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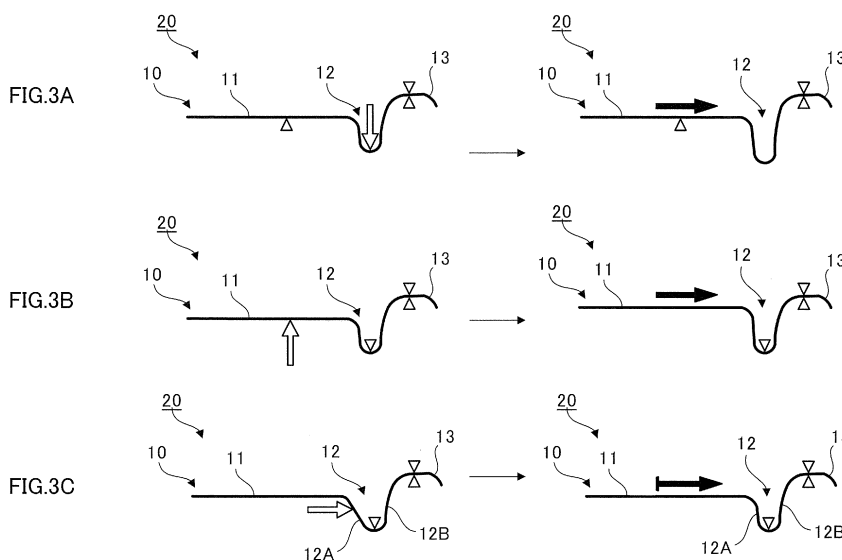
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(54) **METHOD FOR MANUFACTURING CAN LID, CAN LID, AND CAN BODY**

(57) In the elongation processing shown in A, the height of the panel 11 is maintained by supporting the panel 11 from the bottom side, the curled portion 13 is held from the top side and the bottom side, and the movement of the curled portion 13 is restricted in both of the upper direction and the lateral direction. In the elongation processing, external force is applied to the bottom part of the annular groove 12 in the downward direction in this

state, and the bottom part of the annular groove 12 is pressed down. Accordingly, the panel 11 is pulled toward the outer direction in the diameter direction of the panel 11, and the tension is generated in the panel 11 as shown by the black arrow, which is intended to reduce distortion of a can lid while reducing formation of shapes in the can lid.



Description

Technical Field

[0001] The present invention relates to a method for manufacturing a can lid, a can lid, and a can body.

Background Art

[0002] Patent Document 1 discloses a can lid including a central panel having an approximately central region in which a concave panel recess portion is formed by a panel forming method, and further including a score for an opening.

Citation List

Patent Literature

[0003] Patent Document 1: Japanese Patent Application Laid-Open Publication No. 2010-132355.

Summary of Invention

Technical Problem

[0004] In a manufacturing process of a can lid, deformation processing is often performed on a plate made of a metal, for forming a score line and a rivet. Such deformation processing is likely to cause distortion of the can lid. The distortion of the can lid may be reduced by forming a shape such as a dent in the can lid and elongating the plate constituting the can lid. However, formation of the shape in the can lid may be difficult in some cases, depending on the shape or size of the can lid.

[0005] An object of the present invention is to reduce distortion occurring in a can lid while reducing formation of shapes in the can lid.

Solution to Problem

[0006] A method for manufacturing a can lid to which this invention is applied, is provided with: forming an annular groove in a plate made of a metal; performing deformation processing on an inner-side region of the plate, the inner-side region being located on an inner side of a part where the annular groove is formed; applying a tension to the inner-side region by applying external force to a portion where the annular groove has been formed in the panel, after performing the deformation processing.

[0007] Here, applying the tension to the inner-side region is further provided with applying the tension to the inner-side region by applying, to the inner-side region, external force that acts toward an outside in a diameter direction of the inner-side region and that is caused by applying external force increasing a depth of the annular groove to the annular groove and increasing the depth of the annular groove. In this case, it is possible to reduce

distortion occurring in the inner-side region.

[0008] Further, forming the annular groove causes a protruding portion to be formed in the plate, the protruding portion protruding from a surface of the plate opposite to the other surface where the annular groove is formed and being formed into an annular shape, and applying the tension to the inner-side region is further provided with applying the tension to the inner-side region by applying the external force caused by pressing a side of the protruding portion toward an outer-side direction in a diameter direction of the protruding portion, the side being located on an inner side in the diameter direction of the protruding portion formed into the annular shape. In this case, it is possible to reduce distortion occurring in the inner-side region.

[0009] From another point of view, a method for manufacturing a can lid to which this invention is applied, is provided with: performing deformation processing on a plate made of a metal; and applying external force acting in a thickness direction of the plate, to a portion located on an inner side with respect to an outer-side portion of the plate in a state where the outer-side portion is held, after performing the deformation processing, the outer-side portion being a portion located on an outer peripheral-edge side of the plate and located on an outer side with respect to a processed portion where the deformation processing has been performed.

[0010] From still another point of view, a method for manufacturing a can lid to which this invention is applied, is provided with: performing deformation processing on a plate made of a metal; and forming an annular groove enclosing a processed portion of the plate by performing another deformation processing on a peripheral area of the processed portion of the plate, after performing the deformation processing on the plate, the processed portion being a portion where the deformation processing has been performed.

[0011] In the case where this invention is taken as a can body, a can body to which this invention is applied is provided with: a main body of a can comprising an opening part and containing a content; and a can lid attached to the opening part of the main body. The can lid is the can lid manufactured by any one of the aforementioned methods for manufacturing the can lid.

[0012] In the case where this invention is taken as a can lid, a can lid to which this invention is applied is provided with: a base formed into a plate and being to be attached to a main body of a can, the main body containing a content; a processed portion which is located on an inner side of an outer peripheral edge of the base and on which deformation processing has been performed; and an annular groove formed along the outer peripheral edge of the base and around the processed portion. Elongation processing is performed on a part of the base by applying external force to the annular groove after the deformation processing is performed on the base, the part being located on the processed portion, or elongation processing is performed on the part of the base by

forming the annular groove by another deformation processing after the deformation processing is performed on the base, the part being located on the processed portion.

[0013] From still another point of view, a can lid to which this invention is applied is provided with: a base that is formed into a plate and is to be attached to a main body of a can, the main body containing a content; and a processed portion which is located in an inner-side region located on an inner side of an outer peripheral edge of the base, and on which deformation processing has been performed. Elongation processing is performed on a part of the base by pressing at least part of the inner-side region in a thickness direction of the base in a state where an outer peripheral edge of the base is held, after the deformation processing is performed, the part of the base being a portion where the deformation processing has been performed.

[0014] Here, a score line is formed in the processed portion by the deformation processing, the score line enhancing cracking of the base when an opening is formed in the base, the score line comprises one end and the other end on a central-part side in a diameter direction of the base, is formed to expand toward an outer peripheral-edge side of the base, and further comprises a peak on the outer peripheral-edge side, and the score line is formed so that the one end and the other end are located in one region out of two regions opposite to each other with respect to a central part in the diameter direction of the base and the peak is located in the other region. In this case, it is possible to have an opening occupying a large percentage of the can lid, and the elongation processing can be performed on the portion where the opening is formed in the plate even in the case of the opening occupying a large percentage of the can lid.

[0015] In the case where this invention is taken as a can body, the can body to which this invention is applied is provided with: a main body of a can comprising an opening part and contains a content; and a can lid which is attached to the opening part of the main body. The can lid is any one of the aforementioned can lids.

Advantageous Effects of Invention

[0016] According to the present invention, it is possible to reduce distortion occurring in a can lid while reducing formation of shapes in the can lid.

Brief Description of Drawings

[0017]

FIGS. 1A to 1F are views illustrating a method for manufacturing a can lid used as a beverage can; FIGS. 2A and 2B are views of the can lid according to the exemplary embodiment on which the processing up to the score processing shown in FIG. 1C has been performed;

FIGS. 3A to 3C are views illustrating an outline of the elongation processing performed in the exemplary embodiment;

FIGS. 4A to 4D are views illustrating a specific procedure of the first elongation processing;

FIGS. 5A to 5D are views illustrating a specific procedure of the second elongation processing;

FIGS. 6A and 6B are views illustrating another configuration example of the molds;

FIGS. 7A to 7D are views illustrating a specific procedure of the third elongation processing;

FIGS. 8A and 8B are views illustrating a specific procedure of the third elongation processing;

FIG. 9 is a front view of the can lid according to the exemplary embodiment;

FIG. 10 is a view illustrating another configuration example of the upper mold;

FIG. 11 is a view illustrating another configuration example of the can lid;

FIG. 12 is a front view illustrating the state of the can lid before the tab is attached to the can lid; and

FIGS. 13A to 13F are views illustrating the states of the panel.

Description of Embodiments

[0018] Hereinafter, an exemplary embodiment of the present invention will be described in detail with reference to attached drawings.

[0019] FIGS. 1A to 1F are views illustrating a method for manufacturing a can lid used as a beverage can. First, a typical method for manufacturing a can lid will be described with reference to FIGS. 1A to 1F.

[0020] At the beginning of manufacturing a can lid widely used as a beverage can, a plate made of a metal such as aluminum is formed into a dish called a shell 10 by using a press machine, as shown in FIG. 1A. A circular planar portion called a panel (hereinafter, the planar portion is referred to as a "panel 11") is formed at the central part of the shell 10, and an annular groove 12 formed by curvature processing (deformation processing), having a cross-section of a horseshoe shape and formed into a circular ring shape is formed at the periphery of the panel 11.

[0021] The annular groove 12 is recognized to work for reducing deformation of the can lid 20 such as swelling of the can lid 20 to the outer direction of the can lid 20 (outward in the thickness direction). A load for causing the can lid 20 to be deformed to the outer direction may be applied to the can lid 20 upon increase in the internal pressure of the beverage can due to increase in temperature of the inside of the beverage can or fall of the beverage can. However, the can lid 20 in which the annular groove 12 has been formed is less likely to be deformed if such a load is applied to the can lid 20.

[0022] Further, bending processing (curling processing) is performed on the outside of the annular groove 12 in the can lid 20 according to the exemplary embod-

iment, as shown in FIG. 1A, and thus the portion located on the outside of the annular groove 12 has a curled portion 13 curled inward.

[0023] In a manufacturing process of a beverage can, the can lid 20 is usually attached to the beverage can after beverage as a content is filled in the main body of the beverage can. For the attachment, the curled portion 13 of the can lid 20 (edge part of the can lid 20) is put on a flanged portion 22 flaring toward the outside and formed at the circular opening end of the upper part of the main body, and so-called seaming processing (bending processing) is performed on the overlapped area. More specifically, the bending processing (curling processing) is performed on both of the curled portion 13 and the flanged portion 22 at the opening end of the main body, and compression processing is also performed thereon. By the processing, the can lid 20 is fixed to the main body.

[0024] Next, rivet processing as an example of deformation processing is performed on an inner-side region located on the inner side with respect to the annular groove 12 and in the can lid 20 in the exemplary embodiment, as shown in FIG. 1B. In the rivet processing, a protruding portion (protrusion) 14 used for attachment of a tab (described later) as a tool for an opening is formed in the central part of the panel 11. Note that, at the attachment of the tab, the tip of the protruding portion 14 is pressed and flattened after the protruding portion 14 is put into a penetration hole formed in the tab. By this configuration, a stopper is formed and the tab is fixed to the can lid 20.

[0025] Then, score processing is performed. Specifically, a wedge having a cross-section of a V-shape is driven into the panel 11 to form a score line 15 constituted by a recessed portion (scratch) like a groove (a line) on the panel 11 and assisting cracking of the panel 11. For drinking the beverage inside the beverage can, an opening functioning as a tap is formed in the can lid 20. For the formation of the opening, the tab is pressed against the region enclosed by the score line 15. Thereby, cracking of the panel 11 occurs at the score line 15, and the opening is formed in the can lid 20.

[0026] On the other hand, stress generated in the panel 11 at the aforementioned rivet processing or score processing is difficult to be released to the outside of the panel 11 due to the annular groove 12 formed at the periphery of the panel 11 and the curled portion 13 disposed at the periphery of the panel 11. In this case, the stress remaining in the inside of the panel 11 is likely to cause deformation (distortion) of the panel 11 such as curvature of the panel 11.

[0027] Specifically, the rivet processing is performed by, for example, three-step press processing. A hemispherical dome is formed in the first step, the dome is narrowed into a cylindrical protrusion slightly larger than the rivet in the second step, and the protrusion is formed into the shape of the rivet in the third step. In the case where part of the panel 11 is caused to expand to a hemispherical dome in the first step and the dome is narrowed

into a cylinder in the second and third steps as described above, the panel 11 is likely to be distorted since the curved surface around the bottom of the rivet is especially tried to turn back to the planar shape. In addition, since the wedge having the cross section of the V-shape is driven into the panel 11 in the score processing, the surface of the panel 11 is elongated by the width of the groove of the V-shape. Also in this case, distortion of the panel 11 is likely to occur.

[0028] If the distortion (deformation) of the panel 11 occurs, the opening is difficult to be formed in the can lid 20 due to the decrease in the operability of the tab. Specifically, the tab is slanted when one end of the tab is pressed against the panel 11 for forming the opening, and the operability of the tab is likely to decrease. Further, the force required to operate the tab is different between the can lids 20, and defect such as variation of quality of the can lids 20 may occur.

[0029] Thus, dent processing is usually performed on the peripheral area of the portion on which the rivet processing or the score processing has been performed, in the panel 11, as shown in FIG. 1D. Specifically, the portion on which the rivet processing or the score processing has been performed is dented so that the portion on which the rivet processing or the score processing has been performed becomes lower than the other portions in the panel 11. Thereby, the portion on which the rivet processing or the score processing has been performed elongates along the surface direction of the panel 11 (arrangement direction), and the deformation (distortion) occurring in the panel 11 is reduced in response to the elongation.

[0030] Then, a tab 16 functioning as a tool for the opening is attached to the shell 10, as shown in FIG. 1E, and the can lid 20 is finished. Note that the tip of the protruding portion 14 (refer to FIG. 1B) is flattened after the protruding portion 14 formed in the panel 11 is put into the penetration hole formed in the tab 16 for the attachment of the tab 16, as described above. By this configuration, a stopper is formed and the tab 16 is prevented from being separated from the can lid 20.

[0031] Note that the finished can tab 20 is attached to the upper part of the cylindrical main body 21 where beverage has been filled, as shown in FIG. 1F, and the beverage can as an example of a can body is completed. Note that the attachment is performed by the so-called seaming, as described above.

[0032] FIGS. 2A and 2B are views of the can lid 20 according to the exemplary embodiment on which the processing up to the score processing shown in FIG. 1C has been performed. Note that FIG. 2A is a front view and FIG. 2B is a side view. The same reference numerals are used for the portions having the same functions as the aforementioned functions.

[0033] The can lid 20 according to the exemplary embodiment has the diameter smaller than that of a can lid typically used as a beverage can of 350 ml, 500ml or the like, and the diameter of the can lid 20 according to the

exemplary embodiment (diameter of the panel 11 (refer to the reference symbol L in FIG. 2A)) is 45 mm or less. Here, the present invention can be applied to the can lid having the diameter of approximately 55 mm (larger than 45 mm) used for the beverage can of 350ml, 500ml or the like. Note that, the diameter of 45 mm or less is preferable for obtaining a larger effect, and the diameter of 35 mm or less is preferable for obtaining a much larger effect.

[0034] Also in the exemplary embodiment, the annular groove 12 having the cross section of a horseshoe shape and formed into a circular ring has been formed at the outer circumference of the panel 11 serving as a base (on the outer side of the panel 11 in the diameter direction), as shown in FIGS. 2A and 2B. On the outer side of the annular groove 12, the curled portion 13 curling downward (refer to FIG. 2B) is provided.

[0035] The can lid 20 according to the exemplary embodiment is further provided with the score line 15 enhancing the cracking of the panel 11, and the protruding portion (rivet) 14 used for fixing the tab. Each of the score line 15 and the protruding portion 14 is formed by deformation processing, and the portion where the score line 15 or the protruding portion 14 has been formed is regarded as a processed portion.

[0036] A concave portion (finger hole emboss) 17 is formed in the can lid 20 according to the exemplary embodiment, which increases the operability when a user operates the tab. The gap between the surface of the panel 11 and the tab increases due to the formation of the concave portion 17, and a finger of a user is easily inserted between the tab and the panel 11. Thus, the user easily lifts (the rear end of) the tab.

[0037] In the case where the diameter of the can lid 20 is small, as in the case of the exemplary embodiment, the annular groove 12 is close to the score line 15 and the concave portion 17, as shown in FIG. 2A. In this case, the dent processing described with reference to FIG. 1D is difficult to be performed. More specifically, the dent processing is performed on the peripheral area of the portion on which the rivet processing or the score processing has been performed, as described above. However, if the diameter of the can lid 20 becomes small, the area on which the dent processing is performed also becomes small since the annular groove 12 comes close to the score line 15 and the concave portion 17.

[0038] Thus, in the exemplary embodiment, additional processing is performed on the outer circumferential portion of the panel 11 and the like instead of the dent processing. More specifically, in the exemplary embodiment, a concept for elongating the panel 11 by forming a dent in the panel 11 is shifted to a concept for elongating the panel 11 by performing additional processing on the outer circumferential portion of the panel 11 and the like. In this case, the elongation processing can be performed on the panel 11 without changing the layout of the panel 11, since any new shape is not required to be formed in the panel 11.

[0039] FIGS. 3A to 3C are views illustrating an outline of the elongation processing performed in the exemplary embodiment.

[0040] In the exemplary embodiment, any of the first to third elongation processing shown in FIGS. 3A to 3C is executed, and the panel 11 is elongated along the surface direction of the panel 11.

[0041] Note that, each left illustration of FIGS. 3A to 3C shows an external force applied to the shell 10, and each right illustration thereof shows a tension generated in the shell 10. In each of FIGS. 3A to 3C, a supported portion of the shell 10 is indicated by a white triangle, the external force applied to the shell 10 is indicated by a white arrow, and the tension acting on the shell 10 is indicated by a black arrow. Although the external force and the tension acting on the right part of the shell 10 are shown in each of FIGS. 3A to 3C, the external force and the tension act on whole circumference of the shell 10. Although the support state of the portion located at the right half of the shell 10 is shown in each of FIGS. 3A to 3C, the support state of the other portions of the shell 10 in the circumferential direction is the same as the support state shown in each of FIGS. 3A to 3C.

[0042] First, in the first elongation processing shown in FIG. 3A, the height of the panel 11 is maintained by supporting the panel 11 from the bottom side, the curled portion 13 is held from the top side and the bottom side, and the movement of the curled portion 13 is restricted in both of the upper direction and the lateral direction. In the first elongation processing, external force is applied to the bottom part of the annular groove 12 in the downward direction in the aforementioned state, and the bottom part of the annular groove 12 is pressed down. Accordingly, the panel 11 is pulled toward the outer direction in the diameter direction of the panel 11, and the tension is generated in the panel 11 as shown by the black arrow. More specifically, the tension is generated so that the inner-side region of the can lid 20 located on the inner side with respect to the annular groove 12 moves toward the outer side in the diameter direction.

[0043] In the second elongation processing shown in FIG. 3B, the height of the annular groove 12 is maintained, the curled portion 13 is held by the top side and the bottom side, and thus the movement of the curled portion 13 in the upside direction and the lateral direction is restricted. In the second elongation processing, external force intended to move the panel 11 upward acts on the panel 11.

[0044] The tension indicated by the black arrow acts on the panel 11 by applying the aforementioned external force to the panel 11 since the movement of the outer circumferential part of the panel 11 is restricted. More specifically, in the second elongation processing, in the state of supporting the outer-side portion located on the outer circumferential edge side of the shell 10 and on the outside of the processed portion on which the rivet processing or the score processing has been performed, external force acting in the thickness direction of the shell

10 is applied to a portion of the shell 10 located on the inner side with respect to the outer-side portion. Thereby, the tension acting on the panel 11 in the diameter direction is generated in the panel 11.

[0045] In the third elongation processing shown in FIG. 3C, the height of the annular groove 12 is maintained, the curled portion 13 is held from the top side and the bottom side, and thus the movement of the curled portion 13 in the upside direction and the lateral direction is restricted, similarly to the elongation processing shown in FIG. 3B. In the third elongation processing, one sidewall (an inner-side sidewall 12A) out of two sidewalls (the inner-side sidewall 12A and an outer-side sidewall 12B) constituting the annular groove 12, which is located on the central-part side of the panel 11, is pressed from the inner side of the panel 11 in the diameter direction. Thereby, the tension acts on the panel 11 as shown by the black arrow, similarly to the above.

[0046] More specifically, in the case where the annular groove 12 is formed from the one surface of the shell 10 as in the case of the exemplary embodiment, a protruding portion protruding from the surface opposite to the one surface and formed into an annular shape is formed. In the third elongation processing, the side surface (inner-side sidewall 12A) located on the inner side of the protruding portion formed into the annular shape is pressed toward the outer side in the diameter direction of the protruding portion. Thereby, the tension is applied to the region located on the inner side of the shell 10 with respect to the annular groove 12.

[0047] Even in the case where the diameter of the can lid 20 is small, the aforementioned space for the dent processing (region between the annular groove 12 and the score line 15 or the like) can be generated if the tab 16 (referred to FIG. 1E), the score line 15 (referred to FIG. 2A), the concave portion 17 (referred to FIG. 2A) or the like is downsized. However, if the concave portion 17 is downsized, a finger tip of a user is difficult to be inserted into the space under the tab 16, and the concave portion 17 may not play the role.

[0048] Further, for example, if the tab 16 is downsized, distance between the fulcrum (a portion supported by the rivet) and the point of effort (portion pulled up by a user) may become small in some cases. In such a case, the operation load for pulling up (raising) the tab 16 increases. In particular, in the case where the distance between the fulcrum and the point of effort becomes small while distance between the point of load (front end of the tab) and the fulcrum does not change, the operation load increases.

[0049] Alternatively, if the entire size of the tab 16 is downsized, ratio between the distance between the fulcrum and the point of load and the distance between the fulcrum and the point of effort does not change, and the increase of the operation load required to pulling up the tab 16 is not likely to occur. However, in this case, the opening to be formed is likely to be small. In the case where the entire size of the tab 16 is downsized, the

length of the portion located between the fulcrum and the point of load becomes shorter, and thus the pressing amount of the tab 16 at pressing down the panel 11 decreases. In this case, the formed opening (tap) becomes small.

[0050] Instead of downsizing the tab 16, the score line 15 (region enclosed by the score line 15) may be downsized. Also in this case, the opening becomes small.

[0051] On the other hand, the tab 16, the score line 15, the concave portion 17 or the like is not downsized in the exemplary embodiment, and thus the aforementioned defect is not likely to occur.

[0052] Further detailed description will be given for the first elongation processing to the third elongation processing. FIGS. 4A to 4D are views illustrating a specific procedure of the first elongation processing.

[0053] In the first elongation processing, the panel 11 is elongated by making the annular groove 12 formed in the shell 10 deeper, and thus distortion generated in the panel 11 is reduced.

[0054] Specifically, in the first elongation processing, the shell 10 on which the processing up to the score processing has been performed (the shell 10 where the processing up to the processing shown in FIG. 1C has been completed) is inserted between an upper mold 41 at a standby position and a lower mold 42 also at a standby position, as shown in FIG. 4A. Then, the shell 10 is placed on the lower mold 42, as shown in FIG. 4B.

[0055] The upper mold 41 is constituted by a first upper mold 411 formed into a cylinder and a second upper mold 412 disposed inside the first upper mold 411, as shown in FIG. 4A. The second upper mold 412 is constituted by a base 412A formed into a cylinder, and a protruding portion 412B protruding from the bottom surface of the base 412A in FIG. 4A. The protruding portion 412B is formed along the circumferential direction of the base 412A and formed into a circular ring.

[0056] On the other hand, the lower mold 42 is formed into a cylinder, and has an upper surface having a shape corresponding to the lower surface of the shell 10. In the upper surface, an annular groove (hereinafter, referred to as a "mold groove 42A") formed along the circumferential direction of the lower mold 42 has been formed.

[0057] In the shell 10 according to the exemplary embodiment, a protruding portion 10A (hereinafter, referred to as a "shell-side protruding portion 10A") has been formed on the surface opposite to the surface where the annular groove 12 has been formed, due to the formation of the annular groove 12, as shown in FIG. 4A. In the exemplary embodiment, when the shell 10 is placed on the lower mold 42, the shell-side protruding portion 10A formed in the shell 10 is put into the mold groove 42A formed in the lower mold 42, as shown in FIG. 4B. Note that, in the exemplary embodiment, the depth of the mold groove 42A is greater than the protruding amount of the shell-side protruding portion 10A.

[0058] After the shell 10 is placed on the lower mold 42, the first upper mold 411 and the second upper mold

412 are moved down as shown in FIG. 4C, in the exemplary embodiment. Thereby, the curled portion 13 of the shell 10 is fastened (clamped) by the first upper mold 411 and the lower mold 42, and the curled portion 13 of the shell 10 is held by the first upper mold 411 and the lower mold 42, as shown in FIG. 4C.

[0059] Next, the second upper mold 412 is further moved down as shown in FIG. 4D, in the exemplary embodiment. When the second upper mold 412 reaches a predetermined position, the protruding portion 412B is put into the inside of the annular groove 12, and the bottom part of the annular groove 12 is pressed by the peak part of the protruding portion 412B in response to the further downward movement of the second upper mold 412. Thereby, the tension starts acting on the panel 11 (a portion of the shell 10, which is located on the inner side of the annular groove 12). Thus, the portion where the rivet processing or the score processing has been performed is elongated.

[0060] Next, the second elongation processing will be described.

[0061] FIGS. 5A to 5D are views illustrating a specific procedure of the second elongation processing.

[0062] In the second elongation processing, the panel 11 is elongated by directly pressing the panel 11, and the distortion generated in the panel 11 is reduced.

[0063] The molds used in the second elongation processing include the lower mold 42 constituted by a first lower mold 421 formed into a cylinder and a second lower mold 422 located inside the first lower mold 421, as shown in FIG. 5A.

[0064] The second lower mold 422 is formed into a cylinder, and has an upper end surface in the upper side of FIG. 5A. The upper end surface has a shape corresponding to the bottom surface of the panel 11 included in the shell 10.

[0065] On the other hand, the first lower mold 421 is formed into a cylinder, and has an upper end surface 421A. The first lower mold 421 has a protruding portion 421B protruding from the upper end surface 421A toward the upper side in FIG. 5A. The protruding portion 421B is formed along the circumferential direction of the first lower mold 421 and is formed into a circular ring.

[0066] On the other hand, the upper mold 41 is constituted by a base 413 formed into a cylinder and a protruding portion 414 protruding from the bottom surface of the base 413 in FIG. 5A. The protruding portion 414 is formed along the circumferential direction of the base 413 and formed into a circular ring.

[0067] In the second elongation processing, the shell 10 on which the processing up to the score processing has been performed is inserted between the upper mold 41 at a standby position and the lower mold 42 also at a standby position, as shown in FIG. 5A, similarly to the above. Then, the shell 10 is placed on the lower mold 42, as shown in FIG. 5B. Note that, when the shell 10 is placed on the lower mold 42, the curled portion 13 is put on the protruding portion 421B of the first lower mold 421,

and the shell-side protruding portion 10A is located on the inner side of the protruding portion 421B as shown in FIG. 5B.

[0068] Then, in the processing, the first lower mold 421 and the second lower mold 422 are moved up as shown in FIG. 5C. Thereby, the curled portion 13 of the shell 10 is fastened (clamped) by the first lower mold 421 and the upper mold 41, and the curled portion 13 is held by the first lower mold 421 and the upper mold 41 as shown in FIG. 5C. In the processing, as the first lower mold 421 and the second lower mold 422 are moved upward, the protruding portion 414 formed in the upper mold 41 is put into the annular groove 12 of the shell 10 as shown in FIG. 5C.

[0069] Next, the second lower mold 422 is further moved up as shown in FIG. 5D. When the second lower mold 422 reaches a predetermined position, the panel 11 of the shell 10 is pressed by the second lower mold 422 from the bottom side. At this time, if the curled portion 13 is continued to be held as described above and the panel 11 is pressed from the bottom side by the second lower mold 422, the tension starts acting on the panel 11. Thereby, the portion where the rivet processing or the score processing has been performed is elongated also in the second elongation processing.

[0070] Note that, the upper mold 41 may be constituted by the upper mold 41 shown in FIGS. 4A to 4D, and the lower mold 42 may be constituted by the lower mold 42 shown in FIGS. 5A to 5D, as shown in FIGS. 6A (views illustrating another configuration example of the molds). In this case, the protruding portion 412B provided in the upper mold 41 presses the bottom part of the annular groove 12, and thereby the panel 11 is elongated in the diameter direction, and the second lower mold 422 provided in the lower mold 42 pushes up the panel 11, and thereby the panel 11 is elongated in the diameter direction, as shown in FIG. 6B.

[0071] Next, the third elongation processing will be described.

[0072] FIGS. 7A to 8B are views illustrating a specific procedure of the third elongation processing.

[0073] In the third elongation processing, as described above, the one sidewall out of the two sidewalls constituting the annular groove 12, which is located on the central-part side of the panel 11, is pressed from the inner side in the diameter direction of the panel 11, and the panel 11 is elongated.

[0074] The molds used in the third elongation processing include the lower mold 42 configured by the first lower mold 421 formed into a cylinder and the second lower mold 422 disposed inside the first lower mold 421, similarly to the molds shown in the second elongation processing, as shown in FIG. 7A. The second lower mold 422 is formed into a cylinder and has an upper end surface in the upper side of FIG. 7A, similarly to the above. The upper end surface has a shape corresponding to the bottom surface of the panel 11 of the shell 10.

[0075] The first lower mold 421 is formed into a cylinder

and has the upper end surface 421A in the upper end part in FIG. 7A, similarly to the above. The first lower mold 421 has the protruding portion 421 B protruding from the upper end surface 421A toward the upper side in FIG. 7A. The protruding portion 421B is formed along the circumferential direction of the first lower mold 421 and is formed into a circular ring.

[0076] The upper mold 41 is constituted by the base 413 formed into a cylinder and the protruding portion 414 protruding from the bottom surface of the base 413 in FIG. 7A, similarly to the above. The protruding portion 414 is formed along the circumferential direction of the base 413 and is formed into a circular ring.

[0077] In the third elongation processing, the shell 10 on which the processing up to the score processing has been performed is inserted between the upper mold 41 at the standby position and the lower mold 42 also at the standby position as shown in FIG. 7A, and the shell 10 is placed on the lower mold 42 as shown in FIG. 7B, similarly to the above. Note that, when the shell 10 is placed on the lower mold 42, the curled portion 13 is supported by the protruding portion 421B of the first lower mold 421, and the shell-side protruding portion 10A is located on the inner side of the protruding portion 421B, as shown in FIG. 7B.

[0078] Then, the first lower mold 421 and the second lower mold 422 are moved up also in the processing, as shown in FIG. 7C. Thereby, the curled portion 13 of the shell 10 is held by the first lower mold 421 and the upper mold 41 similarly to the above. When the first lower mold 421 and the second lower mold 422 are moved up, the protruding portion 414 formed in the upper mold 41 is put into the annular groove 12 of the shell 10, as shown in FIG. 7C.

[0079] Subsequently, the second lower mold 422 is further moved up as shown in FIG. 7D. When the second lower mold 422 reaches a predetermined position, a corner (edge) of the second lower mold 422 comes in contact with the one sidewall (inner-side sidewall 12A) out of the two sidewalls (the inner-side sidewall 12A and the outer-side sidewall 12B) constituting the annular groove 12, which is located on the central-part side of the panel 11.

[0080] Further detailed description will be given with reference to FIGS. 8A and 8B. When the second lower mold 422 is moved up in the state where the curled portion 13 of the shell 10 is held by the upper mold 41 and the first lower mold 421, the second lower mold 422 comes closer to the panel 11 as shown by an arrow 8A in FIG. 8A. Then, when the second lower mold 422 reaches the predetermined position, the corner (outer circumferential edge) of the second lower mold 422 comes in contact with the one sidewall (inner sidewall 12A) as shown in FIG. 8B. Note that, in the exemplary embodiment, the peak part of the protruding portion 414 is in contact with the bottom part of the annular groove 12, and thus the position of the annular groove 12 does not change.

[0081] When the second lower mold 422 is further moved up, the inner sidewall 12A as the one sidewall

comes closer to an inner wall 414A (refer to FIG. 8B) of the protruding portion 414, and accordingly, the tension starts acting on the panel 11.

[0082] More specifically, in the exemplary embodiment, the center R1 of the curvature of the inner sidewall 12A is located on the inner side with respect to the center R2 of the curvature of the outer surface of the corner of the second lower mold 422, by the distance Y. Thus, in accordance with the upward movement of the second lower mold 422, the corner of the second lower mold 422 comes in contact with the inner sidewall 12A. Thereby the inner sidewall 12A is inclined toward the inner wall 414A of the protruding portion 414. In response to the behavior, the tension acts on the panel 11.

[0083] Note that, the amount of displacement indicated by the reference symbol Y (the amount of the displacement between the center R1 and the center R2) can be maintained constant in the circumferential direction of the shell 10 formed into a disk, or the amount of the displacement can be increased or decreased according to the location. The distortion of the panel 11 does not uniformly occur in the whole area of the panel 11, but the distortion greatly occurs in the portion where the rivet processing or the score processing has been performed, such as an region shown in a reference numeral 9C in FIG. 9 (front view of the can lid 20 according to the exemplary embodiment). In this case, if the elongation processing is intensively performed on the region shown by the reference numeral 9C, the distortion can be effectively reduced.

[0084] More specifically, since the score line 15 is usually formed at an eccentric position with respect to the center of the panel 11, the distortion generated in the panel 11 tends to occur in the eccentric position with respect to the center of the panel 11. In this case, if the tension acting on the part where the distortion has occurred is increased instead of uniform application of the tension to the whole circumference of the panel 11, the distortion of the panel 11 can be more effectively reduced. Note that, in the example shown in FIG. 9, for example, if the tension acting on the region in the panel 11, which is shown by the reference numeral 9A, is increased, the distortion generated in the panel 11 can be more effectively reduced.

[0085] Note that the aforementioned amount of the displacement (the amount of the displacement between the center R1 and the center R2) is varied in the circumferential direction of the shell 10, and thereby the tension acting on the panel 11 is partially increased in FIG. 9. Instead, the partial increase of the tension can be performed by a configuration shown in FIG. 10 (a view illustrating another configuration example of the upper mold 41).

[0086] In the configuration shown in FIG. 10, the protruding amount of the protruding portion 412B formed in the upper mold 41 is varied, and thereby the tension is intended to be partially increased. In the aforementioned first elongation processing, the tension is applied to the

panel 11 by bringing the protruding portion 412B into contact with the bottom part of the annular groove 12 and pressing down the bottom part. In the case of using the upper mold 41 shown in FIG. 10, the amount at pressing down the bottom part of the annular groove 12 varies in the circumferential direction of the shell 10, and thus the tension acting on the panel 11 can be partially increased.

[0087] Note that the protruding portion 412B (refer to FIG. 4A) may be pressed against part of the annular groove 12 in the first elongation processing described above, although the description thereof has been omitted in the above. More specifically, although the protruding portion 412B is pressed against the whole circumference of the bottom part of the annular groove 12 in the aforementioned description of the first elongation processing, the first elongation processing is not limited to the above example, and the protruding portion 412B may be pressed against part of the annular groove 12.

[0088] In the second elongation processing, the second lower mold 422 is pressed against the whole surface of the panel 11 as shown in FIG. 5D. Instead, the second lower mold 422 may be pressed against part of the panel 11. Similarly, also in the third elongation processing shown in FIGS. 7A to 7D, the second lower mold 422 may be pressed against part of the inner sidewall 12A in the circumferential direction instead of the whole circumference of the inner sidewall 12A (refer to FIG. 7D).

[0089] The aforementioned description has been given for the can lid 20 having a small diameter as an example. However, the aforementioned processing can be performed on the can lid 20 of a regular size. In the case of performing the elongation processing according to the exemplary embodiment on the can lid 20 of the regular size, the aforementioned dent processing (refer to FIG. 1D) can be omitted.

[0090] In the aforementioned description, the elongation processing has been performed by using the annular groove 12 and the like after the score processing and the rivet processing subsequent to the formation of the annular groove 12. However, the procedure is not limited to the above, the score processing and the rivet processing are firstly performed, the annular groove 12 is then formed in the peripheral area of the portion on which the score processing and the rivet processing has been performed, and the elongation processing may be performed by formation of the annular groove 12.

[0091] Detailed description will be given with reference to FIGS. 1A to 1F. For example, in FIG. 1A, the shell 10 only having a flat disk shape is formed, various kinds of processing including the score processing and the rivet processing are performed in FIGS. 1B and 1C, and then the annular groove 12 and the curled portion 13 are formed in the shell 10 by pressing the mold against the shell 10. In the case of the processing, the central part of the shell 10 is elongated in the diameter direction when the annular groove 12 is formed, and the portion on which the score processing or the rivet processing has been performed is elongated when the annular groove 12 is

formed.

[0092] The configuration of the can lid 20 may have a configuration other than the configuration shown in FIGS. 2A and 2B.

5 **[0093]** FIG. 11 is a view illustrating another configuration example of the can lid 20.

[0094] The can lid 20 shown in FIG. 11 has the panel 11 formed into a disk similarly to the above. The tab 16 is attached to the panel 11. In the exemplary embodiment, the tab 16 is fixed to the panel 11 by a rivet 900 provided at a position displaced from the central part (center) of the panel 11.

10 **[0095]** FIG. 12 is a front view illustrating the state of the can lid 20 before the tab 16 is attached to the can lid 20.

15 **[0096]** The panel 11 is formed into a disk, similarly to the above. The rivet processing has been performed on the panel 11, and the protruding portion 14 has been formed in the panel 11, similarly to the above. The protruding portion 14 is provided at a position deviating from the central part CP of the panel 11.

20 **[0097]** In the exemplary embodiment, the score processing has been performed, and thus a first score line 430 has been formed on the surface of the panel 11, similarly to the above. The first score line 430 is formed to enclose a region RA of the panel 11 which is pressed by the tab 16. The first score line 430 is formed to expand toward an outer circumferential edge 410 side of the panel 11, and is formed into an approximately horseshoe shape when the panel 11 is viewed from the front side. Further, the first score line 430 has one end 431 and the other end 432 on the central part CP side of the panel 11, and has a peak 433A on the outer circumferential edge 410 side of the panel 11.

25 **[0098]** In the exemplary embodiment, the one end 431 and the other end 432 are provided on the central part CP side of the panel 11 with respect to a first virtual line KL1 if the first virtual line KL1, which is orthogonal to the centerline CL (also refer to FIG. 11) of the tab 16 and passes through the protruding portion 14, is provided. In the exemplary embodiment, the peak 433A is provided in one region out of two regions opposed to each other with respect to a second virtual line KL2 passing through the central part CP of the panel 11, and the one end 431 and the other end 432 are provided in the other region. In the exemplary embodiment, the protruding portion 14 is provided in the one region.

30 **[0099]** More specifically, the protruding portion 14 turning to the rivet is provided in a section of the panel 11, which is enclosed by the first score line 430 and is located on the peak 433A side in comparison with the one end 431 and the other end 432 of the first score line 430. The first score line 430 has a curved portion 433 as shown in FIG. 12. The curved portion 433 connects the one end 431 and the other end 432, expands toward the side in which the protruding portion 14 has been provided, and passes through a side closer to the outer circumferential edge 410 of the panel 11 than the protruding portion 14.

The curved portion 433 has the peak 433A at a point intersecting with the centerline CL (centerline CL of the tab 16).

[0100] In the exemplary embodiment, a user operates the tab 16, and thus the tab 16 is caused to press the region enclosed by the first score line 430 and the cracking of the panel 11 occurs at a portion where the first score line 430 has been formed (described in detail later). Thereby, the region where the first score line 430 has been formed is formed into a shape like a tongue, and this region bends toward the inside of the beverage can. Accordingly, an opening functioning as a tap is formed in the beverage can. Note that, in the following description, the aforementioned section formed into the shape like a tongue, which has been formed in accordance with the cracking occurring at the first score line 430, may be referred to as a tongue portion in some cases.

[0101] In the exemplary embodiment, a second score line 450 is formed on the surface of the panel 11. Note that the second score line 450 is also constituted by a groove formed on the surface of the panel 11, and functions for assisting the cracking of the panel 11. The second score line 450 has one end 451 and the other end 452. The other end 452 of the second score line 450 is connected to the curved portion 433 of the first score line 430. Thus, in the exemplary embodiment, the score line has a branch at a point where the first score line 430 and the second score line 450 connect.

[0102] The second score line 450 is provided so as to extend from the connection with the first score line 430 into the region enclosed by the first score line 430. The one end 451 of the second score line 450 is provided in the vicinity of the protruding portion 14. More specifically, the second score line 450 has a straight-line portion 453 extending from the other end 452 toward the protruding portion 14. Further, the second score line 450 has a curved portion 454 connecting to the straight-line portion 453, disposed to keep a distance from the protruding portion 14 formed into a cylinder, and provided along the protruding portion 14.

[0103] With reference to FIGS. 13A to 13F (views illustrating the states of the panel 11), the states of the panel 11 during operation of the tab 16 are described. Note that, in FIGS. 13A to 13F, the states of the panel 11 viewed from the front side and the lateral side are illustrated.

[0104] In the exemplary embodiment, when a user pulls up the rear end of the tab 16, a front end 510 (refer to FIG. 11) of the tab 16 presses the aforementioned region RA (refer to FIG. 12) located between the curved portion 454 of the second score line 450 and the peak 433A of the first score line 430. In response to the pressure on the region RA by the tab 16, the panel 11 cracks firstly at the curved portion 454 of the second score line 450 provided to pass between the region RA and the protruding portion 14 (rivet 900) (refer to FIG. 13B).

[0105] Then, the panel 11 further cracks along the second score line 450, which results in the cracking of the

panel 11 extending to the connection between the first score line 430 and the second score line 450. In the exemplary embodiment, the score line has a branch at the aforementioned connection between the first score line 430 and the second score line 450. Accordingly, after the cracking of the panel 11 extends to the aforementioned connection from the aforementioned curved portion 454 of the second score line 450, the cracking further extends toward the one end 431 of the first score line 430 from the connection in the exemplary embodiment, as shown in FIG. 13C. Meanwhile, the cracking also extends toward the other end 432 of the first score line 430 from the connection, as shown in FIG. 13D.

[0106] Then, when the user further pulls up the rear end of the tab 16, the cracking of the panel 11 further extends to the one end 431 and the other end 432 of the first score line 430. Thereby, the region enclosed by the first score line 430 becomes the aforementioned tongue portion. The tongue portion is bent at the bottom of the tongue portion (section located between the one end 431 and the other end 432 of the first score line 430), and the tongue portion enters the inside of the beverage can, as shown in FIG. 13E. Thereby, an opening functioning as a tap is formed in the beverage can. Note that, a slit orthogonal to the longitudinal direction of the tab 16 has been formed on the surface side of the tab 16 in the exemplary embodiment, and accordingly, the tab 16 bends and splits when the pulled-up tab 16 is returned to the original state in the exemplary embodiment, as shown in FIG. 13F.

[0107] Also on the can lid 20 shown in FIGS. 11 to 13F, the elongation processing having been described above has been performed. Thus, the distortion occurring due to the score processing or the rivet processing is reduced.

[0108] As in the exemplary embodiment (as shown in FIG. 12), in the case where the one end 431 and the other end 432 are provided in the one region out of the two regions opposed to each other with respect to the second virtual line KL2 passing through the central part CP of the panel 11 and the peak 433A is located on the other region out of the two regions, the opening is large in comparison with the case where the one end 431, the other end 432 and the peak 433A are located only in any one region out of the two regions.

[0109] Since the opening is likely to be small if the diameter of the can lid 20 is small, such a small opening have difficulty in drinking the contained beverage. However, even if the can lid 20 having a small diameter, since the opening can be formed to be large in the exemplary embodiment, the beverage contained in the can lid 20 can be easily drunk.

[0110] If the opening is made to be large in the typical manufacturing process shown in FIGS. 1A to 1F, the dent processing shown in FIG. 1D is more difficult to be performed, and thus the elongation processing is also difficult. On the other hand, in the exemplary embodiment, since the elongation processing is performed by using the annular groove 12 and the like instead of the dent

processing, the elongation processing can be performed even in the aforementioned case where the large opening is formed.

Reference Signs List

[0111]

11	Panel	
12	Annular groove	
12A	Inner-side sidewall	10
14	Protruding portion	
15	Score line	
20	Can lid	
21	Main body	15

Claims

1. A method for manufacturing a can lid, comprising: 20
 - forming an annular groove in a plate made of a metal;
 - performing deformation processing on an inner-side region of the plate, the inner-side region being located on an inner side of a part where the annular groove is formed; 25
 - applying a tension to the inner-side region by applying external force to a portion where the annular groove has been formed in the panel, after performing the deformation processing. 30
2. The method for manufacturing the can lid according to claim 1, wherein 35
 - applying the tension to the inner-side region further comprises applying the tension to the inner-side region by applying, to the inner-side region, external force that acts toward an outside in a diameter direction of the inner-side region and that is caused by applying external force increasing a depth of the annular groove to the annular groove and increasing the depth of the annular groove. 40
3. The method for manufacturing the can lid according to claim 1, wherein 45
 - forming the annular groove causes a protruding portion to be formed in the plate, the protruding portion protruding from a surface of the plate opposite to the other surface where the annular groove is formed and being formed into an annular shape, and 50
 - applying the tension to the inner-side region further comprises applying the tension to the inner-side region by applying the external force caused by pressing a side of the protruding portion toward an outer-side direction in a diameter direction of the protruding portion, the side being located on an inner side in the diameter direction of the protruding portion formed into the annular shape. 55

4. A method for manufacturing a can lid, comprising:
 - performing deformation processing on a plate made of a metal; and
 - applying external force acting in a thickness direction of the plate, to a portion located on an inner side with respect to an outer-side portion of the plate in a state where the outer-side portion is held, after performing the deformation processing, the outer-side portion being a portion located on an outer peripheral-edge side of the plate and located on an outer side with respect to a processed portion where the deformation processing has been performed.
5. A method for manufacturing a can lid, comprising:
 - performing deformation processing on a plate made of a metal; and
 - forming an annular groove enclosing a processed portion of the plate by performing another deformation processing on a peripheral area of the processed portion of the plate, after performing the deformation processing on the plate, the processed portion being a portion where the deformation processing has been performed.
6. A can body comprising:
 - a main body of a can comprising an opening part and containing a content; and
 - a can lid attached to the opening part of the main body, wherein
 - the can lid is the can lid manufactured by the method for manufacturing the can lid according to any one of claims 1 to 5.
7. A can lid comprising:
 - a base formed into a plate and being to be attached to a main body of a can, the main body containing a content;
 - a processed portion which is located on an inner side of an outer peripheral edge of the base and on which deformation processing has been performed; and
 - an annular groove formed along the outer peripheral edge of the base and around the processed portion, wherein
 - elongation processing is performed on a part of the base by applying external force to the annular groove after the deformation processing is performed on the base, the part being located on the processed portion, or
 - elongation processing is performed on the part of the base by forming the annular groove by another deformation processing after the deformation processing is performed on the base, the

part being located on the processed portion.

8. A can lid comprising:

a base that is formed into a plate and is to be 5
attached to a main body of a can, the main body
containing a content; and
a processed portion which is located in an inner-
side region located on an inner side of an outer 10
peripheral edge of the base, and on which de-
formation processing has been performed,
wherein
elongation processing is performed on a part of
the base by pressing at least part of the inner- 15
side region in a thickness direction of the base
in a state where an outer peripheral edge of the
base is held, after the deformation processing
is performed, the part of the base being a portion
where the deformation processing has been 20
performed.

**9. The can lid according to any one of claims 7 and 8,
wherein**

a score line is formed in the processed portion by 25
the deformation processing, the score line enhanc-
ing cracking of the base when an opening is formed
in the base,
the score line comprises one end and the other end
on a central-part side in a diameter direction of the 30
base, is formed to expand toward an outer periph-
eral-edge side of the base, and further comprises a
peak on the outer peripheral-edge side, and
the score line is formed so that the one end and the
other end are located in one region out of two regions 35
opposite to each other with respect to a central part
in the diameter direction of the base and the peak is
located in the other region.

10. A can body comprising:

a main body of a can comprising an opening part 40
and contains a content; and
a can lid which is attached to the opening part
of the main body, wherein
the can lid is the can lid according to any one of 45
claims 7 to 9.

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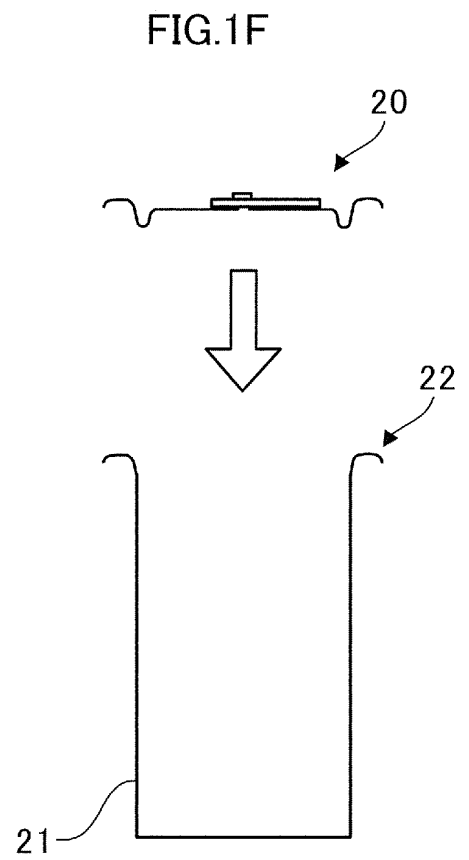
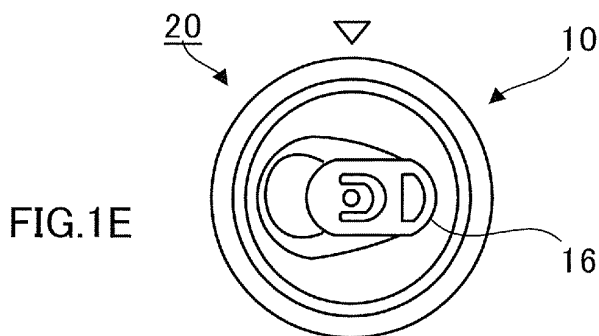
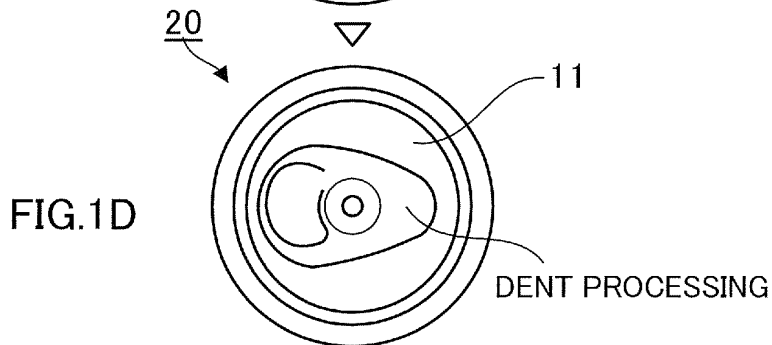
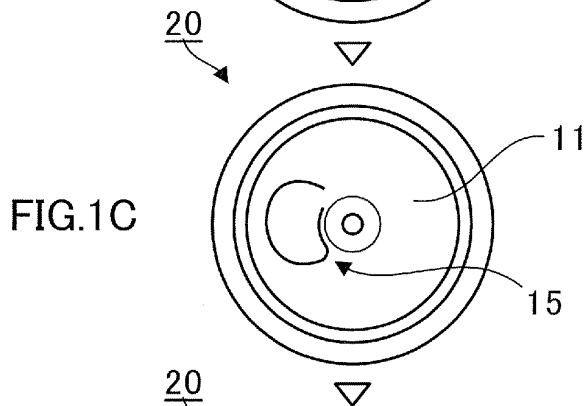
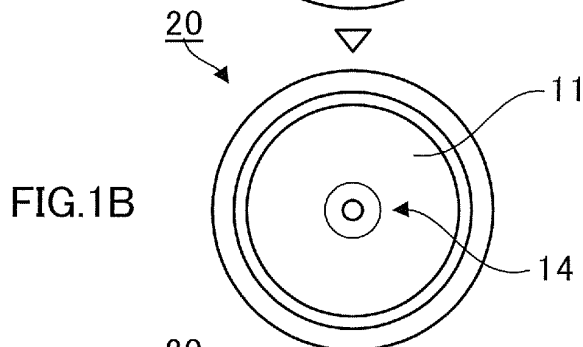
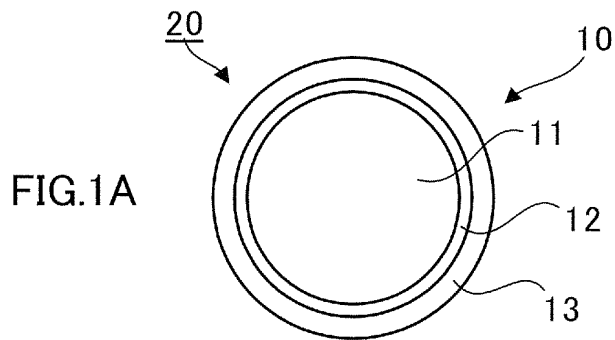


FIG.2A

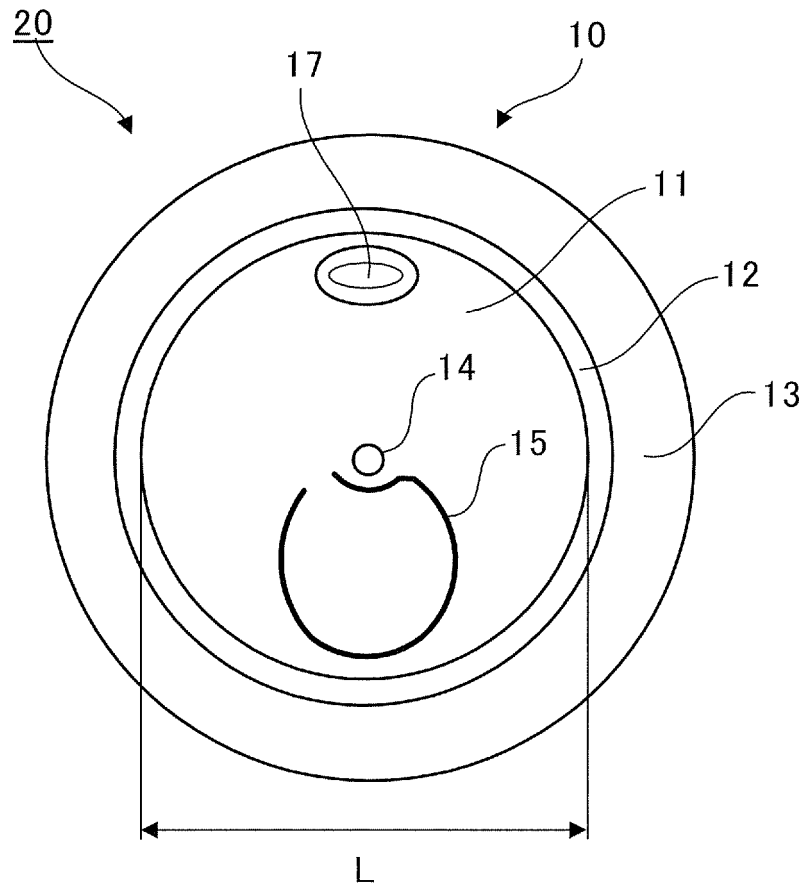
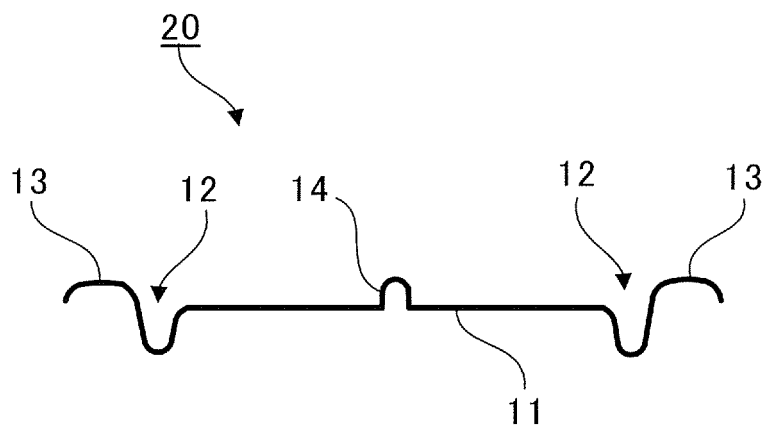


FIG.2B



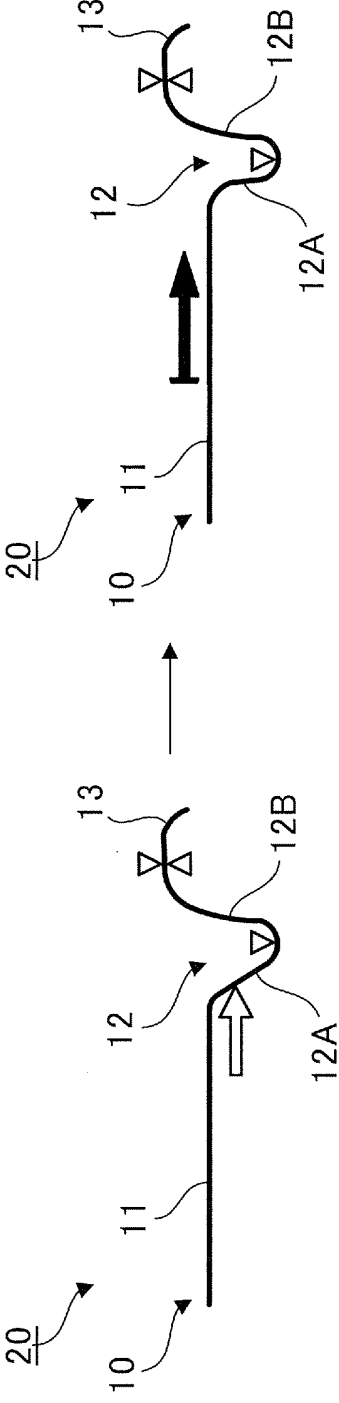
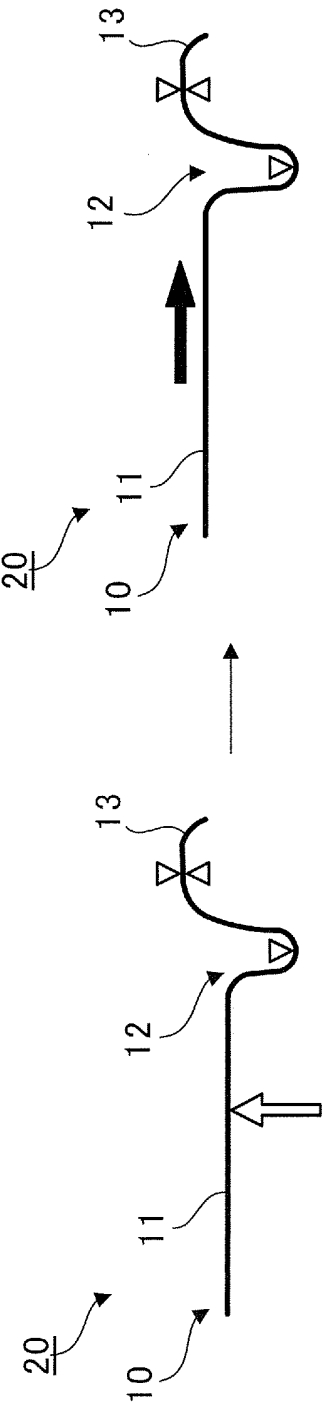
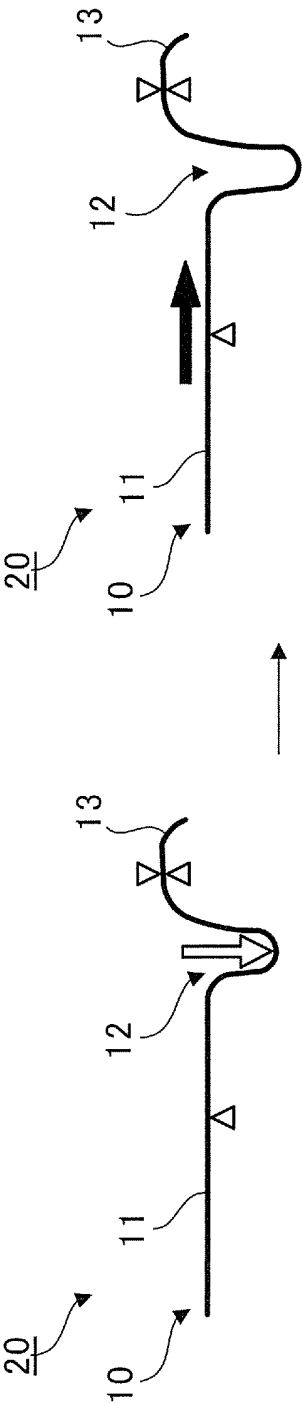


FIG.4A

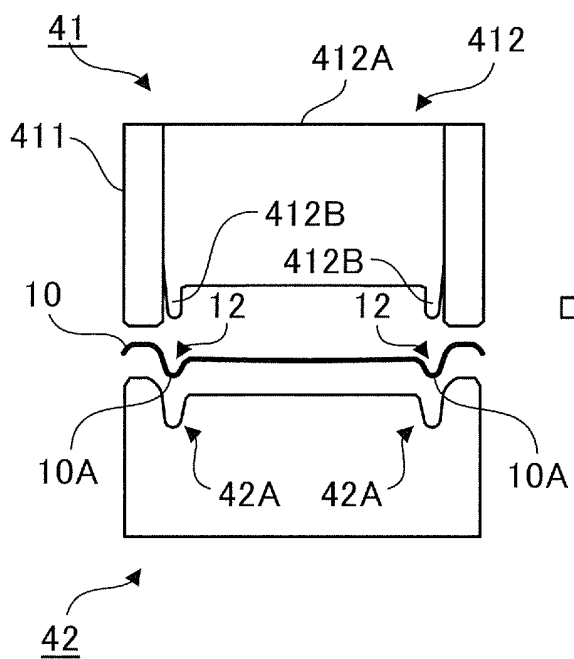


FIG.4B

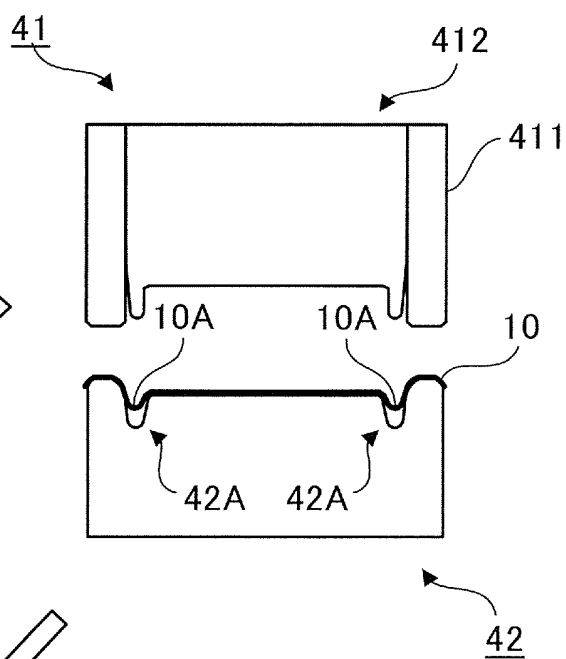


FIG.4C

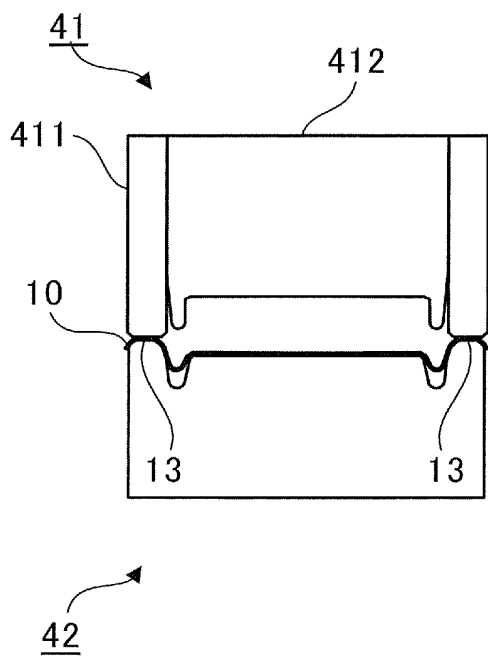


FIG.4D

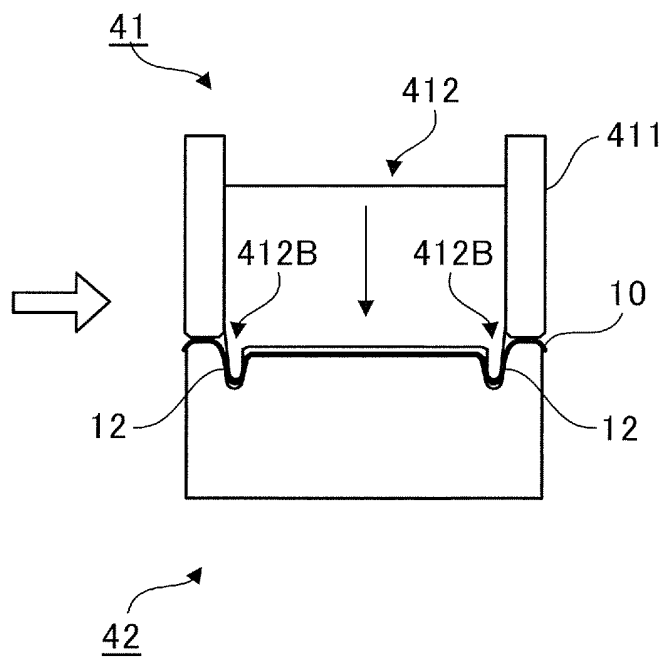


FIG.5A

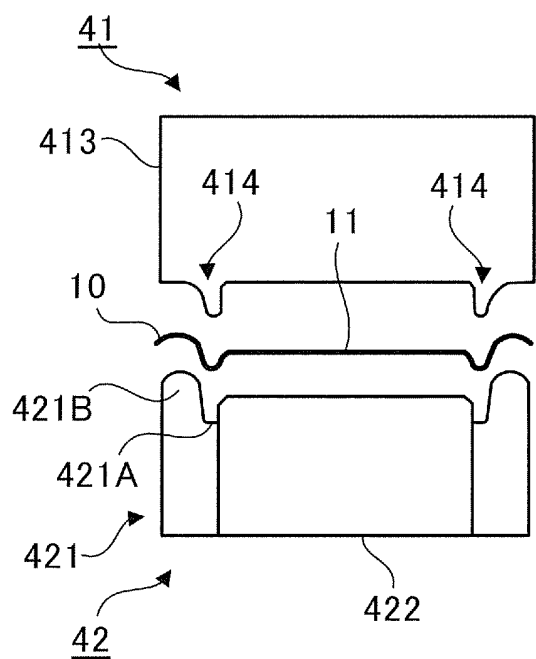


FIG.5B

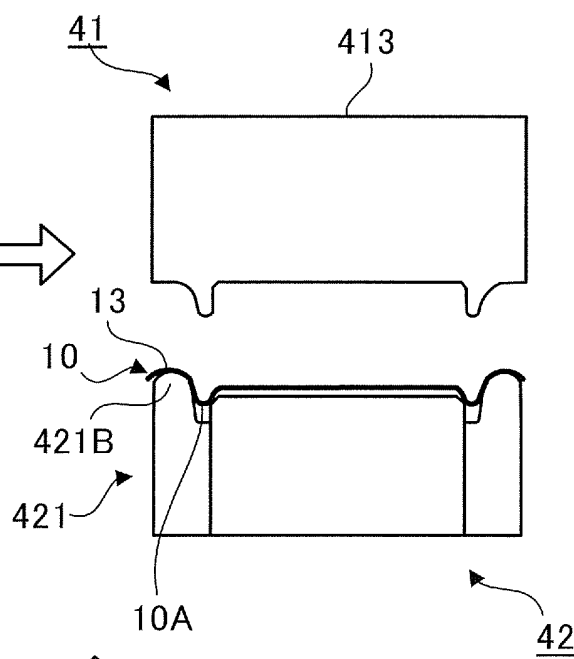


FIG.5C

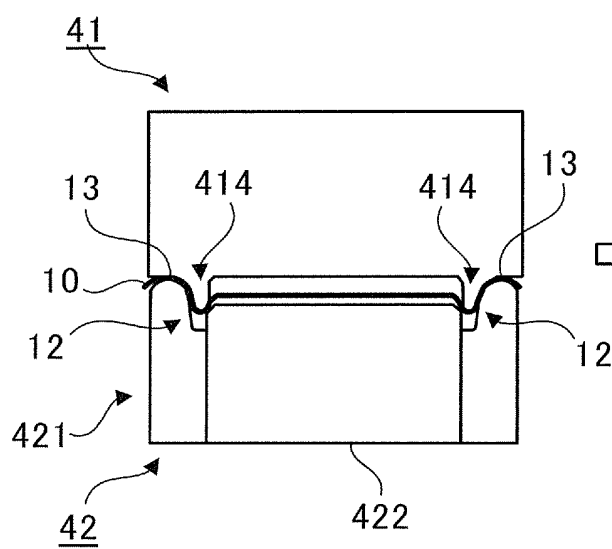


FIG.5D

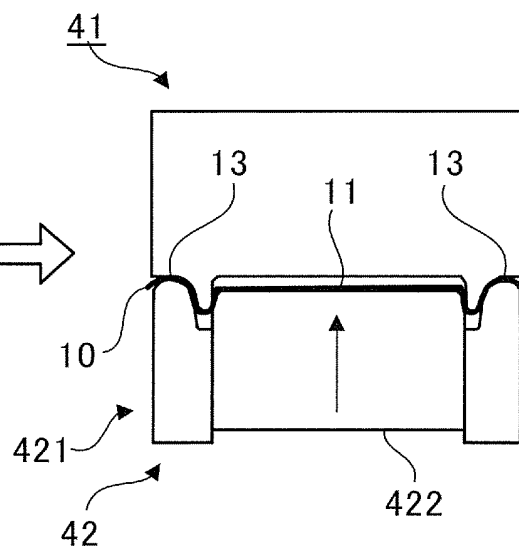


FIG.6A

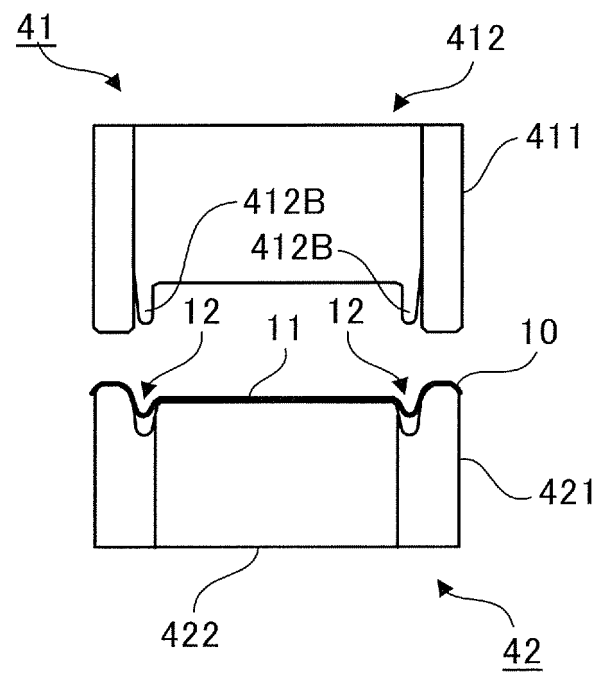


FIG.6B

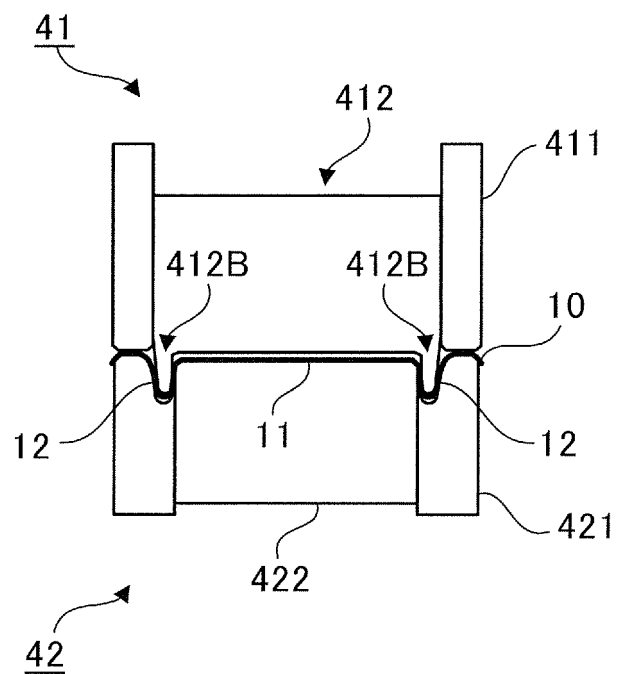


FIG.7A

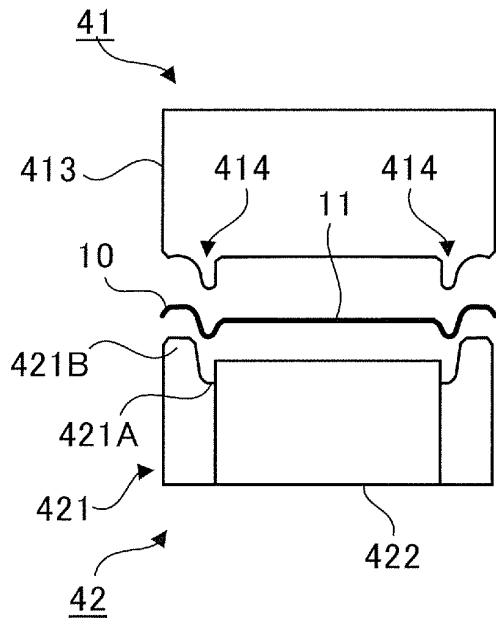


FIG.7B

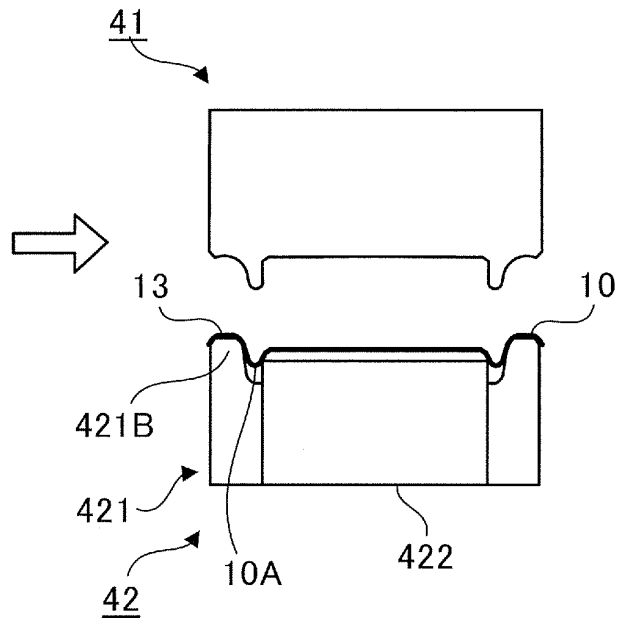


FIG.7C

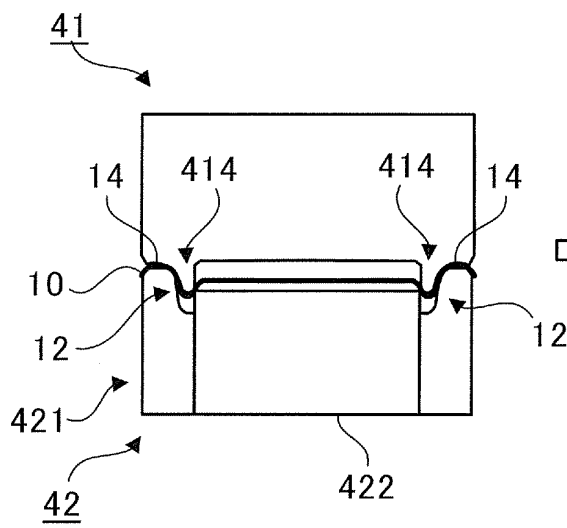


FIG.7D

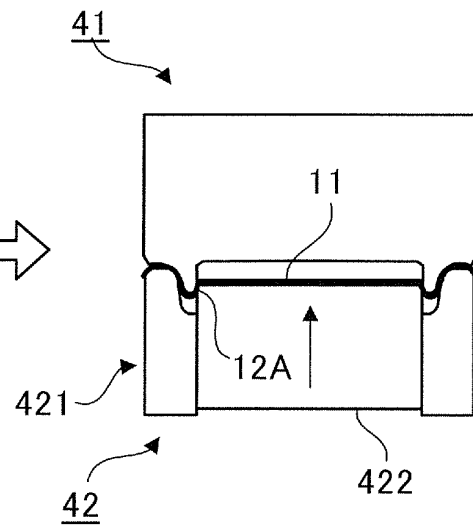


FIG.8A

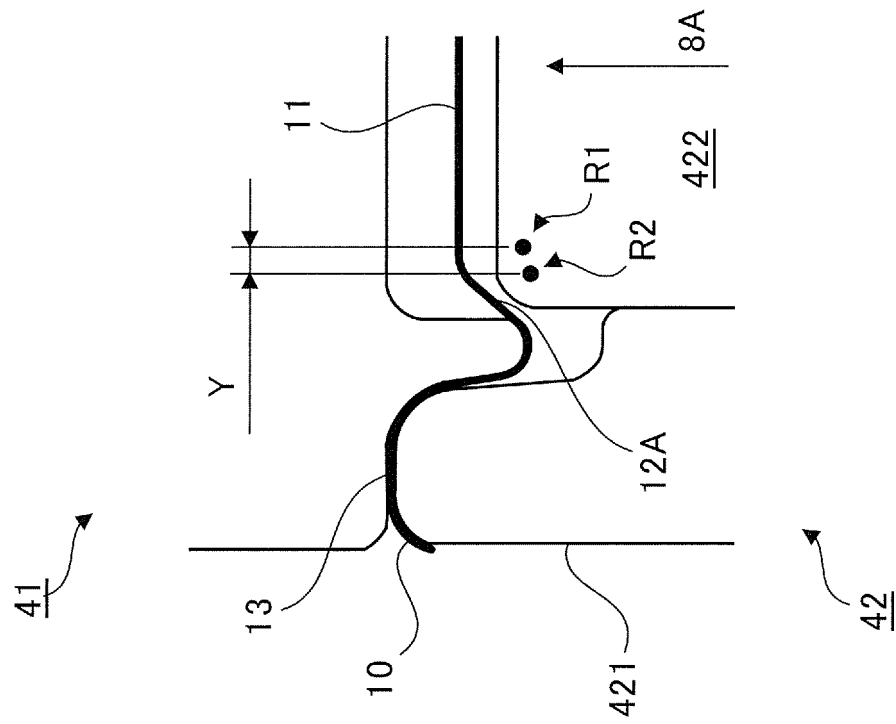


FIG.8B

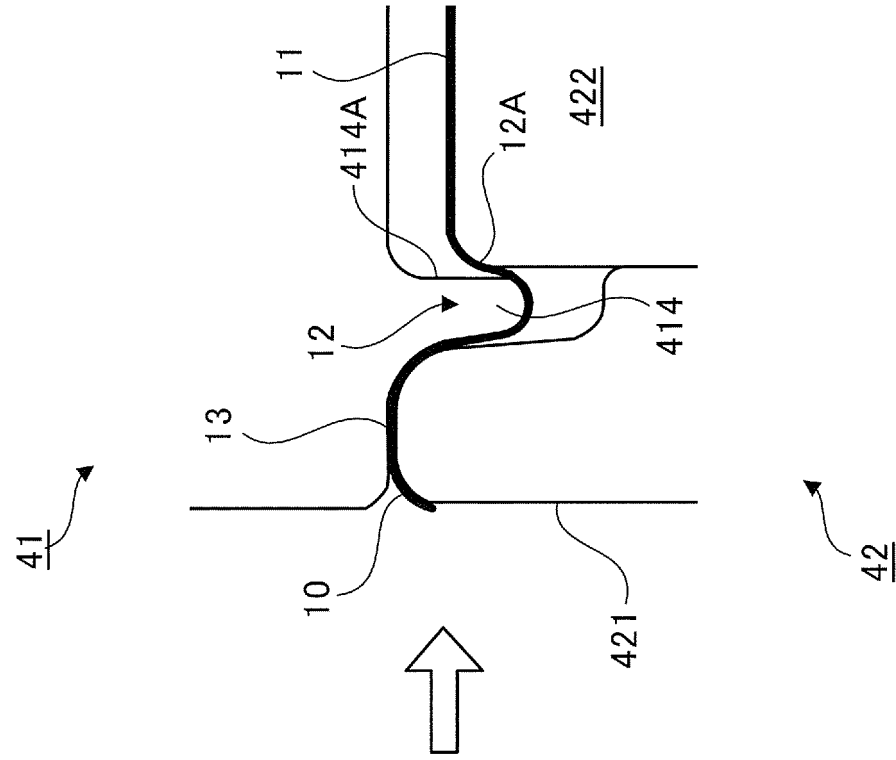


FIG.9

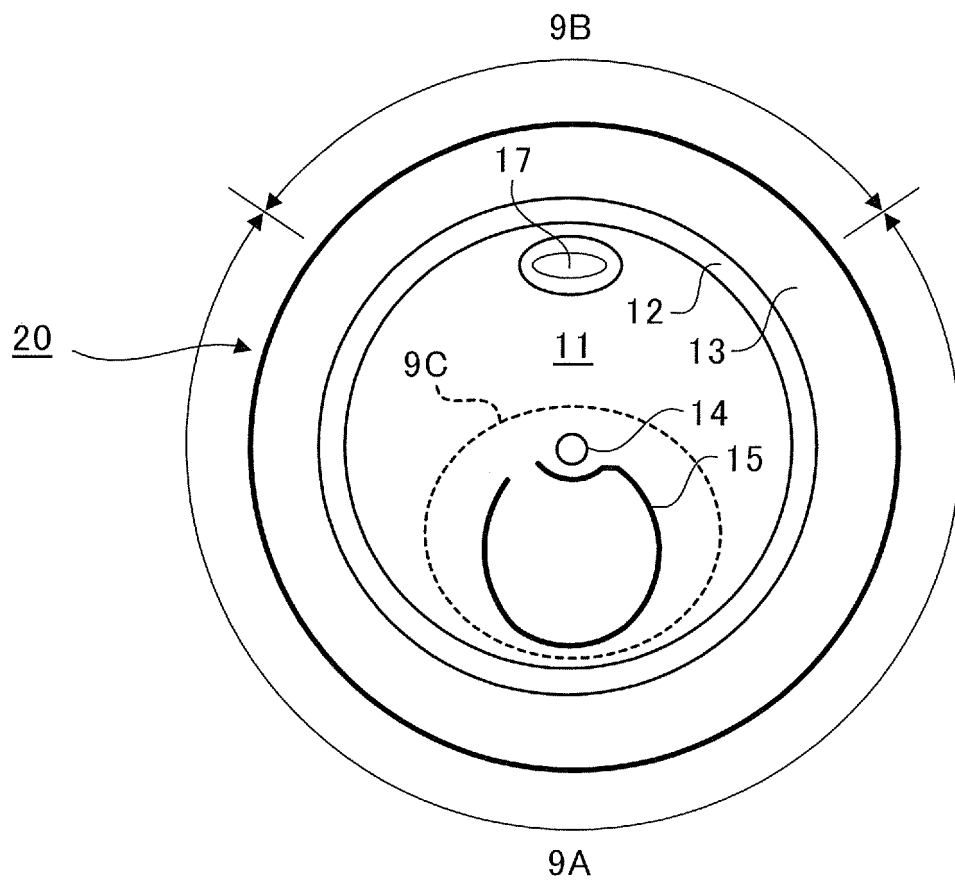


FIG.10

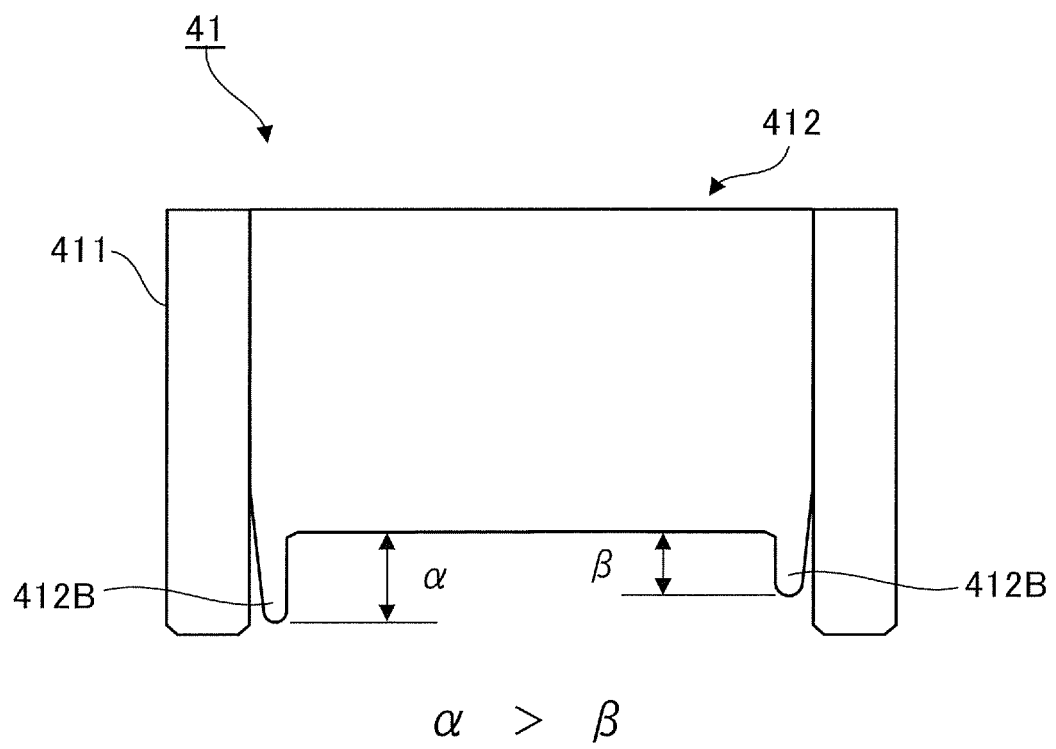


FIG.11

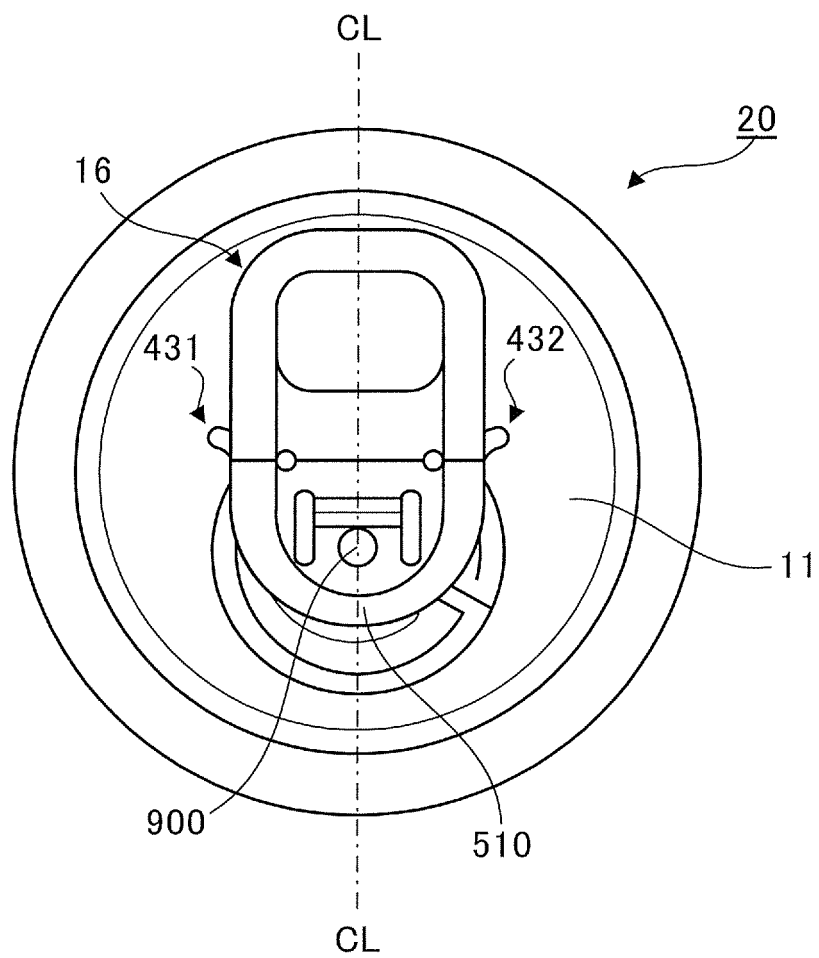


FIG.12

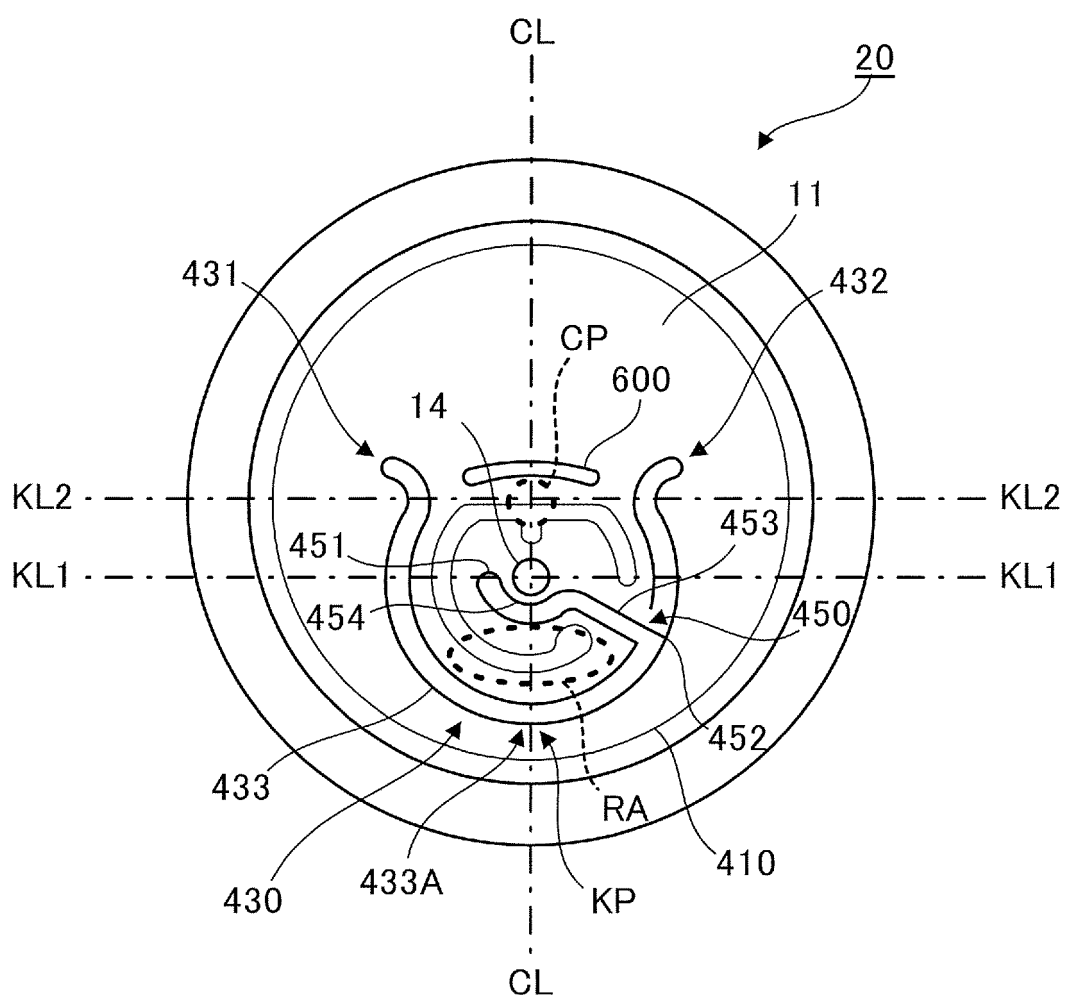


FIG.13A

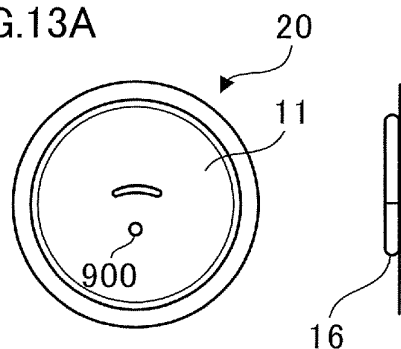


FIG.13B

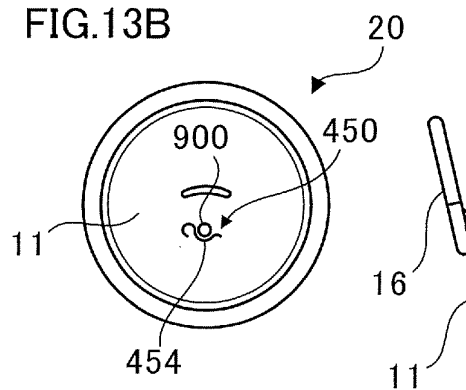


FIG.13C

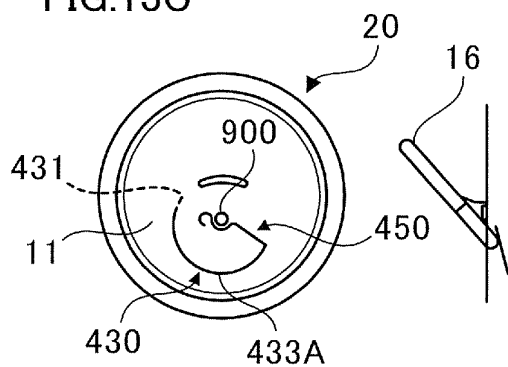


FIG.13D

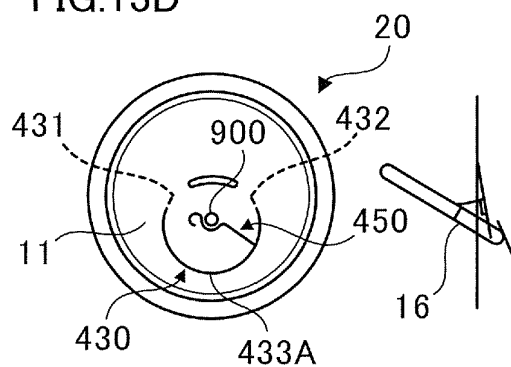


FIG.13E

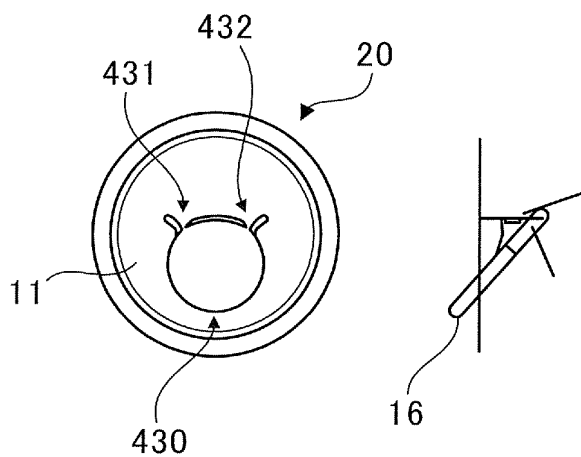
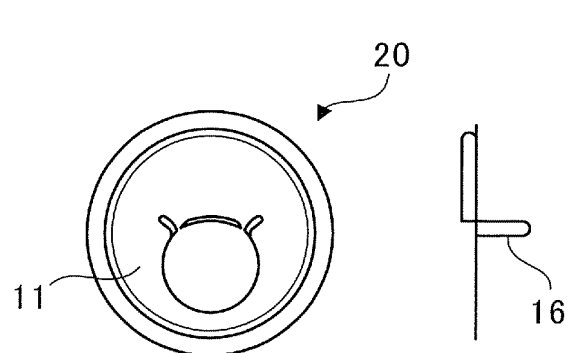


FIG.13F



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2014/055474

A. CLASSIFICATION OF SUBJECT MATTER

B21D51/44(2006.01)i, B21D22/28(2006.01)i, B65D8/04(2006.01)i, B65D17/28(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B21D51/44, B21D22/28, B65D8/04, B65D17/28

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

Jitsuyo Shinan Koho	1922-1996	Jitsuyo Shinan Toroku Koho	1996-2014
Kokai Jitsuyo Shinan Koho	1971-2014	Toroku Jitsuyo Shinan Koho	1994-2014

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.
Y	US 4031837 A (ALUMINUM CO. OF AMERICA), 28 June 1977 (28.06.1977), column 3, line 66 to column 5, line 62; fig. 1 to 6 (Family: none)	1-3, 6-7, 9-10
Y	US 4217843 A (NATIONAL CAN CORP.), 19 August 1980 (19.08.1980), column 5, line 17 to column 7, line 60; fig. 1 to 3 & US 4448322 A & GB 1604068 A & IE 46997 B & GR 60707 A1	1-4, 6-10

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

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"&" document member of the same patent family

Date of the actual completion of the international search
12 May, 2014 (12.05.14)Date of mailing of the international search report
20 May, 2014 (20.05.14)Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

Facsimile No.

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2014/055474

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 60-183353 A (Ball Corp.), 18 September 1985 (18.09.1985), column 11, line 12 to column 18, line 21; fig. 1 to 3 & US 4559801 A & US 4641761 A & EP 139282 A2 & MX 162108 A & AU 3386484 A & CA 1238873 A & AU 574390 B	4, 6, 8-10
X	JP 5-69067 A (Daiwa Can Co.), 23 March 1993 (23.03.1993), paragraphs [0013] to [0015]; fig. 1 (Family: none)	5-6
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 120974/1986(Laid-open No. 28633/1988) (Hokkai Can Co., Ltd.), 25 February 1988 (25.02.1988), fig. 1 to 2 (Family: none)	9-10
Y	JP 2012-144286 A (Showa Aluminum Can Corp.), 02 August 2012 (02.08.2012), fig. 2 (Family: none)	9-10

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

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2010132355 A [0003]