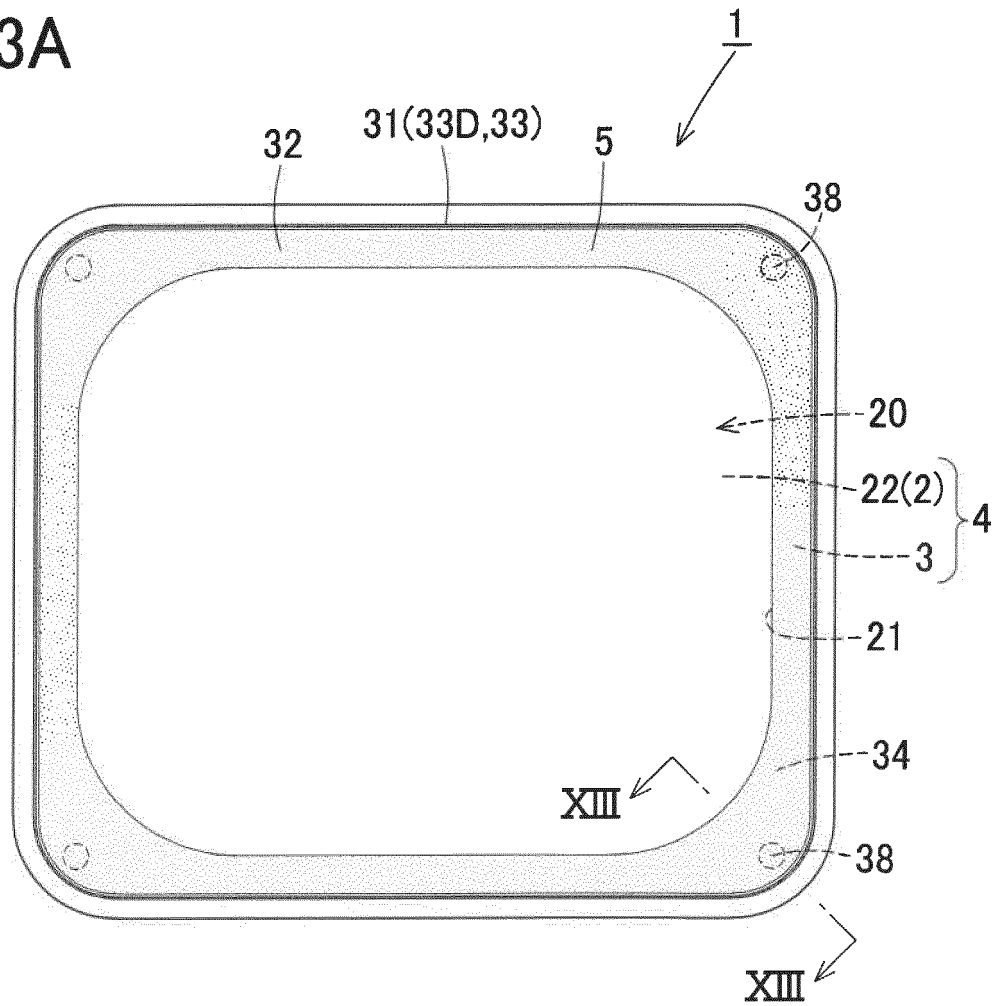


Fig.13B

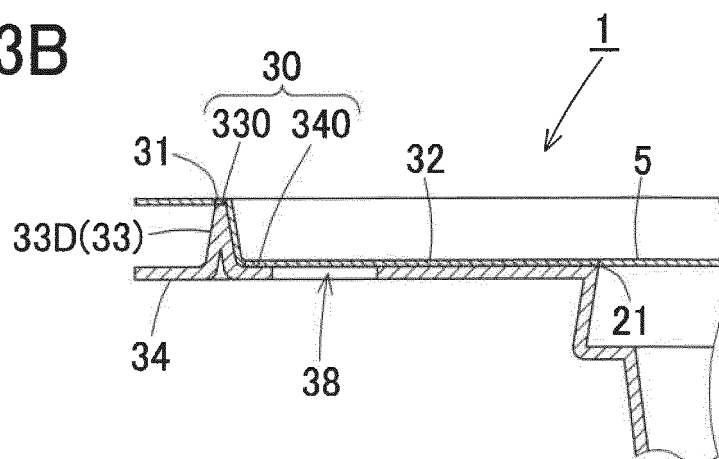


Fig.14A

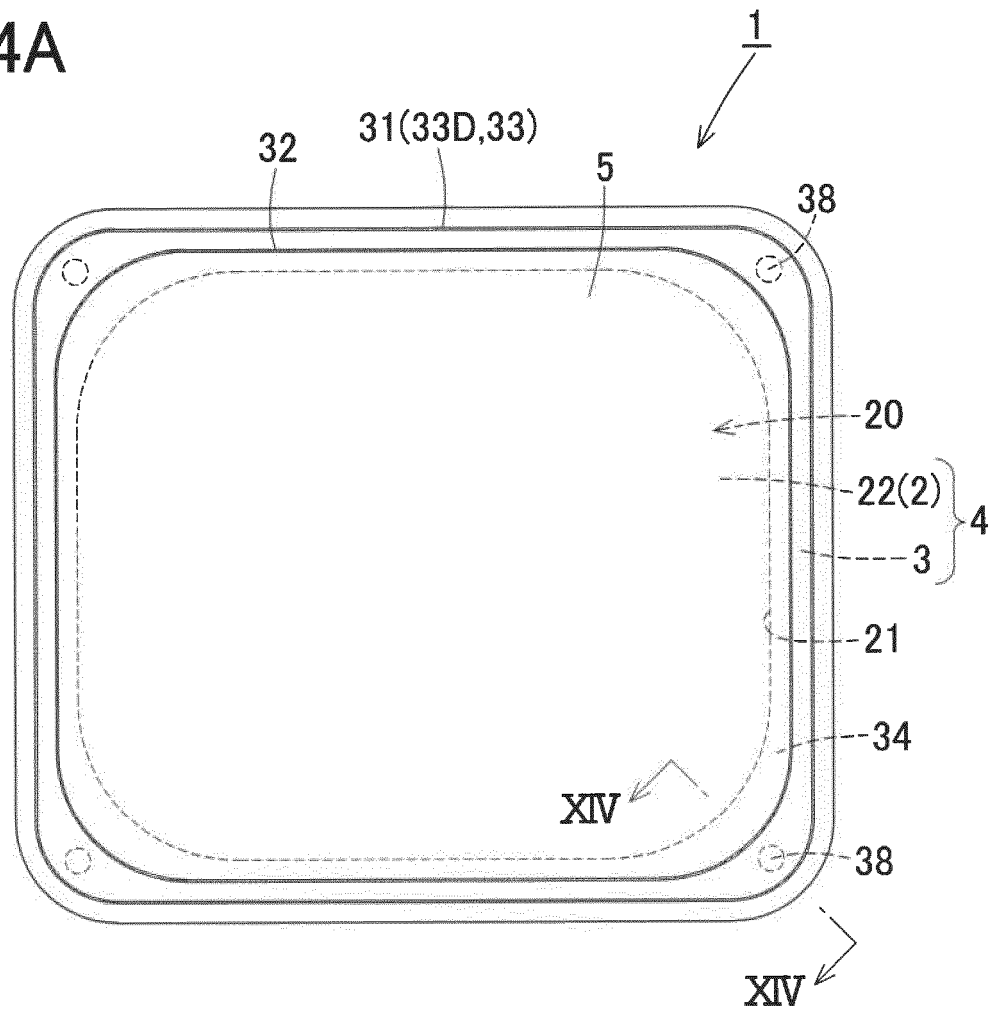


Fig.14B

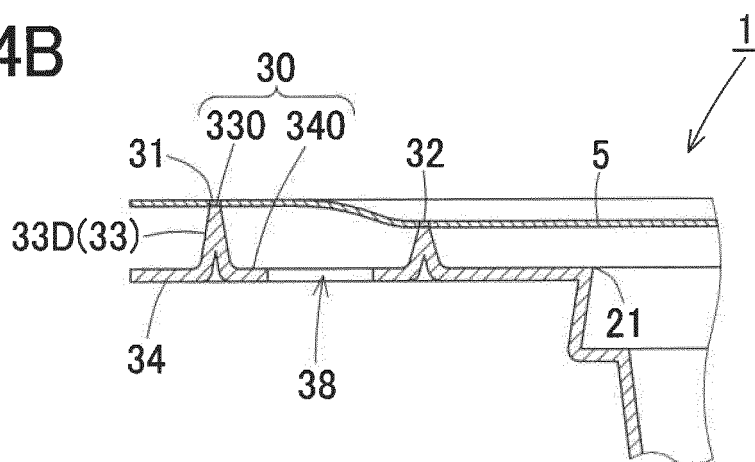


Fig.15A

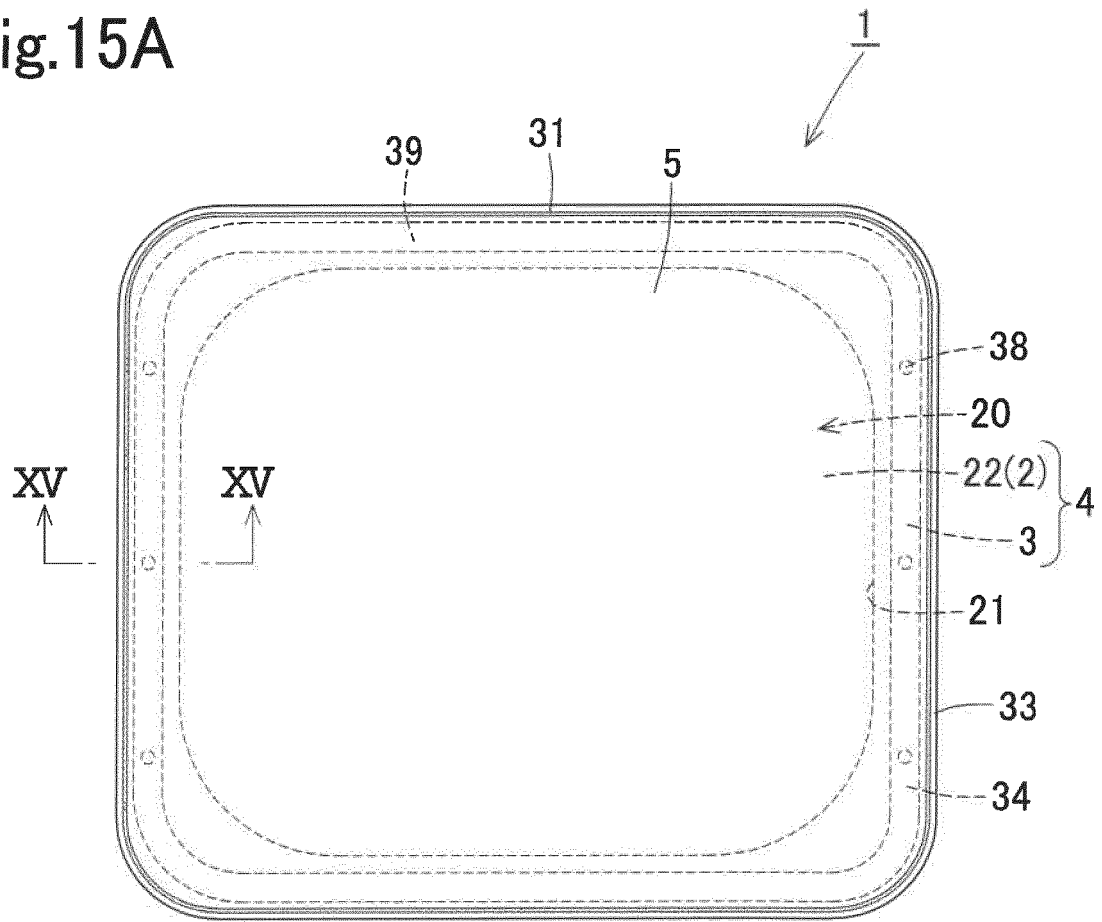


Fig.15B

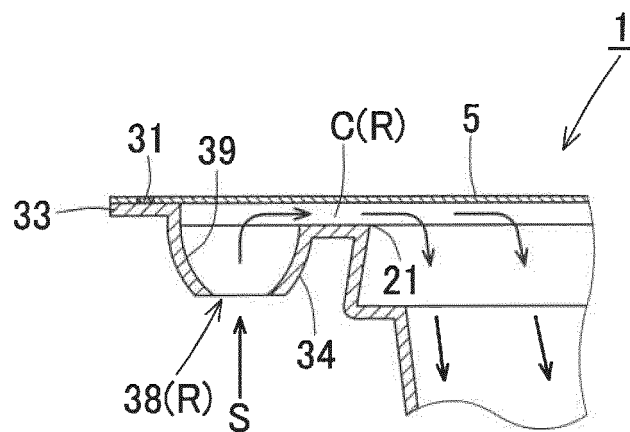


Fig.16A

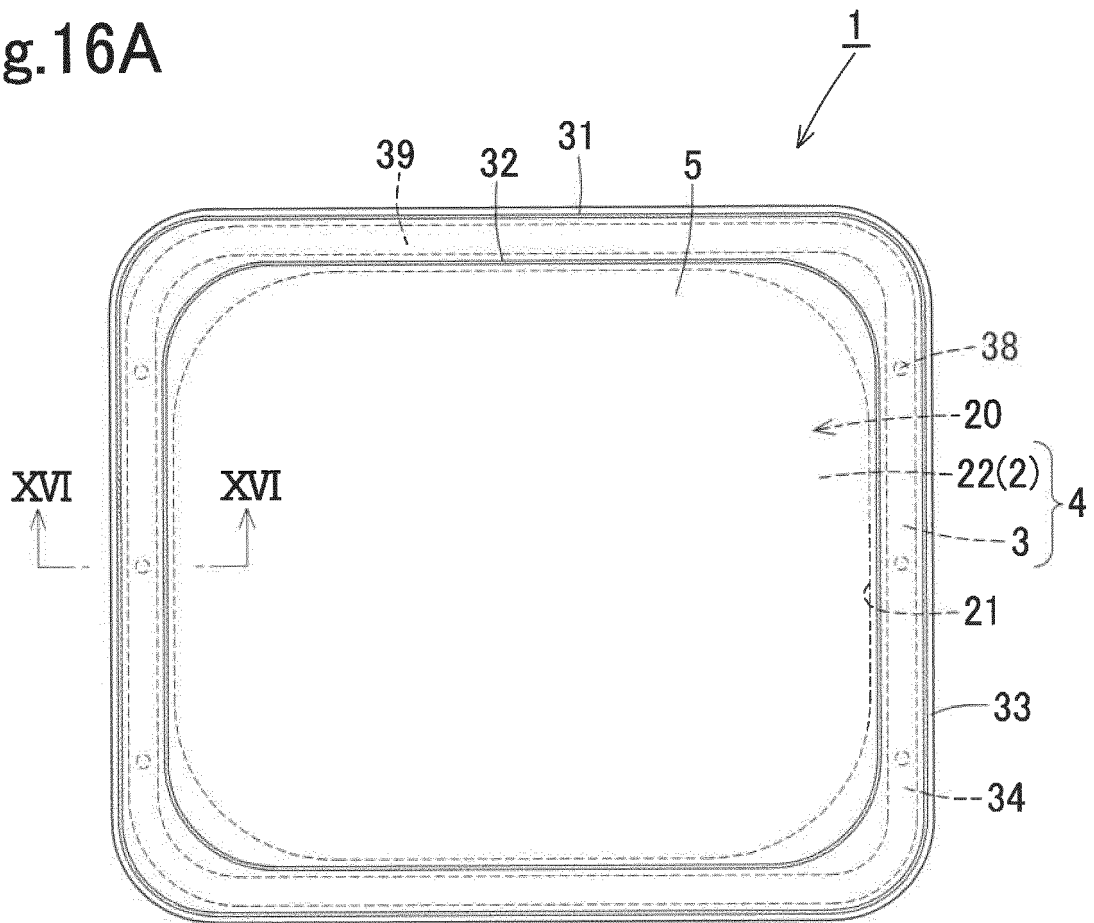


Fig.16B

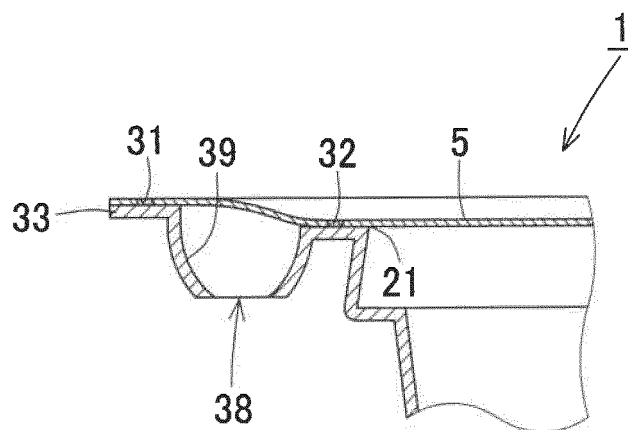


Fig.17A

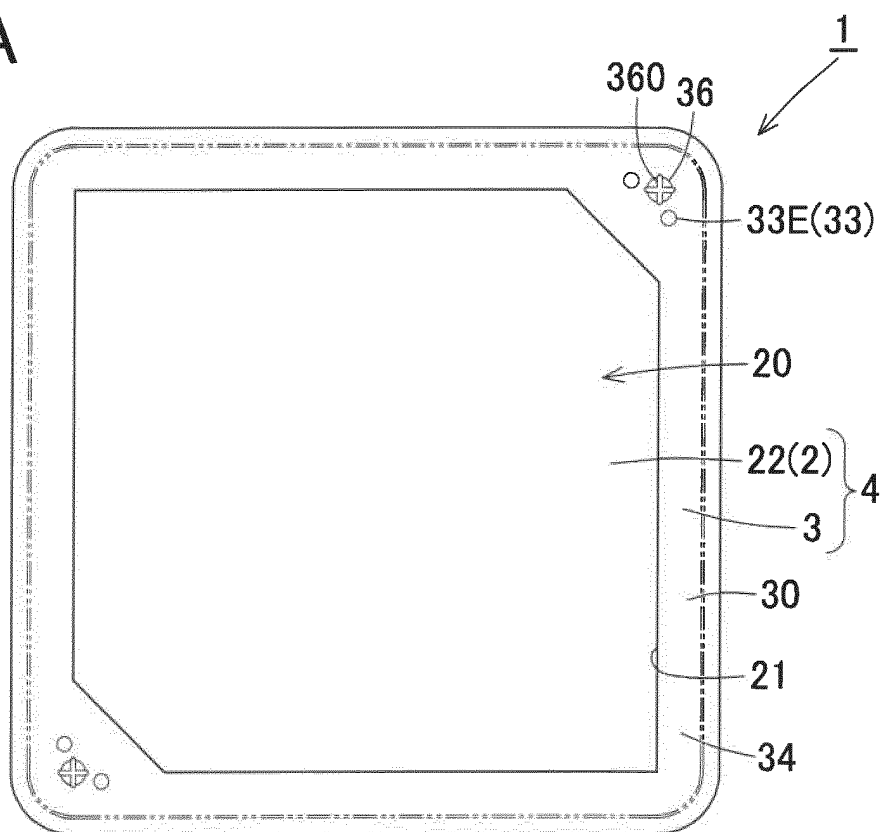


Fig.17B

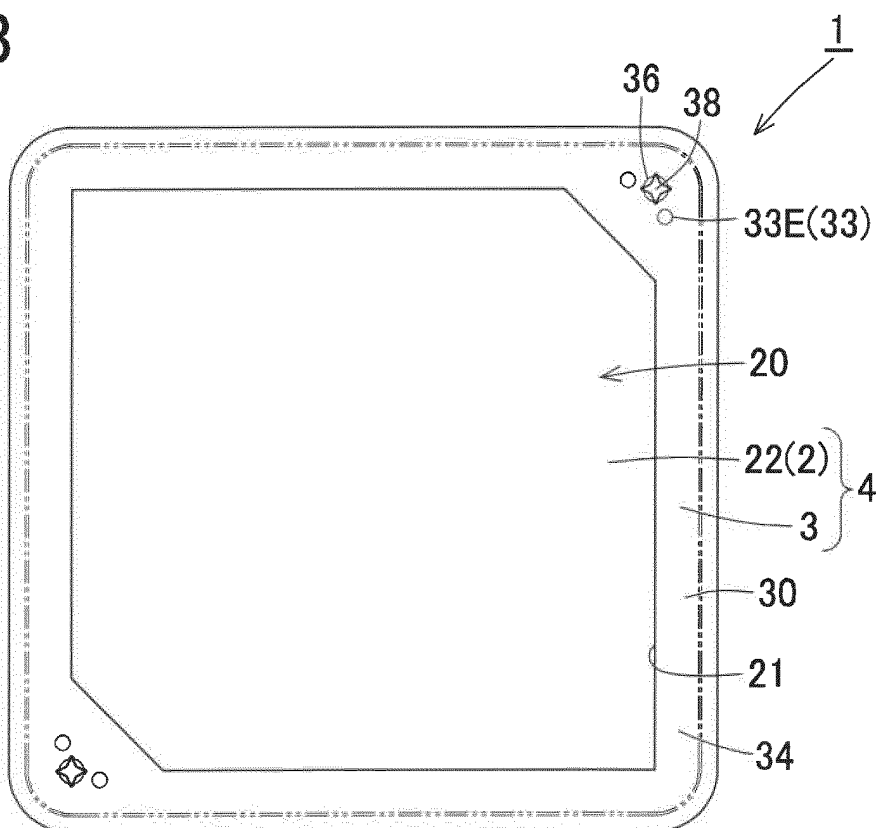


Fig.18A

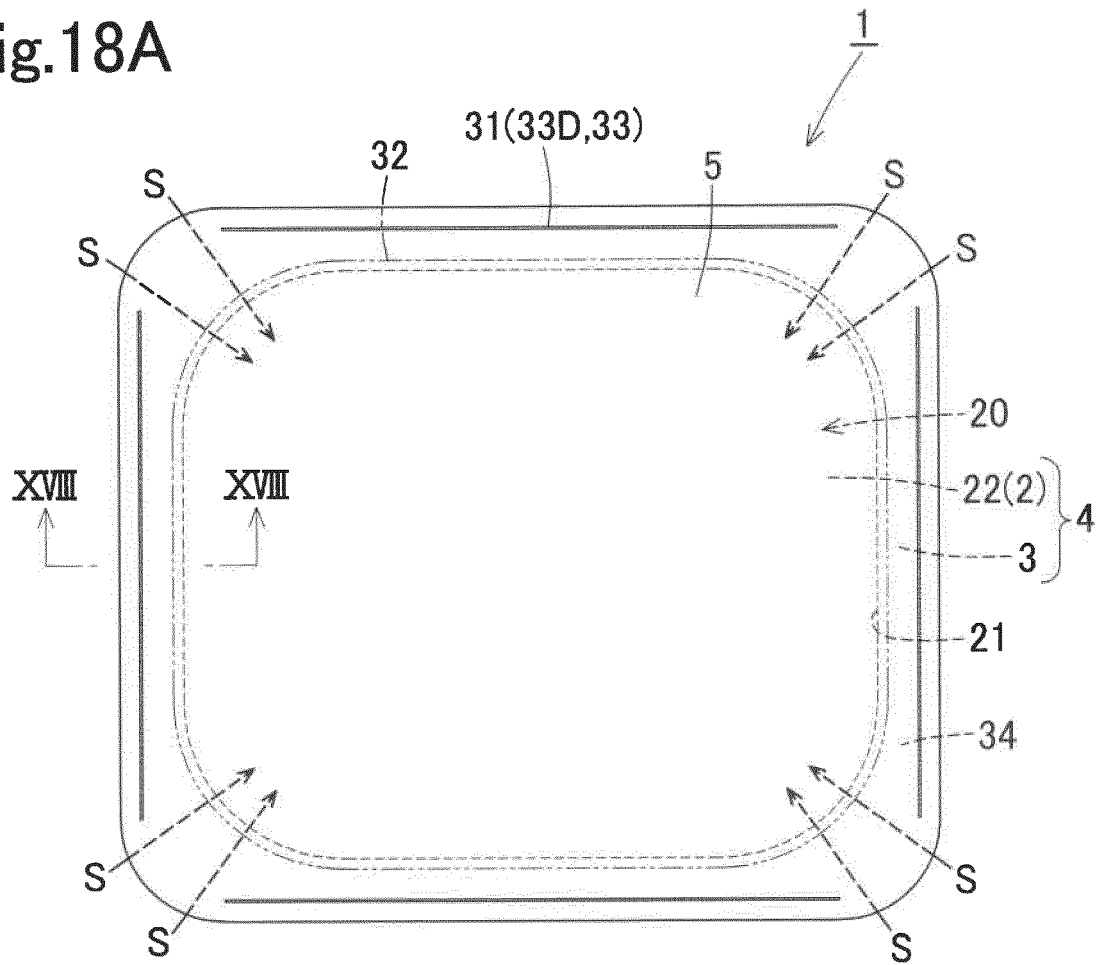


Fig.18B

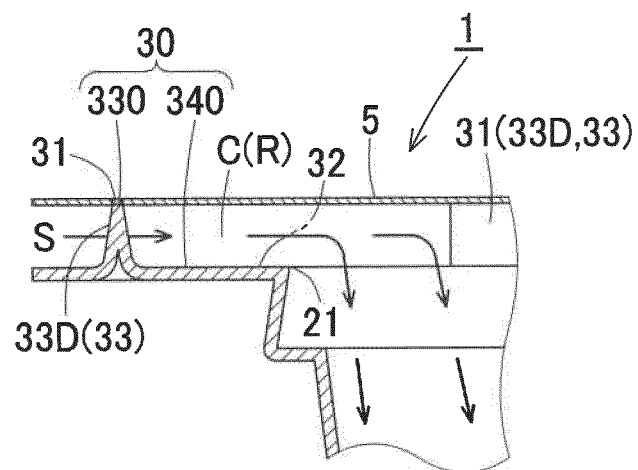


Fig.19A

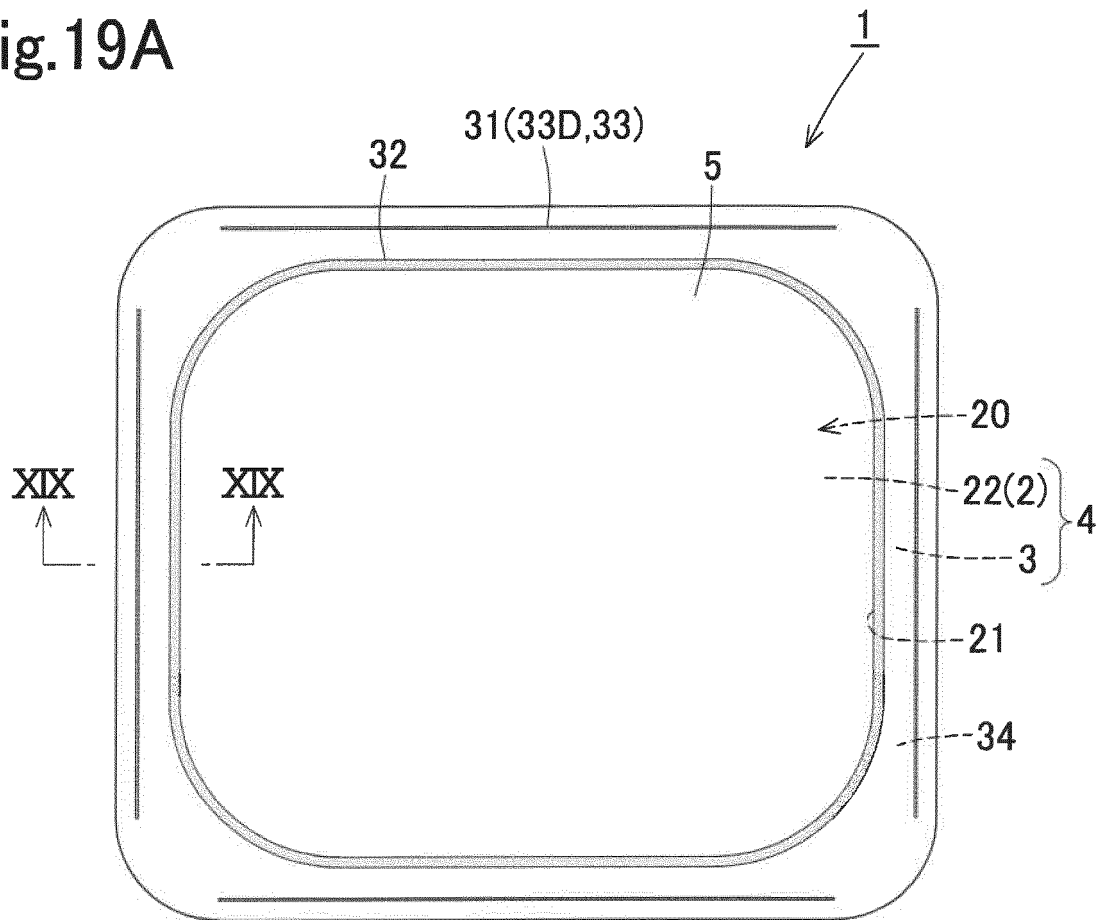


Fig.19B

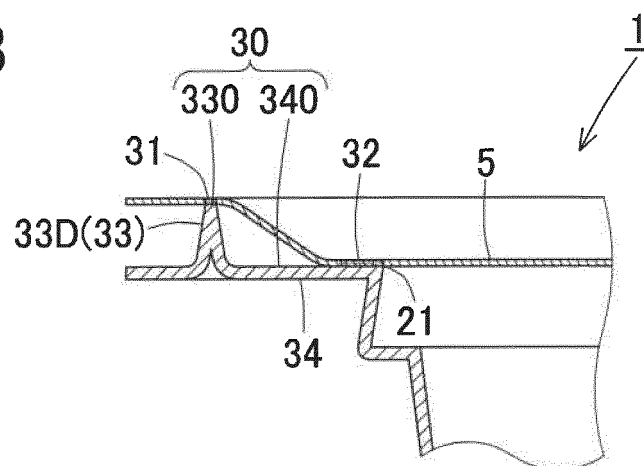


Fig.20A

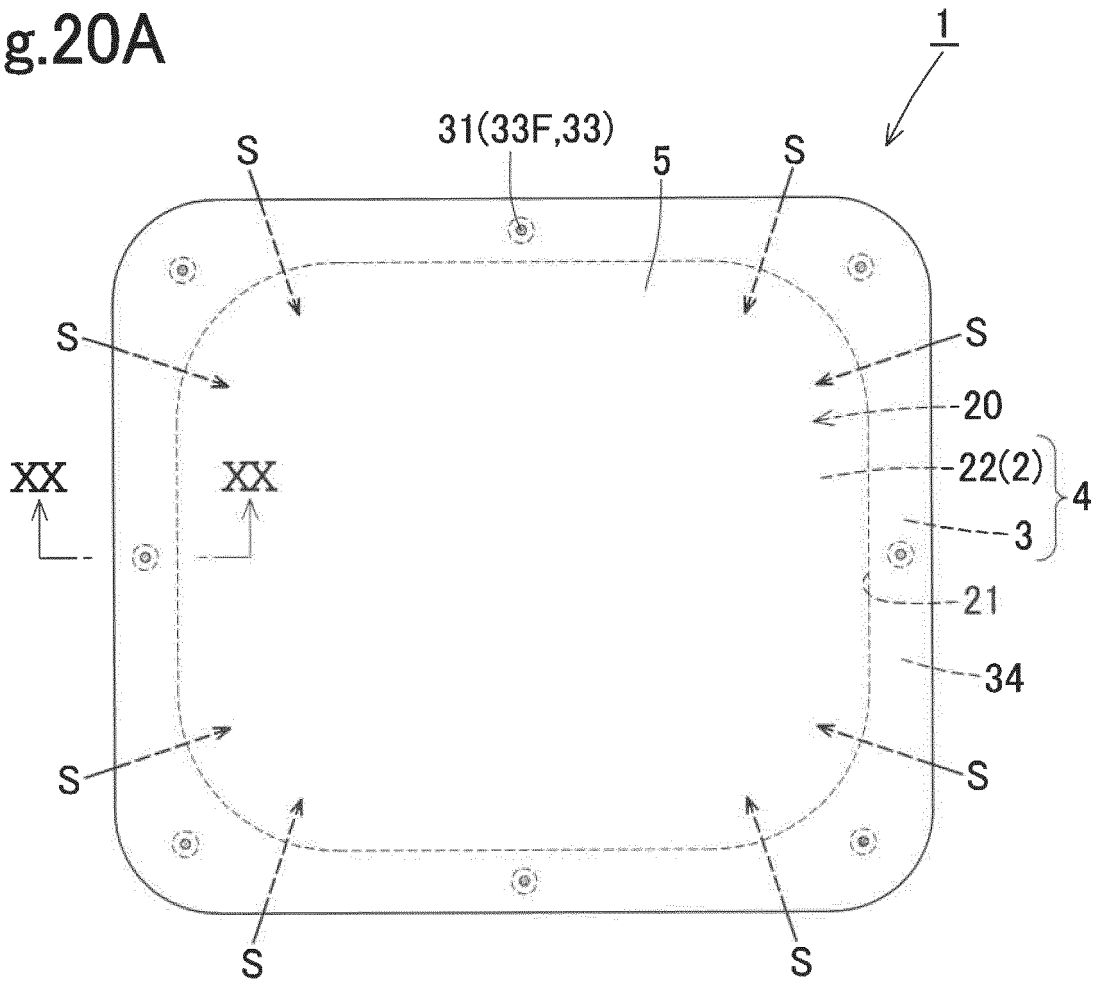


Fig.20B

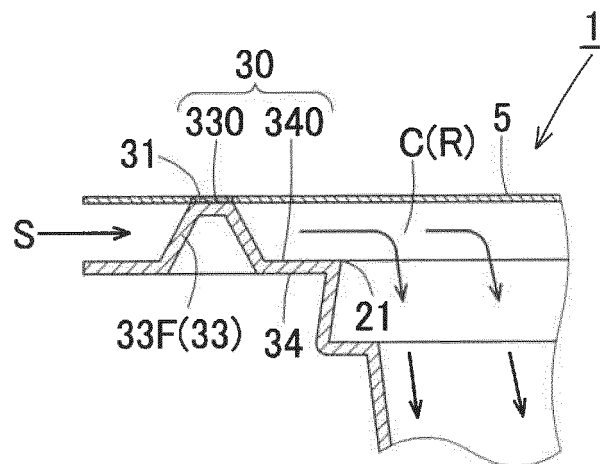


Fig.21A

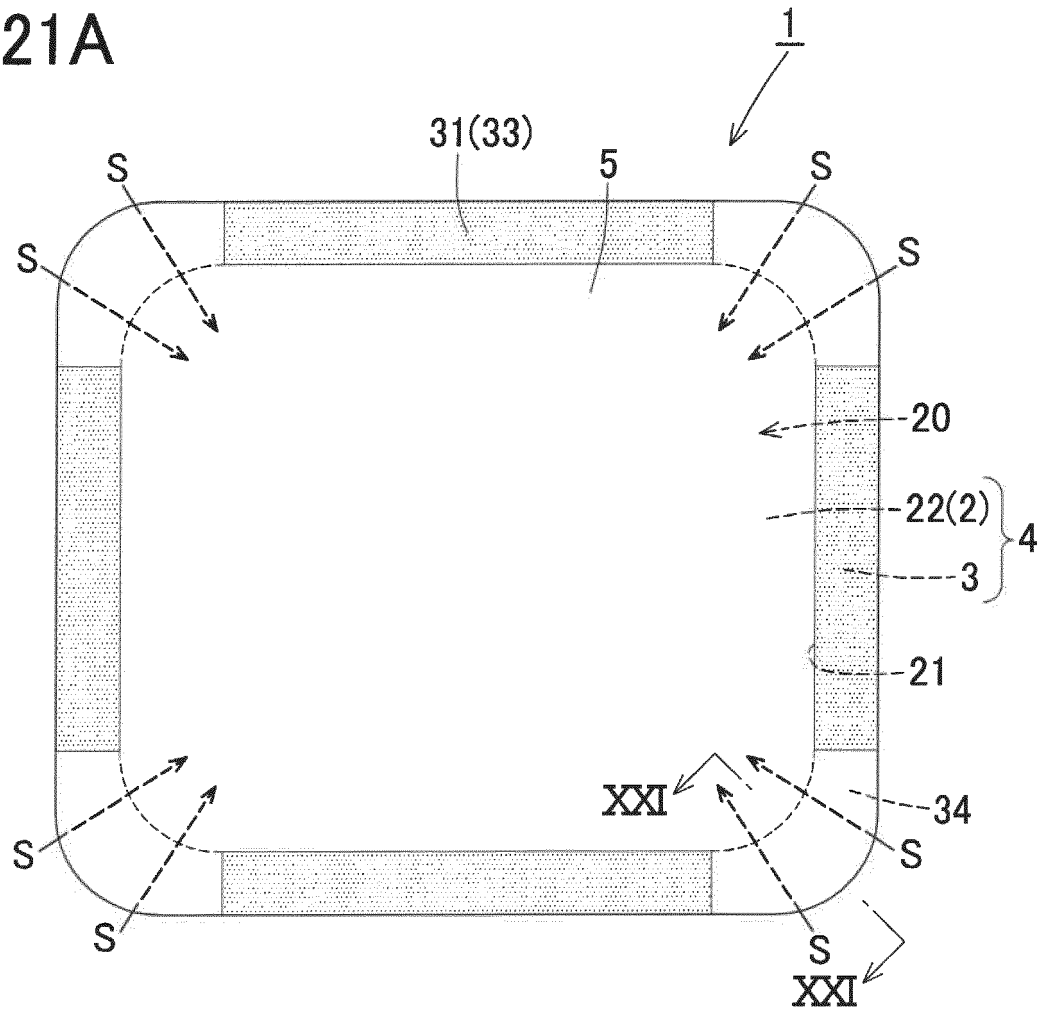


Fig.21B

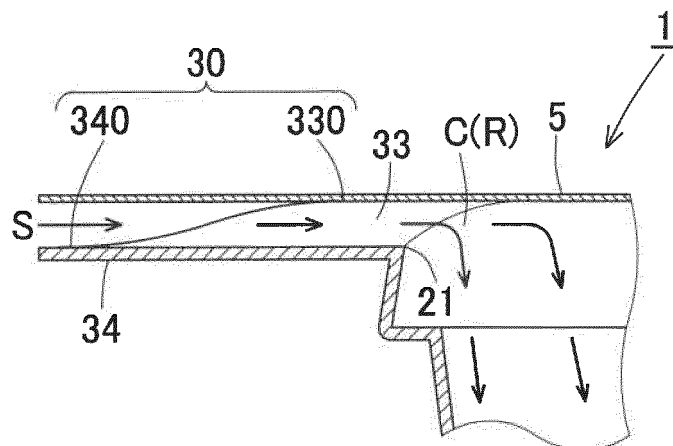


Fig.22A

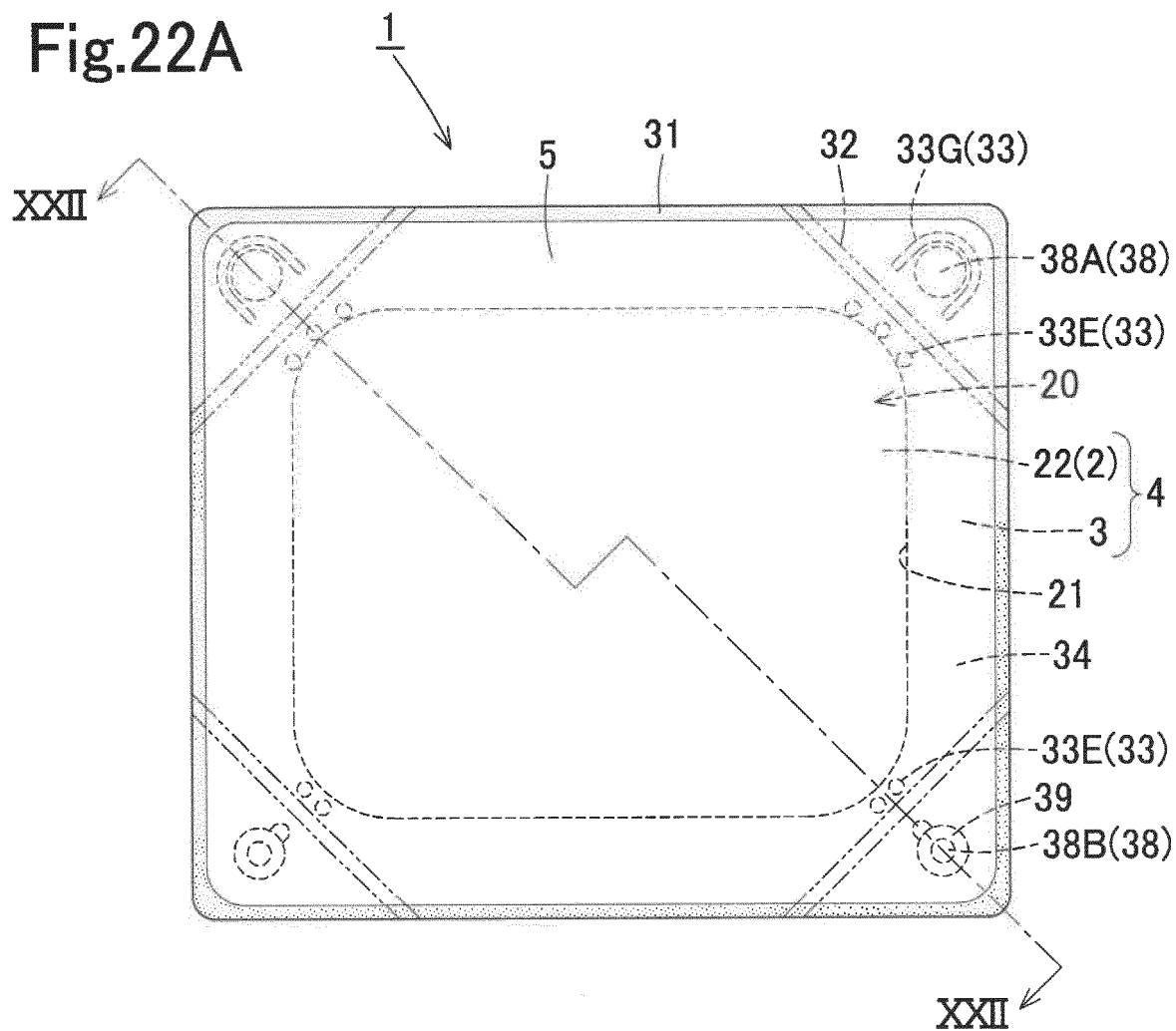


Fig.22B

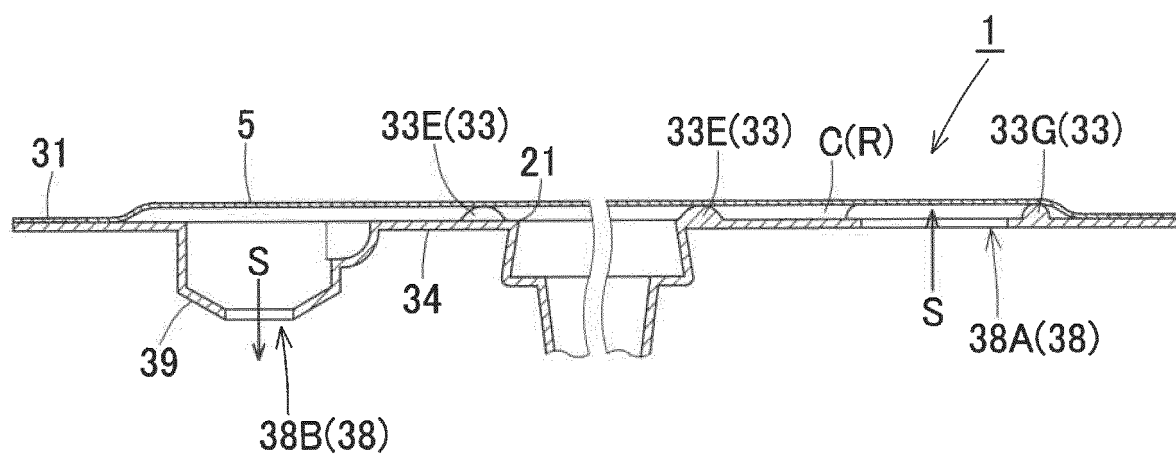


Fig.23A

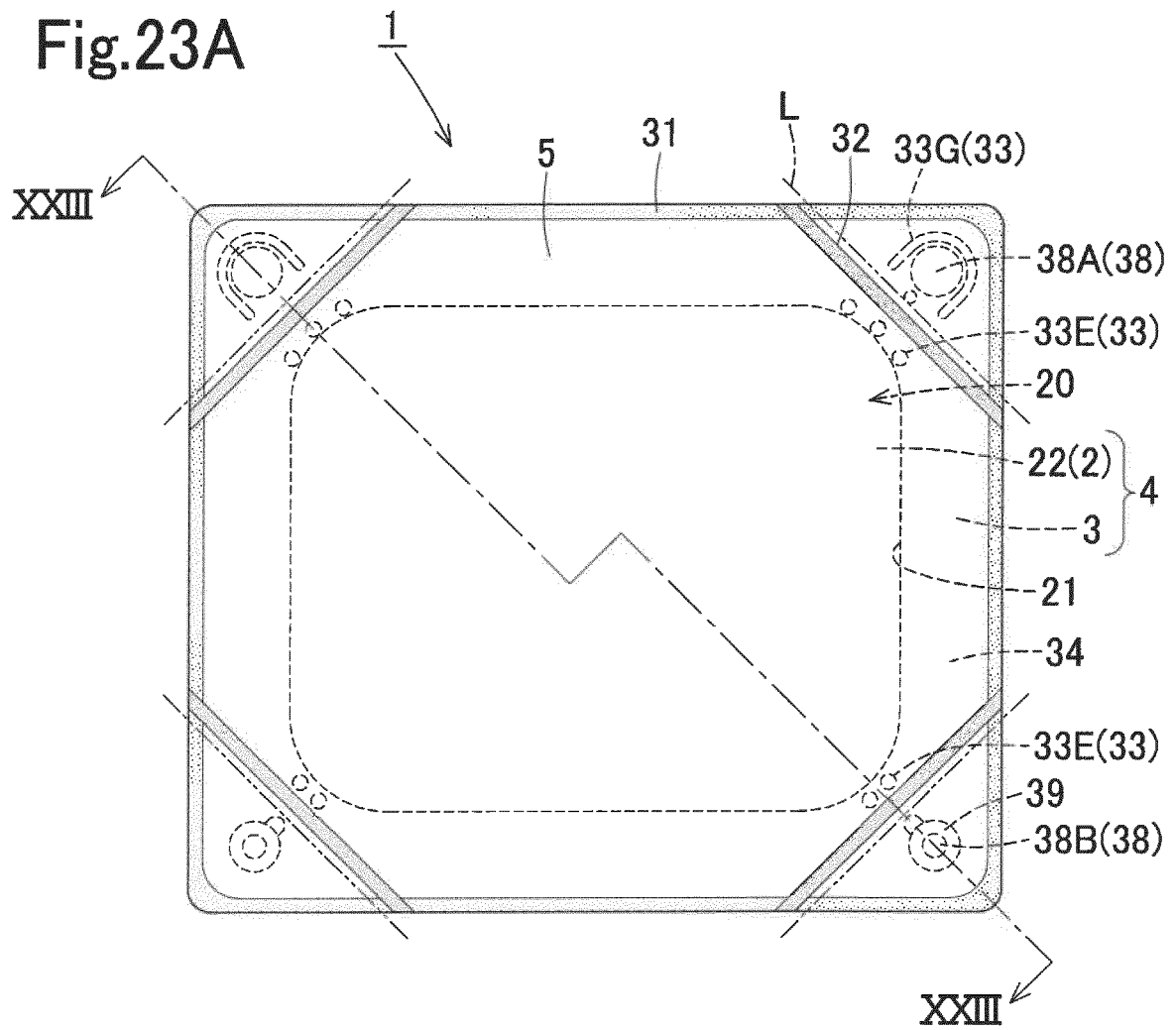


Fig.23B

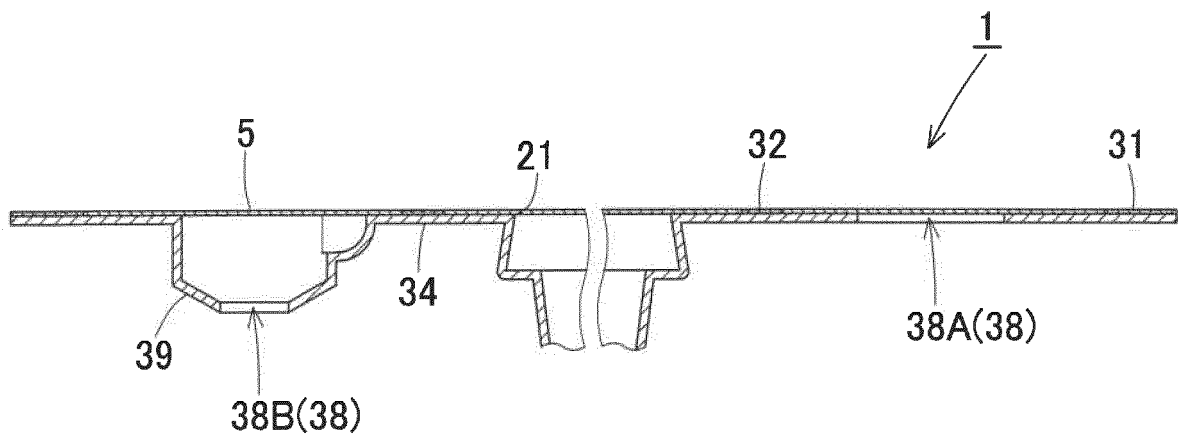


Fig.24A

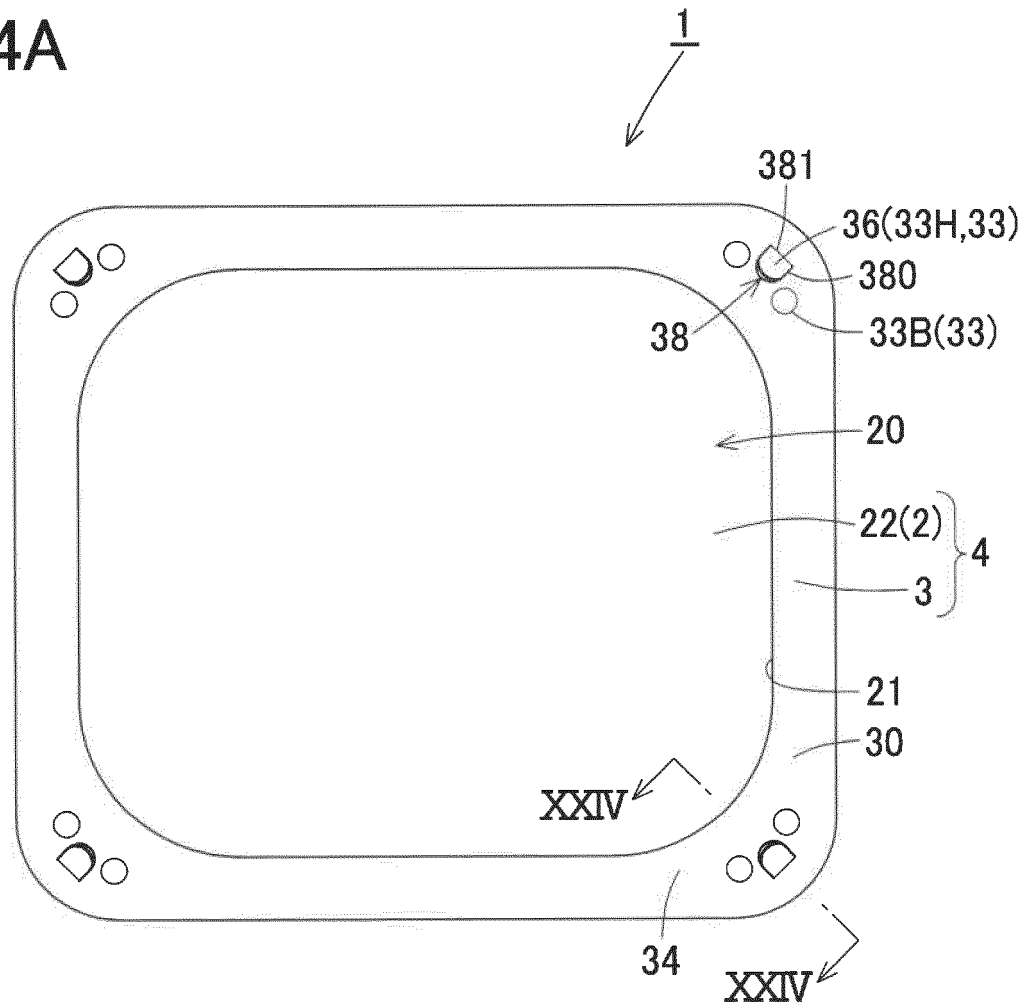


Fig.24B

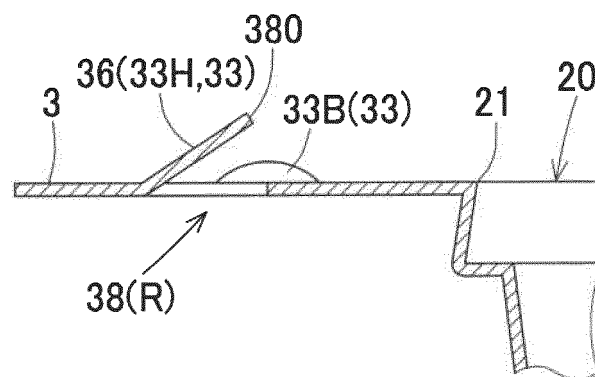


Fig.26A

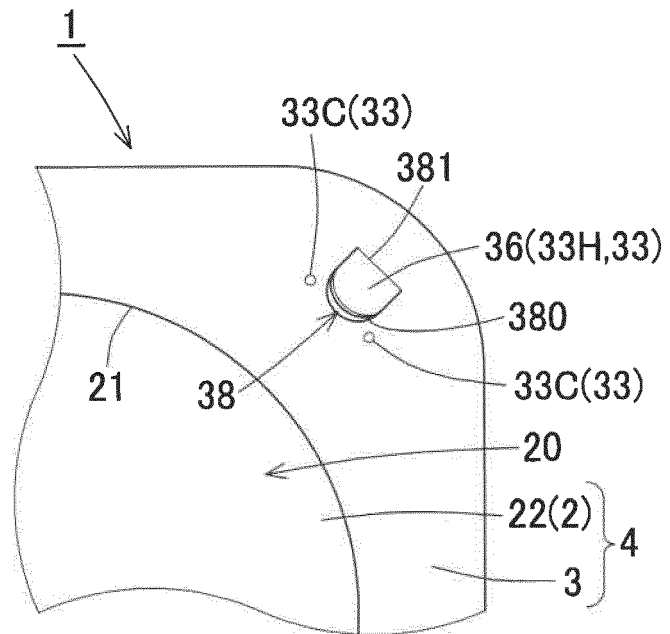


Fig.26B

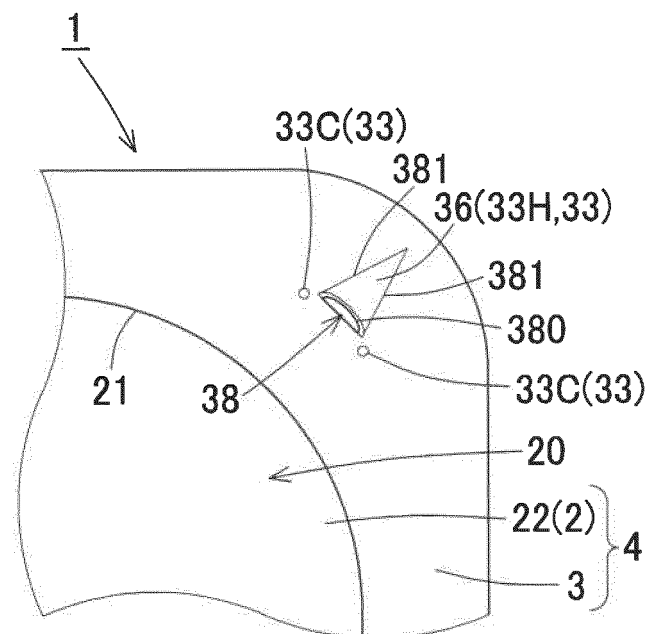


Fig.27A

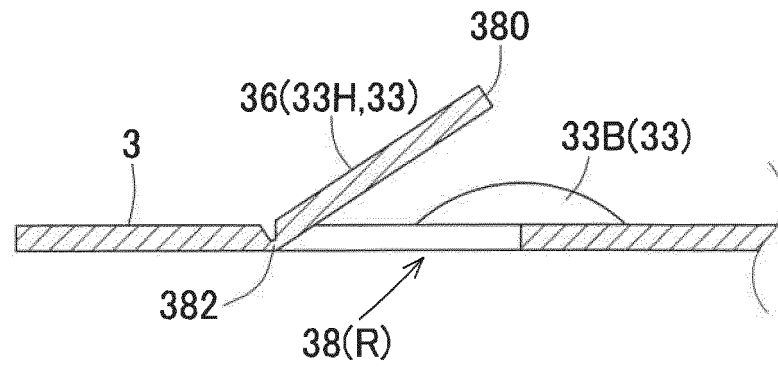


Fig.27B

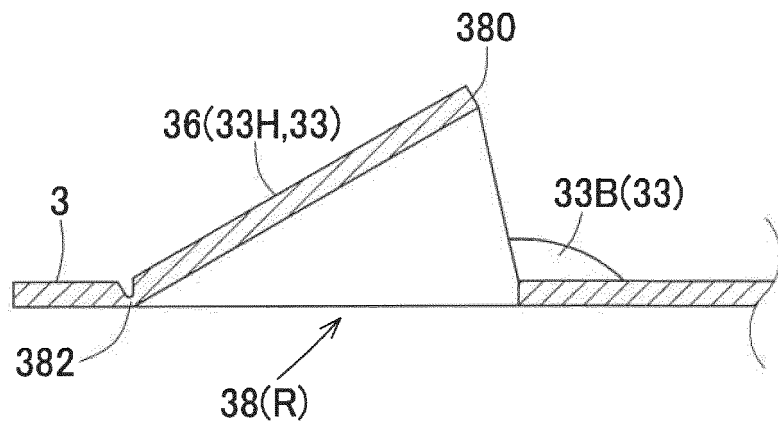


Fig.28A

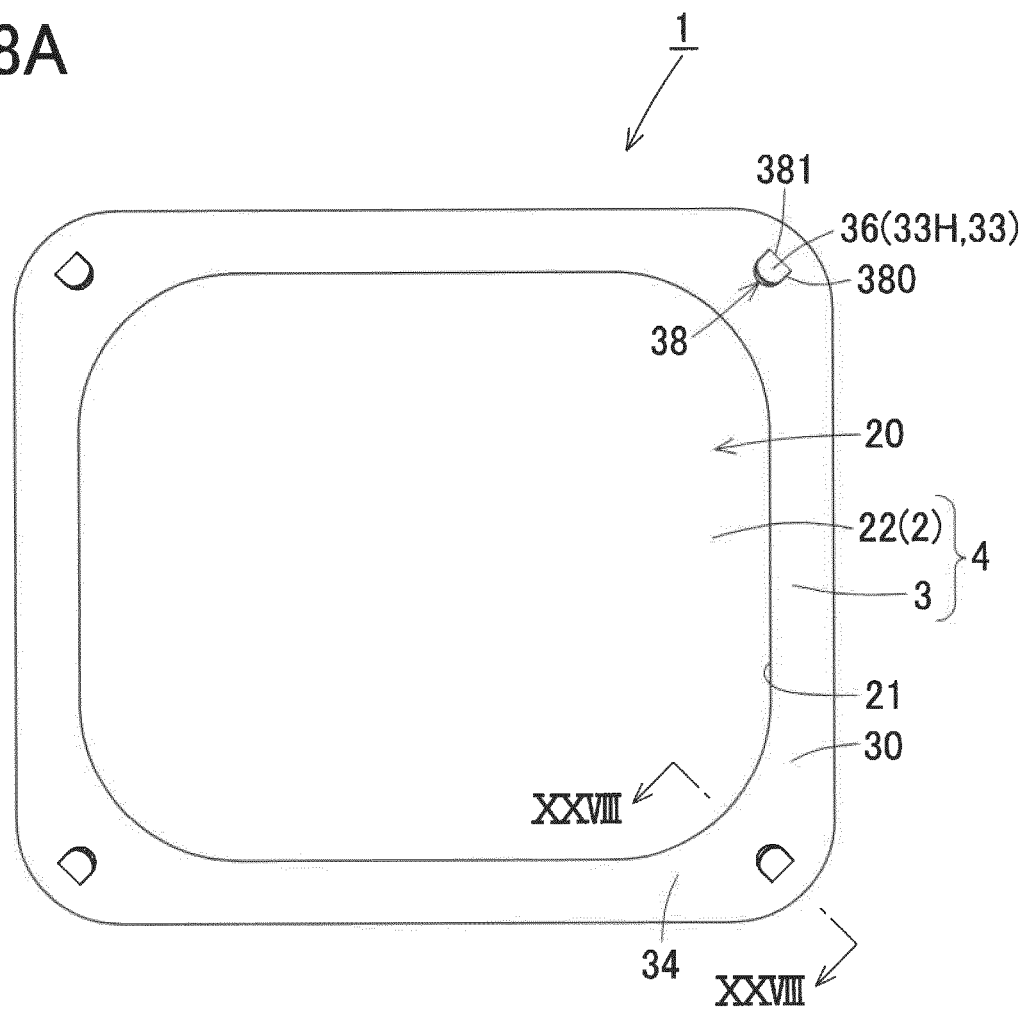


Fig.28B

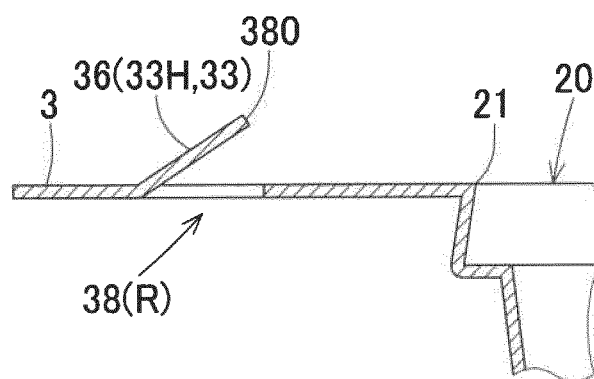


Fig.29A

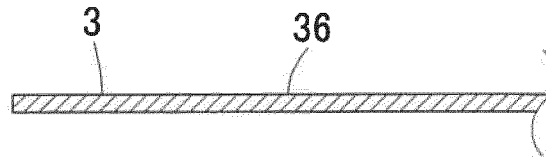


Fig.29B

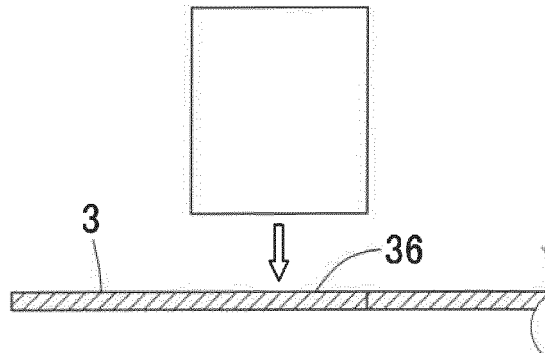


Fig.29C

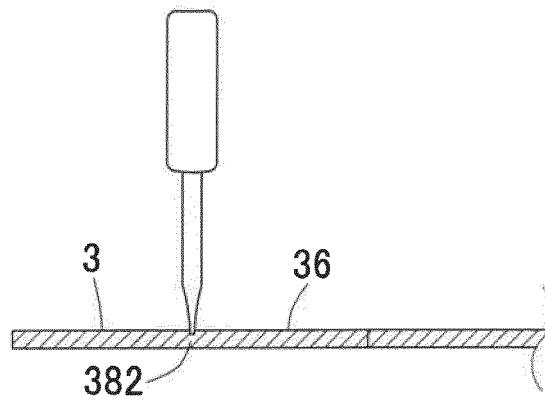


Fig.29D

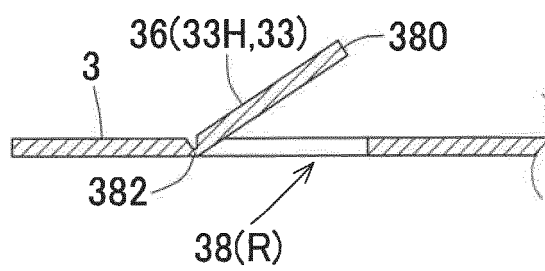


Fig.30A

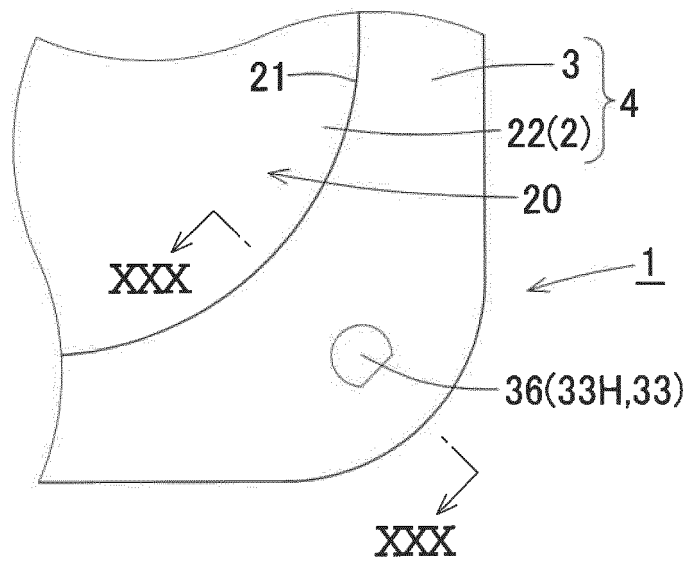


Fig.30B

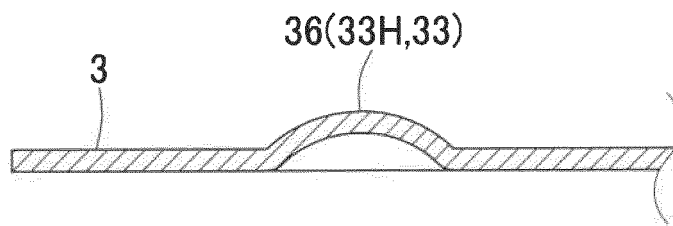


Fig.30C

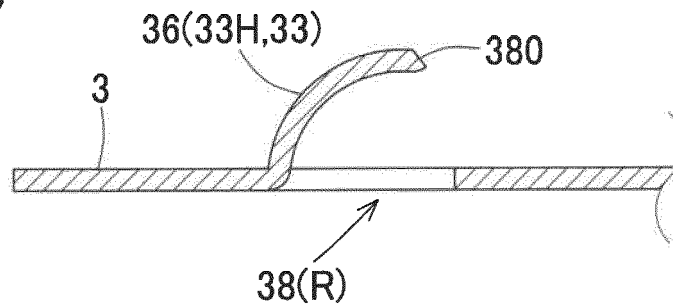


Fig.31A

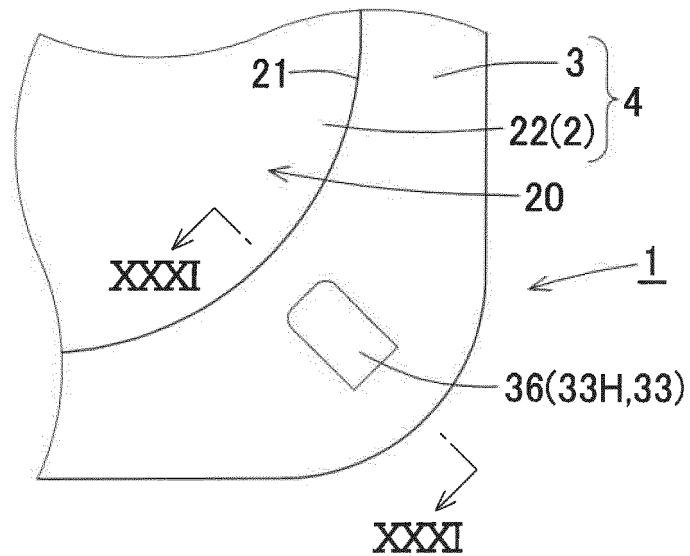


Fig.31B

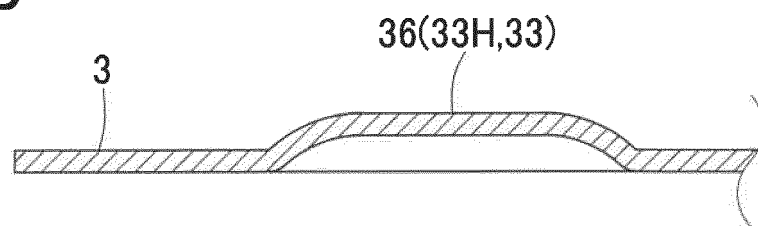


Fig.31C

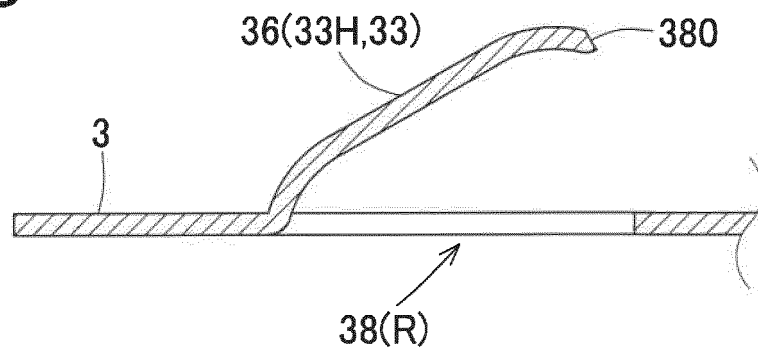


Fig.32A

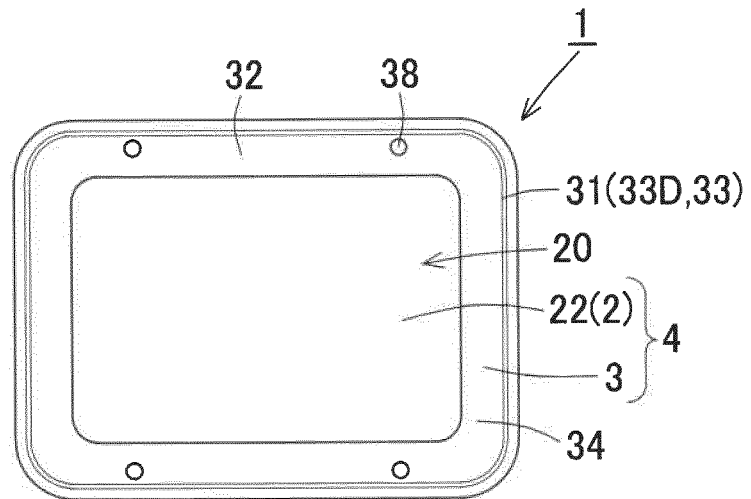


Fig.32B

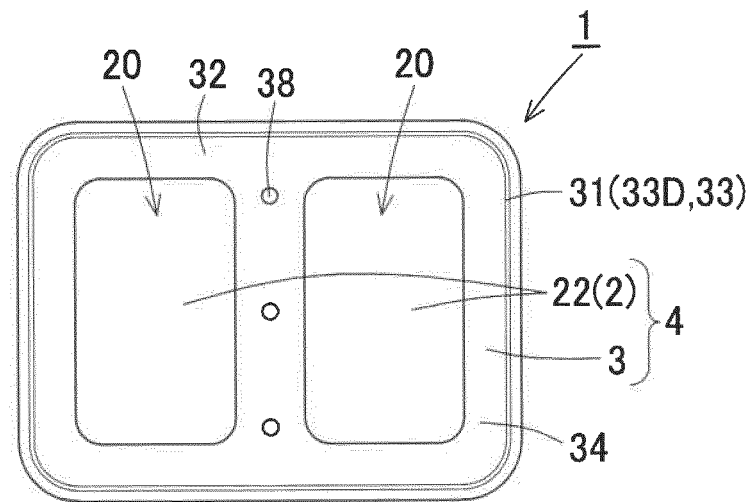
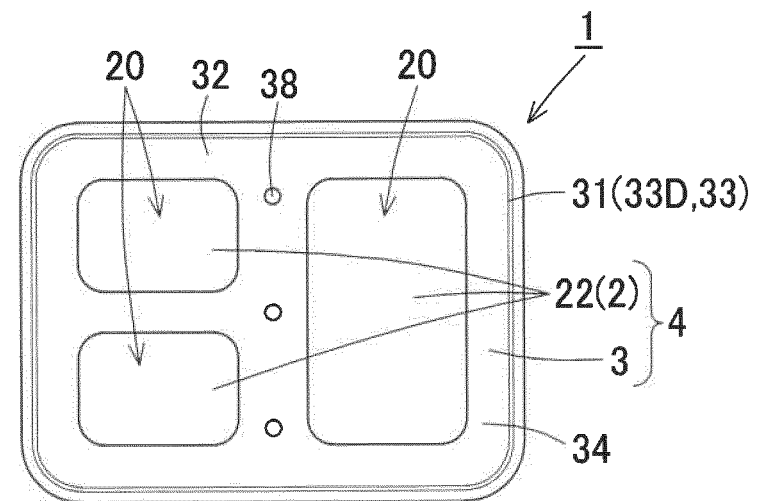


Fig.32C



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2020/046262

A. CLASSIFICATION OF SUBJECT MATTER

B65D 81/20(2006.01)i; B65D 81/24(2006.01)i; B65D 81/28(2006.01)i
 FI: B65D81/20 N; B65D81/24 A; B65D81/28 C; B65D81/20 G; B65D81/24 L
 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)
 B65D81/20; B65D81/24; B65D81/28

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	1971-2021
Registered utility model specifications of Japan	1996-2021
Published registered utility model applications of Japan	1994-2021

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 6203340 B1 (FUJIFOODS CO., LTD.) 27 September 2017 (2017-09-27) paragraphs [0021]-[0026], fig. 1-5	1-2, 4-9, 11-12, 14
Y		13-15
A		3, 10
Y	JP 2009-120247 A (SUN A. KAKEN CO., LTD.) 04 June 2009 (2009-06-04) paragraphs [0024], [0037], fig. 5	13-15
Y	JP 2003-261177 A (TOPPAN PRINTING CO., LTD.) 16 September 2003 (2003-09-16) paragraphs [0001], [0009], [0014], fig. 1-2, 5	15
X	JP 60-134822 A (SHIN NIPPON SHIYOKUKEN KK) 18 July 1985 (1985-07-18) page 2, upper left column, line 12 to page 3, upper left column, line 11, fig. 1-9	6, 11, 14-15



Further documents are listed in the continuation of Box C.



See patent family annex.

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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Date of the actual completion of the international search
 22 January 2021 (22.01.2021)

Date of mailing of the international search report
 02 February 2021 (02.02.2021)

Name and mailing address of the ISA/
 Japan Patent Office
 3-4-3, Kasumigaseki, Chiyoda-ku,
 Tokyo 100-8915, Japan

Authorized officer

Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/JP2020/046262

10

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
JP 6203340 B1	27 Sep. 2017	(Family: none)	
JP 2009-120247 A	04 Jun. 2009	(Family: none)	
JP 2003-261177 A	16 Sep. 2003	(Family: none)	
JP 60-134822 A	18 Jul. 1985	(Family: none)	

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2019223878 A [0001]
- JP H9009937 A [0007]