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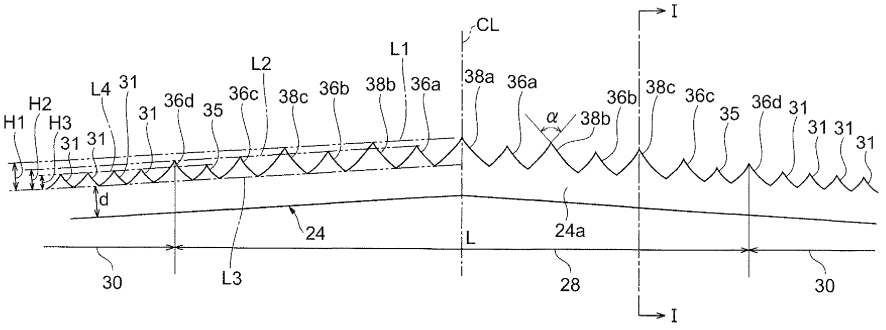
# (54) CUTTING BLADE FOR PACKAGING CONTAINER, AND PACKAGING CONTAINER HAVING THE SAME

(57) The cutting edge 24 for a packaging container comprises a center area 28 and side areas 30 on either side. The center area 28 has a plurality of first teeth 38 with a high tooth height and a plurality of second teeth with a smaller tooth height, one of the first teeth being situated at the V-shaped apex portion and the other first teeth 38 being situated at a prescribed spacing centered around the first tooth 38 at the apex portion, and the second teeth being situated between the first teeth. When the cutting edge is mounted at a prescribed location of the packaging container, the tip section of the first tooth 38 situated at the V-shaped apex portion is curved toward the side opposite the front wall of the cover of the packaging container. A straight line L2 connecting the tips of the second teeth is located between a straight line L1 connecting the tips of the first teeth and a third straight line connecting the bases of the first teeth and second teeth. The side areas 30 comprise a plurality of side teeth 31, and the tips of the side teeth 31 are situated on line L2 or between lines L2 and L3.

***Fig.2***




EP 2 233 403 A1

## Description

### Technical Field

**[0001]** The present invention relates to a packaging container which accommodates a wrap film rolled around a cylindrical core, and to a cutting edge used for the packaging container.

### Background Art

**[0002]** Various types of packaging containers for wrap films have been known in the prior art. Most of these are made of cardboard, and are constructed with a container body that houses a rolled wrap film, and a cover formed integrally with the container body. The wrap film drawn out from the container is cut with a serrated cutting edge attached to the back side of the front wall of the cover.

**[0003]** The cutting edge used is one with a V-shape wherein the middle section of the cutting edge is nearer the base of the container than the sides, instead of a straight edge, to allow easier cutting of the film. Such a shape allows the wrap film to be initially cut from the most protruding section of the cutting edge, for more reliable and easier cutting.

**[0004]** The cutting edge is usually made of metal from the viewpoint of cutting power and durability, but in recent years non-metal materials such as paper or resins have been studied in consideration of environmental problems and user safety.

**[0005]** Such non-metal cutting edges do not readily exhibit the same satisfactory cutting power as metal cutting edges, and since a large force is required to cut highly elastic wrap films such as polyethylene, polypropylene or polyvinylidene chloride, improvement in the cutting power has been desired.

**[0006]** Various cutting edge forms have been proposed as solutions. For example, there has been proposed a form wherein larger teeth are arranged at the apex of the V-shape to facilitate penetration of the teeth into the wrap film at the initial cutting (see Patent documents 1 and 2, for example).

[Patent document 1] Registered Utility Model No. 2547868

[Patent document 2] Japanese Unexamined Utility Model Application Publication HEI No. 7-11527

### Disclosure of the Invention

Problems to be Solved by the Invention

**[0007]** The present inventors have studied the wrap film cutting power, cutting sharpness and durability of cutting edges with V-shaped cutting edges having different tooth arrangements. As a result, it has been found that the conventional V-shaped cutting edges disclosed in Patent documents 1 and 2 do not have sufficient cutting power for wrap films.

**[0008]** The present invention has been accomplished in light of these circumstances, and its object is to provide a cutting edge having sufficiently high cutting power and satisfactory cutting sharpness by optimization of the cutting edge form, as well as a packaging container comprising the cutting edge.

Means for Solving the Problems

**[0009]** The cutting edge of the invention is a non-metallic V-shape cutting edge that is mounted on the back side of the front wall of the cover of a packaging container housing a packaged roll and that serves to cut the packaged roll, the cutting edge being such that:

(a) it comprises a center area that includes the V-shaped apex portion, and side areas on either side of the center area,
(b) the center area has a plurality of first teeth all of the same tooth height and a plurality of second teeth all of the same tooth height with a smaller tooth height than the first teeth,
(c) one of the first teeth is situated at the apex portion while the rest of the first teeth are arranged at prescribed intervals centering around the first tooth at the apex portion,
(e) a second straight line connecting the tips of the second teeth is located between a first straight line connecting the tips of the first teeth and a third straight line connecting the bases of the first teeth and second teeth,
(f) when the cutting edge is mounted at a prescribed location of the packaging container, the tip section of the first tooth arranged on the apex portion is curved toward the side opposite the front wall of the cover, and
(g) the side areas have a plurality of side teeth, the tips of the side teeth being located on the second straight line or between the second straight line and third straight line.

**[0010]** By providing a center area having the tooth configuration described above on the cutting edge, cutting of the

wrap film medium mounted in the packaging container is separated into stages: an initial "piercing" stage at the center area and a subsequent "incision" stage at the side areas. The "piercing" stage is further separated into two steps: a piercing step by the first teeth which have the greatest tooth height, and a piercing step by the second teeth which have a lower tooth height than the first teeth. Since only the first teeth are in contact with the wrap film at the start of cutting, less force is necessary for piercing.

With the first teeth alone, more force would be necessary to pierce the wrap film due to resistance of the valleys between the first teeth, but once it has been pierced with the first teeth, the second teeth penetrate through the wrap film and thus allow smoother piercing of the wrap film.

That is, with the first teeth alone, force would be necessary to pierce the wrap film due to the resistance of the valleys (tooth bases) between the first teeth, but once it has been pierced with the first teeth, the second teeth penetrate through the wrap film, thus further facilitating the "piercing" stage during the initial cutting of the wrap film. The tip sections of the first teeth arranged at the apex portion of the V-shape of the cutting edge of the invention are curved so that they protrude toward the side opposite the front wall side of the cover. By mounting the cutting edge on the cover of the packaging container so that the direction of the tooth tips is toward the wrap film, it is possible to further facilitate initial piercing of the wrap film.

**[0011]** Also, once a pierced section has been formed at the center of the wrap film during the "piercing" stage, strong force is not necessary for further incision of the wrap film, and the wrap film is smoothly incised at the side areas so that the wrap film is cut. The tooth height of each tooth can be measured as the shortest distance between the bottom sections at the recesses formed by adjacent teeth, i.e. a third straight line connecting multiple bases of the teeth, and the tips of the teeth.

**[0012]** In the cutting edge of the invention, the tip sections of the first teeth arranged in the center area and the tips of the second teeth are preferably curved toward the side opposite the front wall of the cover, when it is mounted at a prescribed location of a packaging container.

**[0013]** Thus, the cutting edge having first teeth and second teeth with protruding tips in the center area has higher rigidity in the thickness direction than a flat cutting edge that does not have the tips protruding toward the side opposite the front wall of the cover. The cutting edge is therefore resistant to deformation, and lifting of the cutting edge from the front wall of the packaging container during cutting of the wrap film is also inhibited. It is thus possible for the wrap film to be pierced by the tips without slippage during cutting. The side teeth with relatively low tooth heights, provided in the side area, also facilitate movement from the "piercing" stage to the "incision" stage.

**[0014]** When the cutting edge of the invention is mounted at the prescribed location of the packaging container, the direction of the tooth tips of the tip sections in the longitudinal section, which is perpendicular to the face of the cutting edge on the side in contact with the back side of the front wall (hereunder referred to as "main side") and contains the tooth tips of the tip sections of the first teeth or the tooth tips of the tip sections of the second teeth, forms a prescribed angle $\theta$ with the front wall of the cover, and the angle $\theta$ is preferably 10-40°.

**[0015]** If the tip sections of the first teeth and second teeth of the cutting edge are curved at such an angle, it will be possible to further facilitate piercing of the wrap film at the start of cutting, when the wrap film is cut by the cutting edge mounted on the packaging container. A cutting edge having teeth with tips curved at this angle also has high rigidity in the thickness direction and exhibits adequate durability. It therefore has superior cutting power for wrap films and satisfactory cutting sharpness.

**[0016]** When the cutting edge of the invention is mounted at a prescribed location of the packaging container, the ratio of the lengths of the tips in the direction parallel to the main side to the protruding heights of the tips in the longitudinal section, which is perpendicular to the main side of the cutting edge and contains the tooth tips of the first teeth or the tooth tips of the second teeth, is preferably 1.2-7.

**[0017]** Such a cutting edge can exhibit an even higher level of superior cutting power and satisfactory cutting sharpness and durability.

**[0018]** In addition, the side area preferably has large and small side teeth with different tooth heights, alternately arranged.

**[0019]** Alternately arranging such large and small side teeth with different tooth heights in the side area can reduce the number of side teeth that simultaneously contact the wrap film during transition from the "piercing" stage to the "incision" stage and during the "incision" stage. This smooth transition from the "piercing" stage to the "incision" stage, compared to providing side teeth all of the same tooth height, thus allowing incision cutting of the wrap film to be accomplished with lower force.

**[0020]** The tips of the side teeth are also preferably curved toward the side opposite the front wall of the cover.

**[0021]** A cutting edge having the tips of not only the large and medium teeth in the center area, but also of the side teeth in the side area, curved to protrude toward the side opposite the front wall of the cover will allow even smoother movement from the "piercing" stage to the "incision" stage of the wrap film. A cutting edge that has the tips of the side teeth of the side area also protruding toward the side opposite the front wall of the cover exhibits even greater rigidity in the thickness direction. The cutting edge is therefore resistant to deformation and satisfactorily resistant to lifting of

the cutting edge from the front wall of the packaging container, during cutting of the wrap film. The wrap film cutting power can therefore be even further increased.

**[0022]** The cutting edge of the invention preferably further includes end areas having end teeth with higher tooth heights than the side teeth of the side areas, situated at the outer ends of the side areas.

**[0023]** By arranging teeth, with higher tooth heights than the side teeth of the side areas, at the ends of the cutting edge on the outer ends of the side areas, cutting of the wrap film is separated into two steps, a "piercing" step and a "incision" step, even when cutting of the wrap film is initiated from the end of the wrap film instead of from the center of the wrap film. Since the only teeth in contact with the wrap film at the start of cutting are the end teeth with high tooth heights that are situated at the end areas outside the side areas, less force is necessary for piercing. Thus, the wrap film can be easily cut whether cutting of the wrap film is initiated from the end of the wrap film or whether it is initiated from the center of the wrap film.

**[0024]** Preferably, the oblique side of at least one of the first teeth, second teeth, side teeth and end teeth has an inwardly recessed arc-shape, i.e. the teeth are shaped like gingko leaves.

**[0025]** Such a shape creates an acute angle for the tip angle to ensure cutting power, while also increasing the inter-tooth pitch. This will eliminate the need to increase the number of teeth in a fixed range of length, and will limit the increase in force necessary for piercing of the wrap film. An effect of improved tooth durability is also obtained since the width is increased by the extent of the ends.

**[0026]** According to the invention there is also provided a packaging container comprising a container body housing a packaged roll, a cover formed integrally with the container body and covering part of the front wall of the container body, and the cutting edge described above mounted on the back side of the front wall of the cover.

**[0027]** Since the packaging container comprises a cutting edge having the features described above, it has sufficiently high cutting power for wrap film media, as well as satisfactory cutting sharpness and sufficient durability.

## Effect of the Invention

**[0028]** According to the invention it is possible to provide a cutting edge having both sufficiently high cutting power and satisfactory cutting sharpness by optimization of the cutting edge form, as well as a packaging container comprising the cutting edge.

## Brief Description of the Drawings

**[0029]** Fig. 1 is a perspective view of the form of a packaging container 10 according to the invention.

Fig. 2 is a magnified view of the center of a cutting edge according to a preferred embodiment of the invention.

Fig. 3 is a diagram showing the cross-sectional structure along line I-I in Fig. 2.

Fig. 4 is a longitudinal section diagram of the packaging container 10 of Fig. 1, including the tips of the large teeth 38 and small teeth 36, perpendicular to the main side of the cutting edge 24.

Fig. 5 is a cross-sectional process diagram schematically illustrating a method for producing a packaging container according to this embodiment.

Fig. 6 is a magnified view of the center of a cutting edge according to another embodiment of the invention.

Fig. 7 is a partial magnified view of the side area and end area of one end of a cutting edge according to yet another embodiment of the invention.

Fig. 8 is a drawing showing a schematic view of the cut form of a cut wrap film.

Explanation of Symbols

**[0030]** 3: Tip, 5: body section, 10: packaging container, 12: paper pirn, 14: wrap film, 16: container body, 18: cover, 20: container body rear wall top edge, 22: cover front wall, 23: back side, 24: cutting edge, 24a: main side, 26: container body front wall base, 27: container body front wall, 28: center area, 29: end area, 30: side area, 31: side 1 teeth (side teeth), 32: side 2 teeth (side teeth), 35: small teeth, 36, 36a, 36b, 36c, 36d: medium teeth (second teeth), 38, 38a, 38b, 38c: large teeth (first teeth), 40: end teeth, 60: blade material, 70: lower die, 72: upper die, 76: ultrasonic oscillator, 78: worked section.

## Best Mode for Carrying Out the Invention

**[0031]** Fig. 1 is a perspective view of the form of a packaging container 10 according to the invention. The packaging container 10 is constructed from a single cardboard sheet, and preferably a coated cardboard sheet. As shown in Fig. 1, the packaging container 10 comprises a container body 16 which houses a wrap film 14 rolled around a cylindrical

paper pirn 12, and a cover 18 formed integrally with the container body 16. When covered, the overall shape of the packaging container 10 is essentially rectangular solid. For this embodiment, the wrap film is made of polyvinylidene chloride.

**[0032]** The top of the container body 16 is open, forming an opening to allow the wrap film 14 to be drawn out. The cover 18 extends continuously from the top edge 20 of the rear wall of the container body 16. The cover 18 is thus formed so as to be rotatable with respect to the container body 16 while covering the opening of the container body 16 and a portion of the front wall 27 of the container body.

**[0033]** The front edge of the front wall 22 of the cover 18 is V-shaped, and a V-shaped cutting edge 24 matching its shape is used. When the wrap film 14 is cut using the packaging container 10 employing this V-shaped cutting edge 24, the front edge of the wrap film 14 is taken with one hand and the packaging container 10 is held with the other hand, as shown in Fig. 1, while pressing the thumb of that hand against the center of the cover front wall 22, and twisting the packaging container 10 forward, i.e. in the direction of the arrow A. This causes the teeth at the center area of the V-shaped cutting edge 24 to pierce the wrap film 14, so that pulling the wrap film 14 results in incision and cutting off of the wrap film 14.

**[0034]** The cutting edge 24 of this embodiment will now be explained in detail.

**[0035]** Fig. 2 is a magnified view of the center of a cutting edge according to a preferred embodiment of the invention. The cutting edge 24 is composed mainly of a polyester resin. Such a cutting edge 24 can be obtained by press working or laser shaving an ordinary polyester resin-containing sheet and molding it into teeth with a form according to the invention.

**[0036]** The cutting edge 24 of this embodiment has bilateral symmetry centered around a center line passing through the apex of the V (labeled as CL in Fig. 2), and it is divided into a center area 28 and side areas 30 on either side thereof.

**[0037]** The teeth (side teeth) 31 of the side areas 30 have fixed dimensions and are relatively small, of approximately the same size as teeth commonly used in the prior art. Teeth of this size will hereunder be referred to as "small teeth".

**[0038]** The center area 28 of this embodiment is composed of 15 teeth 35, 36, 38, as shown in Fig. 2. The teeth of the center area 28 are of 3 types: small teeth 35 having the same dimensions as the side teeth 31 of the side area 30, teeth with a larger tooth height than the small teeth 35 (second teeth: hereinafter referred to as "medium teeth") 36, and teeth with an even larger tooth height than the medium teeth 36 (first teeth: hereinafter referred to as "large teeth") 38. In the explanation that follows, alphabetic letters will be appropriately added to the reference numerals 36, 38 for the medium teeth and large teeth.

**[0039]** One of the large teeth 38 (38a) is positioned at the apex portion of the V-shape of the cutting edge 24 (the center in the lengthwise direction of the center area 28), while the other large teeth 38b, 38c are positioned at prescribed intervals with two on either side around the central large tooth 38a as the center. The tip of the first large tooth 38a at the center and the tips of the second and third large teeth 38b, 38c on either side can be connected by a straight line, and the straight line (first straight line) L1 on either side is ahead of the tips of the medium teeth 36 on either side of the center area 28 (away from the front edge of the cover front wall 22 in Fig. 1).

**[0040]** Also, four medium teeth 36 in the center area 28 are located on either side, for a total of eight. The four medium teeth 36a, 36b toward the center are situated at a prescribed interval between the large teeth 38a, 38b, 38c, and the other four medium teeth 36c, 36d are situated on the outside of the third large tooth 38c at the same interval as the large teeth. The tips of the medium teeth 36a, 36b, 36c and 36d on either side can be connected by a straight line (second straight line) L2, the straight line L2 on either side being essentially parallel to the straight line L1 and the third straight line (L3) connecting bases, and located further behind the straight line L1 (nearer the front edge of the front wall 22 of the cover). That is, the straight line L2 is situated between the straight line L1 and the straight line L3.

**[0041]** The straight line (fourth straight line) L4 connecting the tips of the side teeth 31 in the side area 30 on either side is essentially parallel to the straight lines L1, L2 and L3 on the same side, and is located further behind the straight lines L1 and L2 (nearer the front edge of the front wall 22 of the cover). That is, the straight lines L4 on either side are situated between the straight lines L2 and L3.

**[0042]** The small teeth 35 in the center area 28 are arranged between the third and fourth medium teeth 36c, 36d on either side, and their tips are situated on a line extending from the straight line L4 connecting the tips of the side teeth 31 of the side area 30.

**[0043]** In the cutting edge 24b of this embodiment, the tip angle $\alpha$ of each of the small teeth 35, medium teeth 36, large teeth 38 and side teeth 31 are suitable angles for piercing the wrap film 14. For this embodiment wherein the wrap film 14 is made of polyvinylidene chloride, the tip angle $\alpha$ is preferably in the range of 30°-90° and more preferably 40°-70°. If it is larger than 90° a greater amount of force will be necessary to pierce the wrap film 14, and if it is smaller than 30° the durability of the teeth 31-38 themselves will be impaired.

**[0044]** Also, the shapes of the small teeth 35, medium teeth 36, large teeth 38 and side teeth 31 may be simple isosceles triangle shapes, but for this embodiment it is preferred for the oblique sides to form a divergent shape or gingko leaf shape, with the arc recessed inward. This is in order to maintain acute angles for the tip angle $\alpha$, while improving durability. When such a shape is used, it is possible to reduce the number of teeth within the regions of the same length

compared to an isosceles triangle shape, thus contributing to less force required for cutting, as explained below.

**[0045]** Fig. 3 is a diagram showing the cross-sectional structure along line I-I in Fig. 2. That is, Fig. 3 is a longitudinal section diagram of the cutting edge 24, including the tip of a large tooth 38c. The cutting edge 24 and large tooth 38c have a prescribed thickness D. The large tooth 38c has a tip section 3 and a body section 5 formed integrally with the tip section 3 of the large tooth 38c. The tip section 3 of the large tooth 38c is curved from the body section 5 of the large tooth 38c to protrude in the direction of thickness of the cutting edge 24 (downward in Fig. 3).

**[0046]** In Fig. 3, the tip section 3 of the large tooth 38c is integrally formed at a prescribed angle $\theta$ with respect to the body section 5 of the large tooth 38c. The tip section 3 of the large tooth 38c has a prescribed length C in the direction parallel to the main side 24a in the cross-section of Fig. 3. The tip section 3 protrudes in the direction of thickness of the cutting edge 24 in such a manner that the maximum protruding height B from the body section 5 is a prescribed value. The other large teeth 38a, 38b and medium teeth 36a, 36b, 36c in the center area 28 also have cross-sectional structures similar to the large tooth 38c shown in Fig. 3. Thus, the cutting edge 24 of this embodiment has the large teeth 38 and medium teeth 36 curved in an "eagle beak" fashion.

**[0047]** The cutting edge 24 is mounted on the back side of the front wall 22 of the cover 18, in such a manner that when the cover is closed, the tips of the large teeth 38 and medium teeth 36 protrude toward the front wall 27 of the container body that is covered by the cover 18 (Fig. 1). The wrap film 14 can thus be easily pierced by the large teeth 38 and medium teeth 3 6 of the cutting edge 24.

**[0048]** A cutting edge 24 wherein the large teeth 38 and medium teeth 36 in the center area 28 of the cutting edge 24 have the cross-sectional structure shown in Fig. 3, has greater rigidity in the thickness direction compared to a flat cutting edge. The cutting edge 24 is therefore resistant to deformation in the thickness direction during cutting of the wrap film, thus allowing further improvement in cutting power for wrap films.

**[0049]** A case where a wrap film 14 is cut using a packaging container 10 having a cutting edge 24 according to this embodiment will now be explained.

**[0050]** First, the packaging container 10 is held with one hand, the front edge of the wrap film 14 is taken with the other hand, and the desired amount is drawn out, as shown in Fig. 1. The thumb of the hand holding the packaging container 10 is pressed against the center of the cover front wall 22, and the packaging container 10 is twisted forward, i.e. in the direction of the arrow A.

**[0051]** During this time, the first large tooth 38a in the apex portion of the cutting edge 24 is contacted with the wrap film 14 first, and pierces it. Almost simultaneously, the second large teeth 38b and the third large teeth 38c contact the wrap film 14 and pierce it. Thus, since the wrap film 14 is first contacted with at most the five large teeth 38 with a large inter-tooth pitch, a smaller force is necessary to twist the packaging container 10 at the initial cutting. That is, since the minimum force necessary to pierce the wrap film 14 with each of the large teeth 38 is constant, the minimum force for twisting of the packaging container 10 is only about 5 times that force. When the tip angle is small and the inter-tooth pitch is small, as in the prior art, the number of teeth contacting the wrap film 14 is increased so that a greater force must necessarily be applied to the packaging container 10 and the feeling during use is impaired, but such a problem does not arise with this embodiment.

**[0052]** Fig. 4 is a longitudinal section diagram of the packaging container 10 of Fig. 1, including the tips of the large teeth 38 and small teeth 36, perpendicular to the main side of the cutting edge 24. The large teeth of the cutting edge 24 mounted on the back side 23 of the cover front wall 22 have a cross-sectional structure such that the tooth tips at the tip section 3 ends are pointed toward the front wall 27 of the container body, as shown in as shown in Fig. 4. Therefore, the angle $\gamma$ formed between the wrap film 14 and the direction of the tooth tips at the tip section 3 ends of the large teeth may be 10-40° at the start of cutting of the wrap film 14. The wrap film 14 and tips of the cutting edge 24 (large teeth 38) can therefore contact at points, allowing the large teeth 38 to easily pierce the wrap film 14. If the angle $\gamma$ is smaller than 10°, a greater contact area will be present between the large teeth 38 and wrap film 14 during piercing of the wrap film 14, and this will tend to interfere with satisfactory cutting power. On the other hand, if the angle $\gamma$ is greater than 40° the tips of the large teeth 38 and the tips and bases of the large teeth 38 and medium teeth 36 will get caught on the wrap film 14, tending to interfere with satisfactory cutting sharpness.

**[0053]** The medium teeth 36 contact the wrap film 14 next, with the wrap film 14 being penetrated by the medium teeth 36. If no medium teeth 36 were present the pitch between the large teeth 38 would be wider, thus producing more resistance in the valleys between the teeth 38 and increasing the force needed to incise the wrap film 14. With this embodiment, however, the wrap film 14 between the large teeth 38 is penetrated by the medium teeth 36 after the wrap film 14 has been pierced by the large teeth 38, so that piercing of the wrap film 14 is accomplished more smoothly. The maximum number of medium teeth 36 that can simultaneously contact the wrap film 14 is 8, but since fewer than 8 of the medium teeth 36 actually contact the wrap film 14 simultaneously and the wrap film 14 is also pierced by the large teeth 38, thus weakening the periphery, the force required for piercing with the medium teeth 36 is even lower than when piercing is accomplished by the large teeth 38. Thus, the user does not feel resistance from the frst-stage of cutting with the large teeth 38 to the second-stage of cutting by the medium teeth, and the operation is smooth.

**[0054]** The medium teeth 36, like the large teeth 38, also have tip sections that are curved toward the side opposite

the front wall 22 of the cover. That is, the tip sections of the medium teeth 36 are curved so as to protrude in the direction of thickness of the cutting edge 24. Since such medium teeth 36 have a cross-sectional structure wherein the tips are curved so as to protrude toward the front wall 27 of the container body as shown in Fig. 4, it is possible to accomplish piercing of the wrap film 14 more easily than with a conventional flat cutting edge wherein the tips are not curved so as to protrude toward the direction of thickness.

**[0055]** In addition, twisting the packaging container 10 in the direction of the arrow A causes the small teeth 35 of the center area 28 to pierce the wrap film 14 between the third and fourth medium teeth 36c, 36d, so that incision of the wrap film 14 proceeds to the side areas 30. If an initial piercing section of sufficient size is formed in the wrap film 14, the force required to cut the wrap film 14 thereafter will not be very great, and the wrap film 14 will be smoothly incised and cut even in the side areas 30 comprising the side teeth 31.

**[0056]** By using a cutting edge 24 according to this embodiment, a particularly large force is no longer necessary to cut the wrap film 14, and this reduces the need to excessively minimize the tip angle $\alpha$ of the teeth 31,35,36,38, thus improving the durability of the teeth 31,35,36,38.

**[0057]** In addition, since the cutting edge 24 has a prescribed thickness D while comprising large teeth 38 and medium teeth 36 with tip sections curved to protrude toward the front wall 27 of the container body, it has high rigidity in the thickness direction of the cutting edge 24. When the wrap film 14 is cut by rotating the packaging container 10 in the direction A, force pulls the front wall 22 of the cover 18 from the front wall 27 of the container body, i.e. force is applied in the direction of thickness of the cutting edge 24 (upward in Fig. 3), but the cutting edge 24 is not easily deformed because of its high rigidity in the thickness direction. Consequently, lifting of the cutting edge 24 from the front wall 27 of the container body is minimized. As a result, piercing and incision of the wrap film 14 can be accomplished even more easily and the cutting sharpness during cutting is satisfactory.

**[0058]** The thickness of the cutting tooth 24 is preferably 0.05-0.5 mm, more preferably 0.1-0.3 mm and even more preferably 0.15-0.28 mm. An excessively large cutting edge thickness may not result in sufficiently satisfactory cutting power, while an excessively small cutting edge thickness may interfere with satisfactory cutting sharpness. A cutting edge thickness of 0.15-0.28 mm can serve as a cutting edge exhibiting higher levels of both satisfactory cutting power and satisfactory cutting sharpness. The tip sections 3 of the large teeth 38 and medium teeth 36 preferably have approximately the same thickness as the body section 5 (Fig. 3).

**[0059]** If the tooth height of the large teeth 38 and the medium teeth 36 is too great, the distance from the fixed part of the cutting edge 24, i.e. the distance from the front edge of the front wall 22 of the cover, will be increased, potentially impairing the durability. If the tooth height is too large, the hand of the user handling the packaging container 10 may be cut. From the viewpoint of cutting power, durability and safety, therefore, the tooth height H1 of the large teeth 38 in the center area 28, for example, is preferably 1.0-4.0 mm, more preferably 1.2-3.5 mm and even more preferably 1.5-3.0 mm, the tooth height H2 of the medium teeth 36 is preferably 1.0-3.0 mm and more preferably 1.2-2.5 mm, and the tooth height H3 of the small teeth 35 is preferably 0.3-2.5 mm and more preferably 0.5-2.0 mm.

**[0060]** The inter-tooth pitch of the center area 28 is preferably 3.0-9.0 mm, more preferably 4.0-7.0 mm and even more preferably 4.5-6.0 mm between the large teeth 38, and preferably 3.0-9.0 mm, more preferably 4.0-7.0 mm and even more preferably 4.5-6.0 mm between the medium teeth 36. If the inter-tooth pitch is greater than 9.0 mm, the film 14 may become caught in the valleys (bases) between the large teeth 38 at the first stage of "piercing" of the wrap film 14, thus causing a hindrance to cutting, and if the inter-tooth pitch is narrower than 3.0 mm, the number of teeth formed in the center area 28 will be increased, resulting in greater force required for piercing and preventing the object of the invention.

**[0061]** The curvature radius of the tips of the large teeth 38 and medium teeth 36 is preferably 60-100 $\mu$m. A cutting edge 24 with such large teeth 38 and medium teeth 36 has sufficiently excellent cutting power and sufficiently excellent durability.

**[0062]** The length C of the tip sections 3 of the large teeth 38 and medium teeth 36 (Fig. 3) are preferably 0.05-1.0 mm and more preferably 0.05-0.4 mm. The maximum protrusion height B of the tip sections 3 of the large teeth 38 and medium teeth 36 is preferably 0.02-0.2 mm and more preferably 0.02-0.1 mm. The ratio of the length C and the maximum protrusion height B (C/B) of the tip sections 3 is preferably 1.2-7 and more preferably 2-6. A cutting edge 24 comprising large teeth 38 and medium teeth 36 having tip sections 3 with such a ratio of 2-6 has particularly excellent cutting power for wrap films, and satisfactory durability.

**[0063]** The angle $\theta$ formed between the body sections 5 and the tip sections 3 of the large teeth 38 and medium teeth 36 in the center area 28 (Fig. 3) is preferably 10-40° and more preferably 10-20°. A cutting edge 24 comprising large teeth 38 and medium teeth 36 wherein the angle $\theta$ is 10-20° has particularly excellent cutting power for wrap films, and satisfactory durability.

**[0064]** The tooth height H3 of the side teeth 31 in the side area 30 is preferably 0.3-2.5 mm and more preferably about 0.5-2.0 mm. The inter-tooth pitch between the side teeth 31 is preferably 1.0-3.2 mm and more preferably 1.2-2.5 mm.

**[0065]** A method for producing a cutting tooth according to this embodiment will now be explained. Fig. 5 is a cross-sectional process diagram schematically illustrating a method for producing a packaging container according to this

embodiment. The blade material 60 is the material of the cutting edge 24 mounted on the back side 23 of the front wall 22 of the packaging container cover 18. The blade material 60 may be a commercially available laminated sheet obtained by successive lamination of a resin layer, an adhesive layer and a sealant material.

**[0066]** The resin layer of the laminated sheet used as the blade material 60 is preferably composed mainly of polyester resin, polyethylene resin, polypropylene resin, polystyrene resin, acetal resin, polyphenylene sulfide, PEEK (polyether/ether/ketone resin), PES (polyethersulfone resin) or the like. It is preferably composed mainly of polyester resin. This will allow even smoother movement from "piercing" to "incision" of the wrap film, and result in even more excellent durability of the cutting edge. Polyethylene terephthalate (PET) resins and polylactic acid resins are especially preferred among polyester resins.

**[0067]** The resin layer may be formed using a composition comprising other components added to the resin component. As components other than resin components, it may include the inorganic fillers disclosed in Japanese Patent No. 3573605, as well as heat stabilizers, light stabilizers, moisture-proof agents, waterproofing agents, release agents, pigments, dyes and the like. As inorganic fillers there may be used inorganic powders such as barium sulfate, calcium carbonate, titanium oxide, silica and talc.

**[0068]** However, from the viewpoint of obtaining sufficiently high cutting power and durability, the polyester resin content is preferably 80 wt% or greater and more preferably 90 wt% or greater with respect to the total resin layer.

**[0069]** The adhesive layer is formed from a polyurethane-based adhesive. A modified polyethylene resin may be used as the sealant material. As modified polyethylene resins there may be mentioned ethylene/vinyl acetate copolymers, ethylene/methacrylic acid copolymers, and ionomers composed mainly of ethylene resins. Ethylene/methacrylic acid copolymers are particularly preferred among these.

**[0070]** The thickness of the blade material 60 is preferably 0.05-0.5 mm, more preferably 0.1-0.3 mm and even more preferably 0.15-0.28 mm. Such a sheet-like blade material 60 is punched with a lower die 70 and upper die 72 to form the cutting edge 24.

**[0071]** The upper die 72 used to form the cutting edge 24 of this embodiment has a slanted section with a shape complementary to the tip sections of the cutting edge 24, formed at the blade edge of the worked section 78 which is used for punching of the large teeth 38 and medium teeth 36 in the center area 28. As a result, the tip sections of the large teeth 38 and medium teeth 36 are molded during punching in such a manner as to protrude in the direction of thickness of the cutting edge 24.

**[0072]** While the cutting edge 24 is formed by punching the blade material 60 with the lower die 70 and upper die 72, an ultrasonic oscillator 76 is used for irradiation of the packaging container with ultrasonic waves from the front wall 22 of the cover 18, to bond the cutting edge 24 to the front wall back side 23 (ultrasonic bonding method). If such a laminated sheet obtained by laminating a resin layer, adhesive layer and sealant material in that order is used as the blade material 60, it will be possible to anchor the cutting edge 24 to the front wall back side 23 by bonding the sealant material to the front wall back side 23. Thus, the cutting edge 24 bonded to the cover 18 of the packaging container by the sealant material is anchored to the back side of the front wall of the cover of the packaging container by sufficient adhesive force, and therefore it does not easily peel from the packaging container cover.

**[0073]** This production method allows production of a packaging container 10 having the cutting edge 24 provided on the back side 23 of the front wall of the packaging container cover. The method of attaching the cutting edge to the back side of the front wall of the packaging container cover may be a known cold glue method or pressure-sensitive adhesive method.

**[0074]** The above detailed explanation of preferred embodiments of the invention is naturally not intended to restrict the scope of the invention to these particular embodiments.

**[0075]** For example, Fig. 6 is a magnified view of the center of a cutting edge according to another embodiment of the invention. The cutting edge 24 of this embodiment comprises a center area 28 and side areas 30 situated on either side thereof, and it has the same tooth arrangement in the center area 28 as the embodiment described above. The cutting edge 24 of this embodiment differs from the cutting edge 24 of the previous embodiment in that it is provided with large and small side teeth with different tooth heights in the side area 30.

**[0076]** The side areas 30 of the cutting edge of Fig. 6 have side 1 teeth 31 and side 2 teeth 32 with different tooth heights, alternatingly situated in the lengthwise direction. The side 2 teeth 32 have a greater tooth height than the side 1 teeth 31 and the same tooth height as the medium teeth 36 in the center area 28. Consequently, the straight line L2 connecting the tips of the medium teeth 36 in the center area 28 passes through the tips of the side teeth 32 in the side area 30. Also, the straight line L4 connecting the tips of the small teeth 35 in the center area 28 and the tips of the side 1 teeth 31 in the side area 30 is essentially parallel to the straight line L1 connecting the tips of the large teeth 38 in the center area 28, the straight line L2 connecting the medium teeth 36 in the center area 28 and the straight line L3 connecting the bases, and is located further behind the straight lines L1 and L2 (nearer the front edge of the cover front wall 22). That is, the straight line L4 is situated between the straight line L2 and the straight line L3. Only four side teeth are shown in each side area of Fig. 6, but in actuality the side teeth 31, 32 are provided in an alternating fashion up to the end of the cutting edge 24. The cutting edge 24 is also provided with the same tooth arrangement in the other side

area 30, in a symmetrical manner.

**[0077]** The tip angles of the side teeth 31, 32 in the cutting edge 24 of this embodiment have the same tip angles as the large teeth 38 and medium teeth 36. Also, although the shapes of the side teeth 31, 32 may be simple isosceles triangle shapes, it is preferred for the oblique sides to form divergent shapes or gingko leaf shapes, with the arcs recessed inward, similar to the large teeth 38 and medium teeth 36. This is in order to maintain acute angles for the tip angles, while improving durability. When such a shape is used, it is possible to reduce the number of teeth within regions of the same length compared to isosceles triangles, thus contributing to less force required for cutting.

**[0078]** If a cutting edge 24 according to this embodiment is used, having two types of side teeth (side teeth 31, 32) with different tooth heights in the side area as shown in Fig. 6, it is possible to reduce the number of side teeth simultaneously contacting the wrap film 14 during movement from the "piercing" stage to the "incision" stage and as the "incision" stage proceeds, so that the force required for movement from the piercing stage to the incision stage and the force required during the incision stage are reduced.

**[0079]** The tooth height H3 of the side 1 teeth 31 in the side areas 30 is preferably 0.3-2.5 mm and more preferably 0.5-2.0 mm. Also, the tooth height H2 of the side 2 teeth 32 is preferably 1.0-3.0 mm and more preferably 1.2-2.5 mm. The inter-tooth pitch between the side 1 teeth 31 and side 2 teeth 32 is preferably 1.0-3.0 mm and more preferably 1.5-2.5 mm.

**[0080]** Fig. 7 is a partial magnified view of the side area and end area of one end of a cutting edge according to yet another embodiment of the invention. The cutting edge 24 in Fig. 7 has the same tooth arrangement as in Fig. 6, i.e. the embodiment described above, in the center area and side areas. However, the cutting edge 24 of this embodiment differs from the cutting edge of the embodiment described above in that it is provided with end areas 29 having end teeth 40, in the outer ends of the side areas 30 (the sides opposite the center area). The cutting edge 24 of this embodiment also has the same tooth arrangement shown in Fig. 7 in the other end area as well.

**[0081]** The end teeth 40 in the end areas 29 of the cutting edge 24 of this embodiment have tooth heights that are higher than the side 1 teeth 31 and side 2 teeth 32 in the side area 30. The straight line L5 connecting the tips of the end teeth 40 is located between the straight line L1 connecting the large teeth of the center area and the straight line L2 connecting the medium teeth of the center area. By thus providing end teeth 40 with greater tooth heights than the side teeth of the side area, it is easy to cut the wrap film even when cutting of the wrap film is initiated from one end of the cutting edge 24. That is, the wrap film can be easily cut with satisfactory feeling during cutting, whether the wrap film is initially cut from the apex portion of the cutting edge or from one end of the cutting edge.

**[0082]** The tooth height H4 of the end teeth 40 is preferably 0.8-3.5 mm, more preferably 0.9-2.0 mm and even more preferably 1.0-1.5 mm. The inter-tooth pitch between the end teeth 40 is preferably 0.5-3.5 mm and more preferably 0.7-2.5 mm.

**[0083]** Only end teeth 40 having the same tooth height are arranged in the end area 29 for the embodiment described above, but end teeth with different tooth heights may be provided, alternatingly for example, as in the side area 30. End teeth with higher tooth heights than the side teeth and end teeth with lower tooth heights than the side teeth may also be provided in the end area 29.

**[0084]** Although the packaged roll wrap films were composed of polyvinylidene chloride in the embodiments described above, the invention may be applied to wrap films made of other resins as well. In such cases, the tooth heights, inter-tooth pitch and tip angles may be appropriately modified from the dimensions mentioned above. In addition, the packaged roll may be aluminum or paper instead of a wrap film.

**[0085]** The number of teeth in the center area may also be greater or smaller than in the embodiments described above, but a construction with at least two stages of contact of the wrap film with the teeth is an essential condition. In the embodiments described above, the tip directions of the tip sections of all of the large teeth and the tip sections of all of the medium teeth in the center area were protruding toward the front wall of the container body, but the effect of the invention can still be obtained with a cutting edge wherein only the tip directions of the tip sections of the large teeth in the V-shaped apex portion are protruding toward the front wall of the container body. Also, the tip directions of the tip sections of the side teeth in the side area or the end teeth in the end area, instead of only the tip sections of the large teeth and medium teeth in the center area, may protrude toward the front wall of the container body, similar to the tip sections of the large teeth and medium teeth in the center area.

Examples

**[0086]** The present invention will now be explained in greater detail based on examples, comparative examples and reference examples, with the understanding that these examples are in no way limitative on the invention.

(Example 1)

**[0087]** A commercially available polyethylene terephthalate resin sheet (biaxial-stretched (crystalline), thickness: 250

μm) was used to fabricate a V-shaped cutting edge. The cutting edge comprised a center area 28 and side areas 30 on both outer sides of and adjacent to the center area, as shown in Fig. 6. Specifically, it had 5 large teeth 38, 8 medium teeth 36 and 2 small teeth 35 in the center area 28, and 37 side 1 teeth 31 and 38 side 2 teeth 32 in the side areas 30. The tooth heights of the large teeth 38 were 1.7 mm, the tooth heights of the medium teeth 36 were 1.2 mm, the tooth heights of the small teeth 35 were 0.8 mm, the tooth heights of the side 1 teeth 31 were 0.8 mm and the tooth heights of the side 2 teeth 32 were 1.2 mm.

**[0088]** The large teeth 38 and medium teeth 36 in the center area 28 of the cutting edge had tip sections 3 curved so as to protrude in the direction of thickness of the cutting edge, as shown in Fig. 3. The length C in the direction parallel to the main side 24a of each tip section 3 of the large teeth 38 and medium teeth 36 was 0.30 mm, and the maximum protruding height B of each tip section 3 was 0.08 mm. In the cross-section of the cutting edge 24, such as shown in Fig. 3, the angle θ formed between the tip section 3 and body section 5 of each large tooth 38 and medium tooth 36 was 15°.

**[0089]** This cutting edge was bonded to a packaging container used for NEW KUREWRAP$^{R}$ (coated cardboard container, length: approximately 31 cm, width: 4.5 cm, height: 4.5 cm), produced and sold by Kureha Corp., and a packaging container housing a polyvinylidene chloride wrap film was produced, as shown in Fig. 1. The tips of the large teeth 38 and medium teeth 36 in the center area 28 of the cutting edge were curved toward the side opposite the front wall 22 of the cover, and the angle formed between the tip directions of the large teeth 38 and medium teeth 36 and the cover front wall 22, in the longitudinal section including the tips of the large teeth 38 and medium teeth 36 perpendicular to the main side 24a, was 15°. The angle γ formed between the tip directions of the tip sections 3 of the large teeth and medium teeth of the cutting edge and the container body front wall, when the cover was closed (Fig. 4), was 15°.

(Examples 2 and 3)

**[0090]** Cutting edges with the same shape (same cross-sectional shape) as Example 1 were fabricated, and packaging containers were fabricated in the same manner as Example 1.

(Comparative Examples 1 and 2)

**[0091]** A commercially available polyethylene terephthalate resin sheet (biaxial-stretched (crystalline), thickness: 250 μm) was used to fabricate a V-shaped cutting edge. The cutting edge comprised a center area 28 and side areas 30 on both outer sides thereof and adjacent thereto, as shown in Fig. 6. Specifically, it had 5 large teeth 38, 8 medium teeth 36 and 2 small teeth 35 in the center area 28, and 37 side 1 teeth 31 and 38 side 2 teeth 32 in the side areas 30. The tooth heights of the large teeth 38 were 1.7 mm, the tooth heights of the medium teeth 36 were 1.2 mm, the tooth heights of the small teeth 35 were 0.8 mm, the tooth heights of the side 1 teeth 31 were 0.8 mm and the tooth heights of the side 2 teeth 32 were 1.2 mm.

**[0092]** The cross-sectional shape of the cutting edge was flat, as a conventional cutting edge, and none of the tips of the teeth were curved in the thickness direction of the cutting edge.

**[0093]** Each cutting edge was bonded to a packaging container used for NEW KLTREWRAP$^{R}$ (coated cardboard container, length: approximately 31 cm, width: 4.5 cm, height: 4.5 cm), produced and sold by Kureha Corp., and a packaging container housing a polyvinylidene chloride wrap film was produced with each, as shown in Fig. 1. The angle γ formed between the tip directions of the tip sections 3 of the large teeth and medium teeth of the cutting edge and the container body front wall, when the cover was closed (Fig. 4), was 0°.

<Cutting power test 1>

**[0094]** Each of the packaging containers of Examples 1-3 and Comparative Examples 1 and 2, fabricated as described above, was set in a tensile tester and the polyvinylidene chloride wrap film drawn out from the packaging container was pulled and cut at a fixed angle of 60° with respect to the cover front wall, as a tensile test. The cutting force (g) was determined from the initially detected peak in the tensile test.

**[0095]**

[Table 1]

| | Cutting power test 1 (g) | | | | |
|---|---|---|---|---|---|
| | Example 1 | Example 2 | Example 3 | Comp. Example 1 | Comp. Example 2 |
| 1 | 230 | 230 | 290 | 430 | 410 |
| 2 | 225 | 220 | 330 | 450 | 340 |

(continued)

| | Cutting power test 1 (g) | | | | |
|---|---|---|---|---|---|
| | Example 1 | Example 2 | Example 3 | Comp. Example 1 | Comp. Example 2 |
| 3 | 225 | 290 | 260 | 410 | 290 |
| 4 | 350 | 280 | 320 | 450 | 290 |
| 5 | 380 | 250 | 240 | 500 | 310 |
| Average | 282 | 254 | 288 | 448 | 328 |

<Cutting power test 2>

**[0096]** Each of the packaging containers fabricated in Example 1 and Comparative Example 1 was used to cut wrap film by a common method, and the cut shape of the cut wrap film was visually observed. Fig. 8(a) shows a schematic view of the cut shape of wrap film cut with the packaging container of Example 1. Fig. 8(b) shows a schematic view of the cut shape of wrap film cut with the packaging container of Comparative Example 1.

**[0097]** The cut shape of the wrap film cut with the packaging container of Example 1 had the same shape as the cutting edge. The packaging container of Example 1 therefore had satisfactory cutting sharpness.

**[0098]** On the other hand, the cut shape of the wrap film cut with the packaging container of Comparative Example 1 was not the same as the shape of the cutting edge. The cut shape shown in Fig. 8(b) shows that the wrap film had stretched during cutting. The cutting power of the packaging container of Comparative Example 1 was poor, as indicated by the ruptured shape.

<Durability test>

**[0099]** The packaging containers of Example 1 and Comparative Example 1 were used for a durability test. Specifically, the cutting power test 1 described above was repeated 300 times and the cutting force was measured in the same manner as cutting power test 1. The measurement was repeated 5 times and the average value was calculated. The measurement results are shown in Table 2.

**[0100]**

[Table 2]

| | Durability test (g) | |
|---|---|---|
| | Example 1 | Comp. Example 1 |
| 1 | 250 | 350 |
| 2 | 320 | 330 |
| 3 | 280 | 325 |
| 4 | 250 | 300 |
| 5 | 350 | 310 |
| Average | 290 | 323 |

**[0101]** The results of the durability test demonstrated that Example 1 had more satisfactory durability than Comparative Example 1.

## Industrial Applicability

**[0102]** According to the invention it is possible to provide a cutting edge having both sufficiently high cutting power and satisfactory cutting sharpness by optimization of the cutting edge form, as well as a packaging container comprising the cutting edge.

## Claims

1. A cutting edge for a packaging container, which is a non-metallic V-shaped cutting edge that is mounted on the back side of the front wall of the cover of a packaging container housing a packaged roll and that serves to cut the packaged roll, the cutting edge comprising:

   a center area that includes the V-shaped apex portion; and
   side areas on either side of the center area,
   wherein the center area has a plurality of first teeth all of the same tooth height and a plurality of second teeth all of the same tooth height with a smaller tooth height than the first teeth,
   one of the first teeth is situated at the apex portion while the rest of the first teeth are arranged at prescribed intervals centering around the first tooth at the apex portion,
   the second teeth are situated between the first teeth,
   a second straight line connecting the tips of the second teeth is located between a first straight line connecting the tips of the first teeth and a third straight line connecting the bases of the first teeth and second teeth,
   when the cutting edge is mounted at a prescribed location of the packaging container, the tip section of the first tooth arranged on the apex portion is curved toward the side opposite the front wall of the cover, and
   wherein the side areas have a plurality of side teeth, the tips of the side teeth being located on the second straight line or between the second straight line and the third straight line.

2. The cutting edge for a packaging container according to claim 1, wherein the tip sections of the first teeth and the tip sections of the second teeth arranged in the center area are curved toward the side opposite the front wall of the cover, when the cutting edge is mounted at a prescribed location of the packaging container.

3. The cutting edge for a packaging container according to claim 2, wherein when the cutting edge is mounted at a prescribed location of the packaging container,
   the direction of the tooth tips of the tip sections in the longitudinal section, which is perpendicular to the face of the cutting edge on the side in contact with the back side of the front wall and contains the tooth tips of the tip sections of the first teeth or the tooth tips of the tip sections of the second teeth, forms a prescribed angle $\theta$ with the front wall of the cover, and the angle $\theta$ is 10-40°

4. The cutting edge for a packaging container according to claim 2 or 3 wherein when the cutting edge is mounted at a prescribed location of the packaging container,
   the ratio of the lengths of the tip sections in the direction parallel to the face of the cutting edge with respect to the protruding heights of the tip sections, in the longitudinal section which is perpendicular to the face of the cutting edge and contains the tooth tips of the tip sections of the first teeth or the tooth tips of the tip sections of the second teeth, is 1.2-7.

5. The cutting edge for a packaging container according to any one of claims 1 to 4, wherein the side areas have two different types of side teeth with different tooth heights, alternately arranged.

6. The cutting edge for a packaging container according to any one of claims 1 to 5, wherein the tip sections of the side teeth are curved toward the side opposite the front wall of the cover.

7. The cutting edge for a packaging container according to any one of claims 1 to 6, further comprising end areas, having end teeth having higher tooth heights than the side teeth in the side areas, at the ends of the cutting edge on the outer sides of the side areas.

8. The cutting edge for a packaging container according to any one of claims 1 to 7, wherein at least one of the oblique sides of the first teeth, the second teeth and the side teeth is an inwardly recessed arc-shape.

9. The cutting edge for a packaging container according to claim 7, wherein at least one of the oblique sides of the first teeth, the second teeth, the side teeth and the end teeth is an inwardly recessed arc-shape.

10. A packaging container comprising a container body housing a packaged roll, a cover formed integrally with the container body and covering part of the front wall of the container body, and a cutting edge according to any one of claims 1 to 9 mounted on the back side of the front wall of the cover.

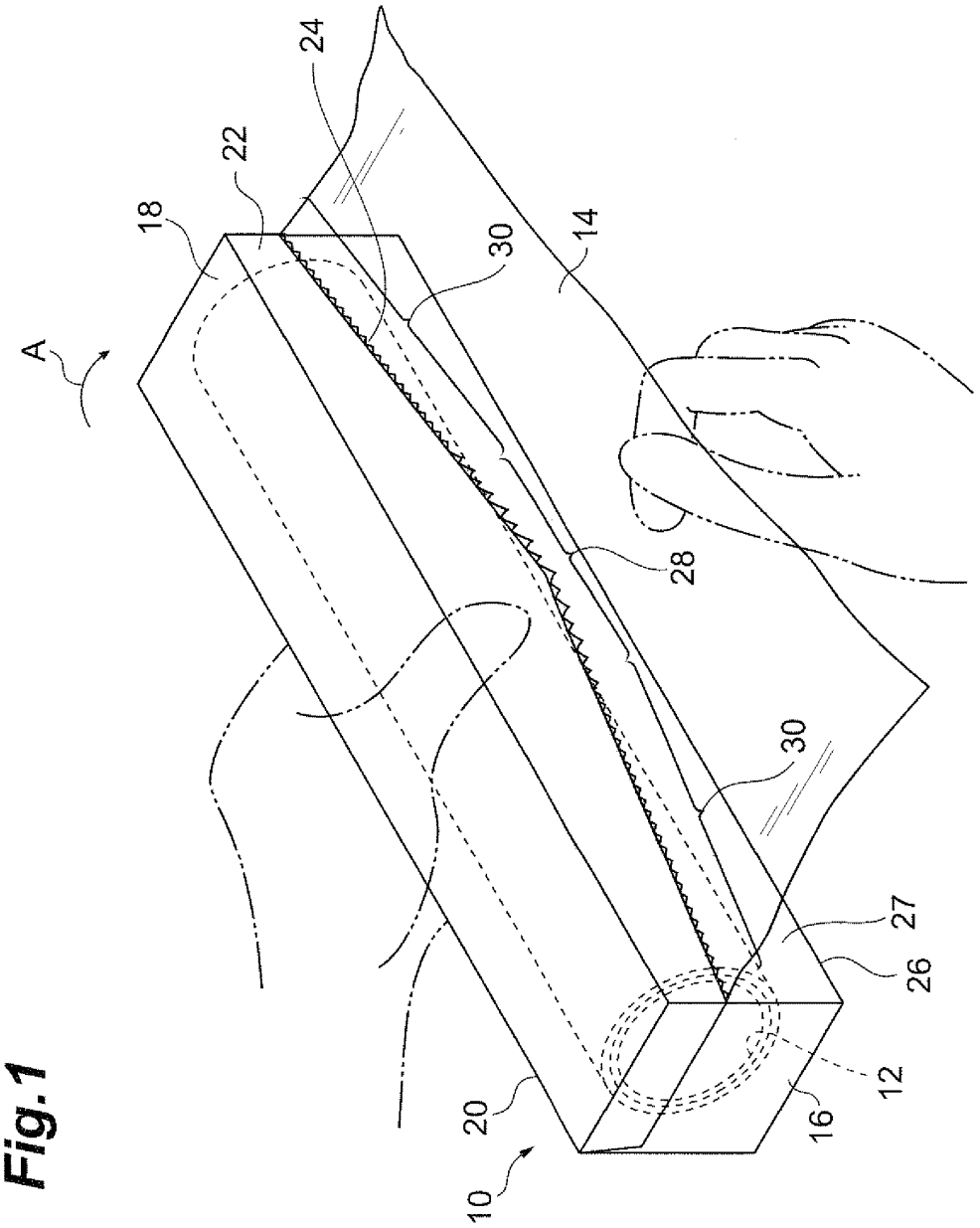



Fig.1

*Fig.2*

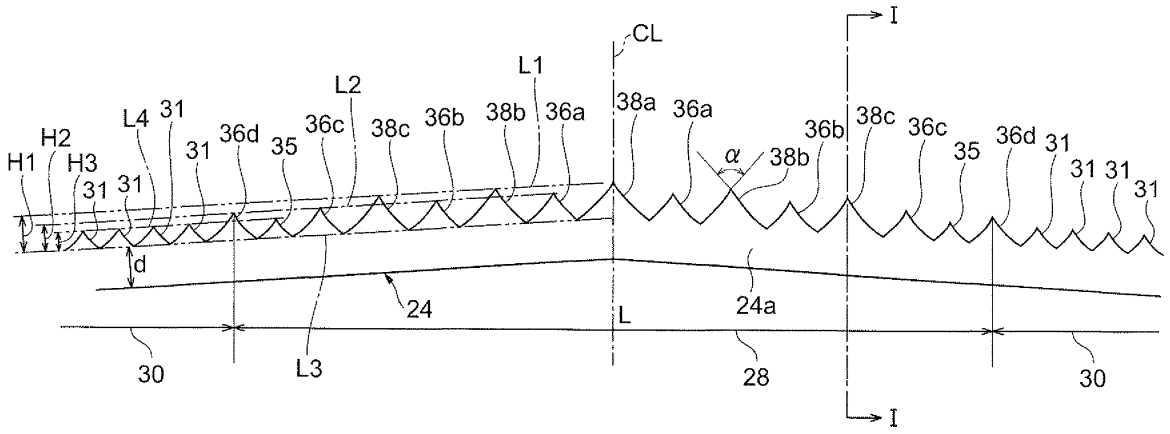

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*Fig.3*

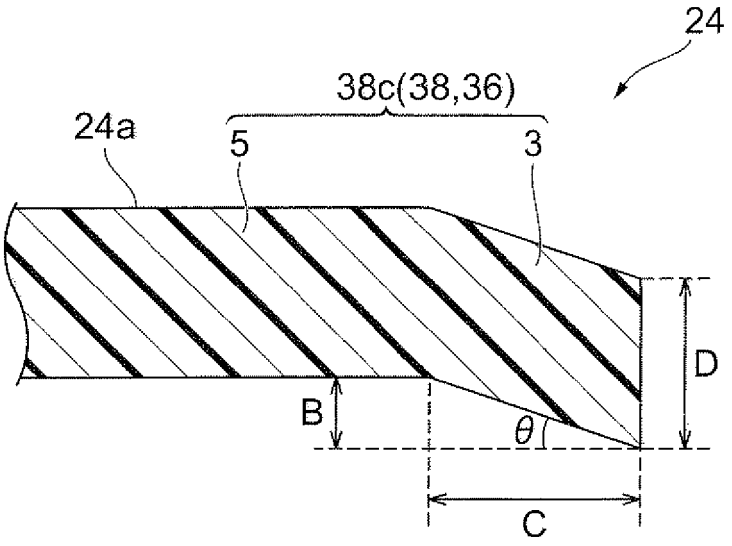
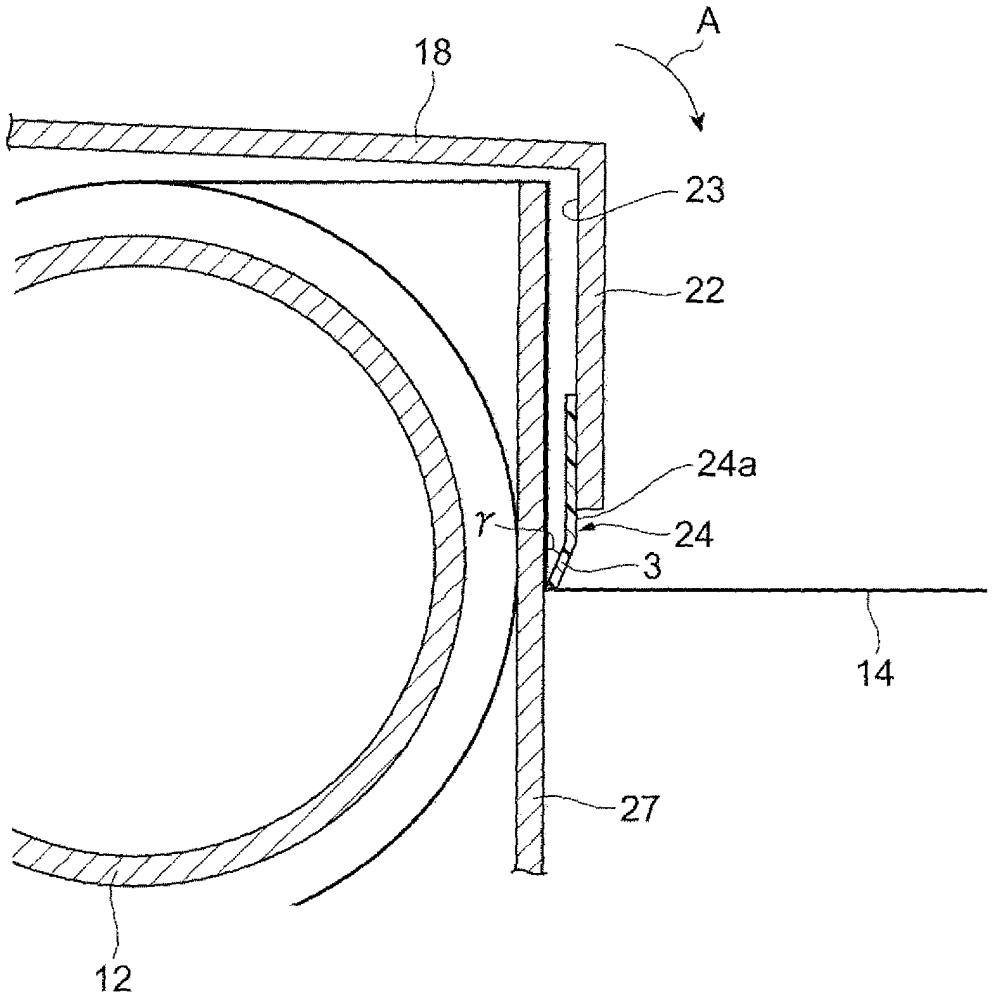


*Fig.4*



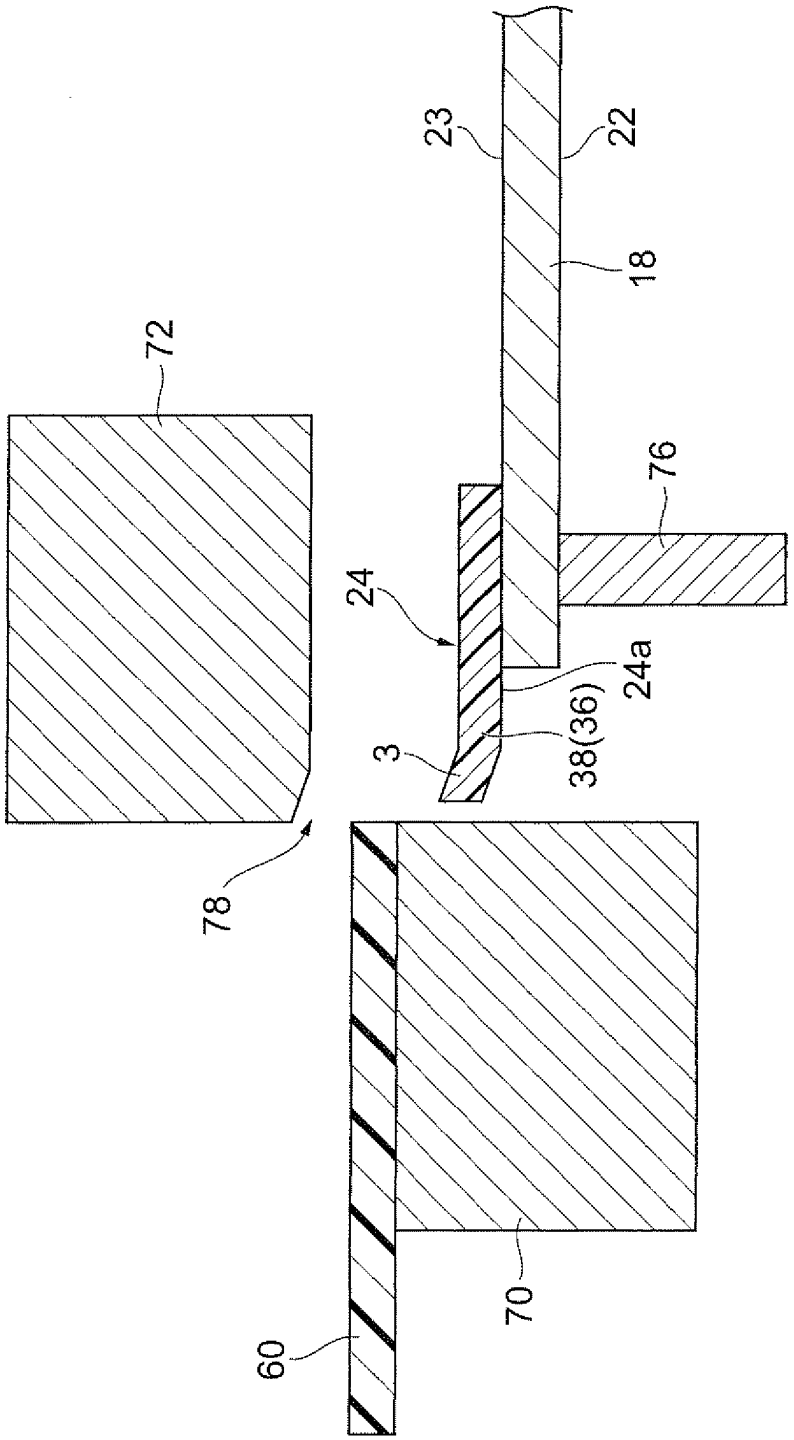



Fig.5

Fig.6

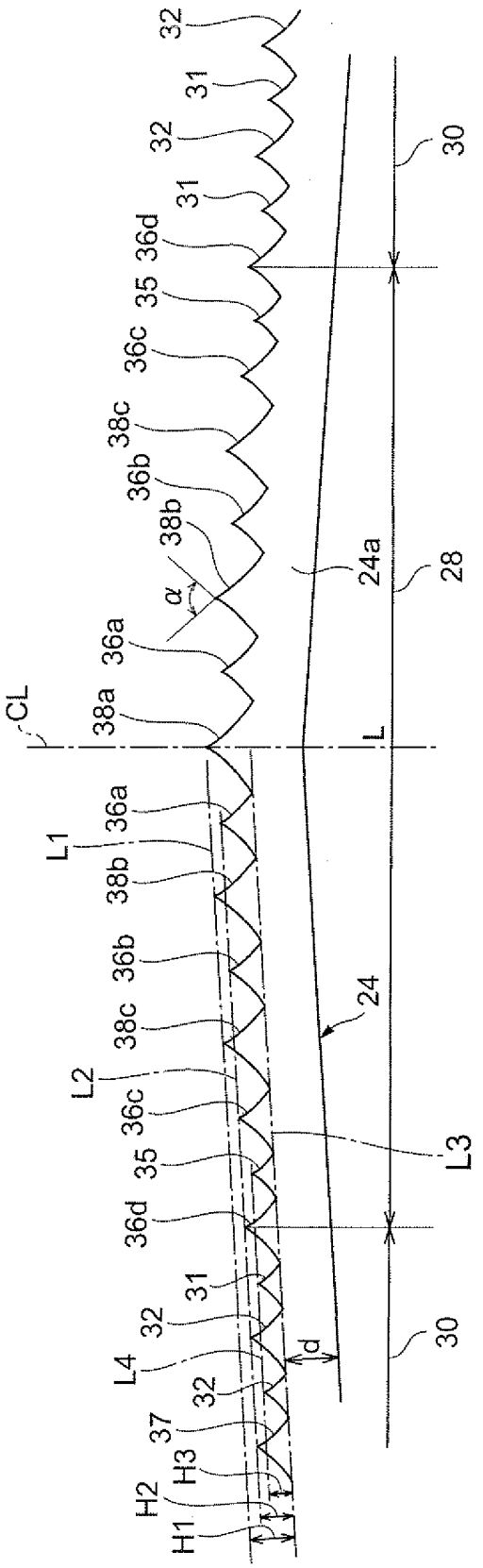

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Fig.7

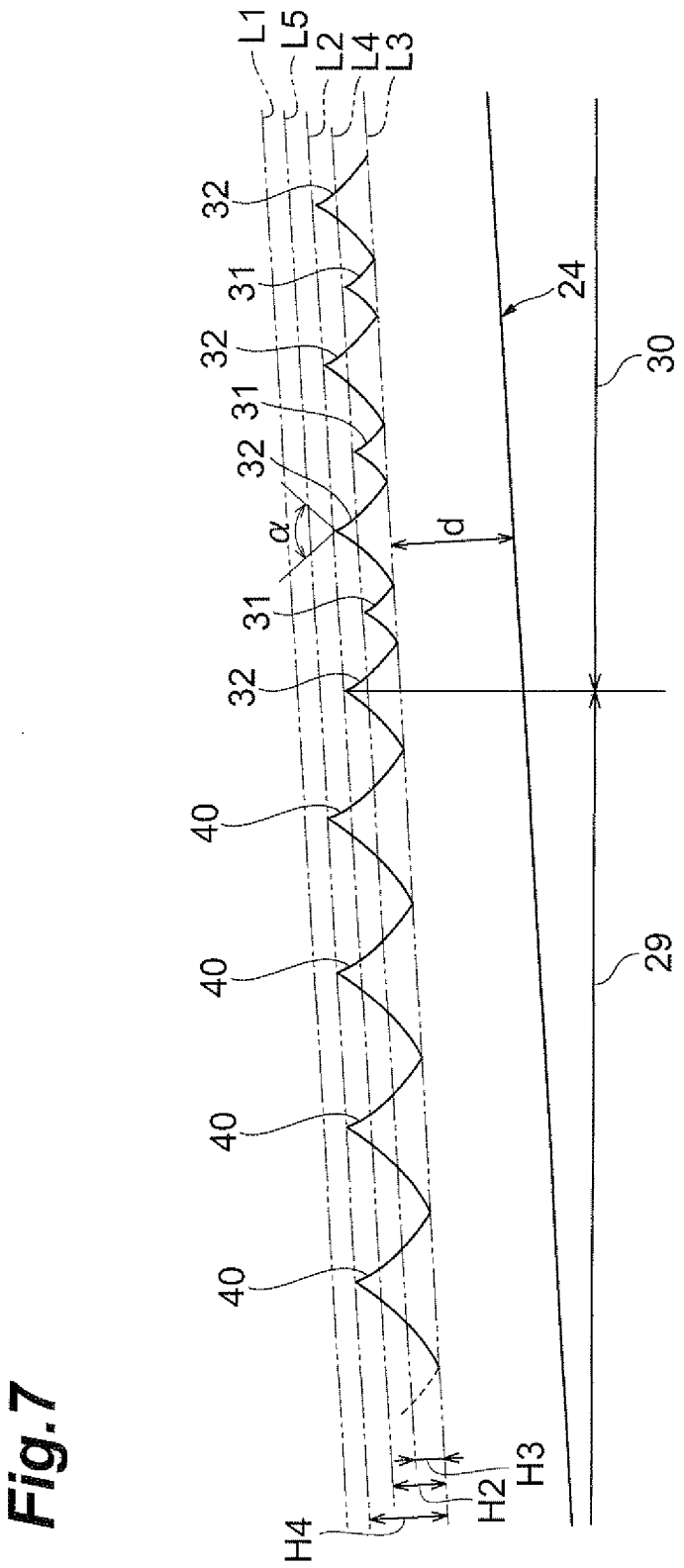
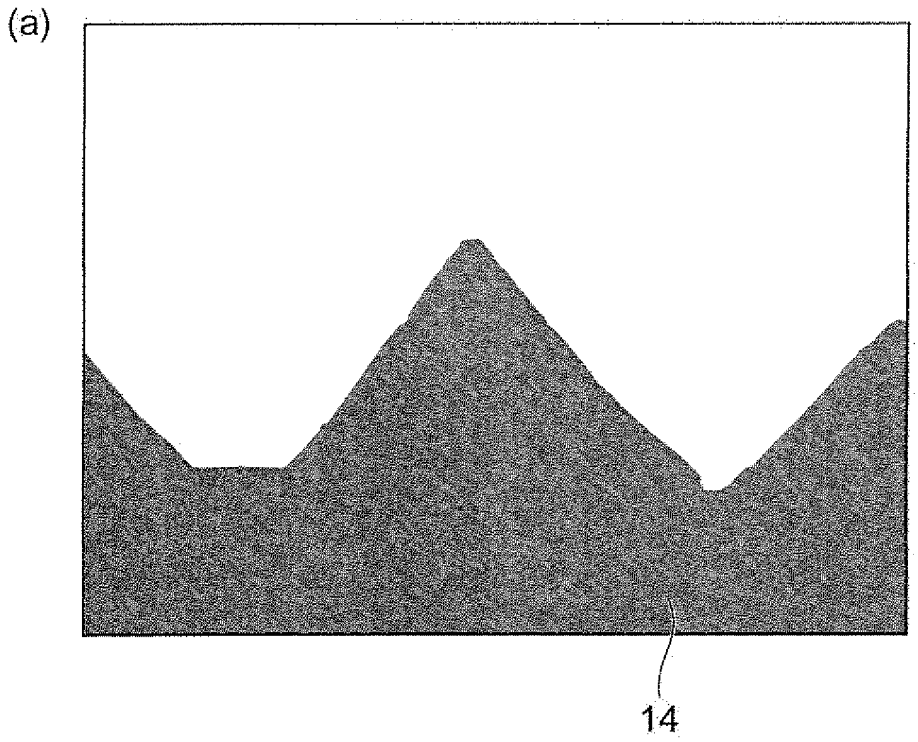
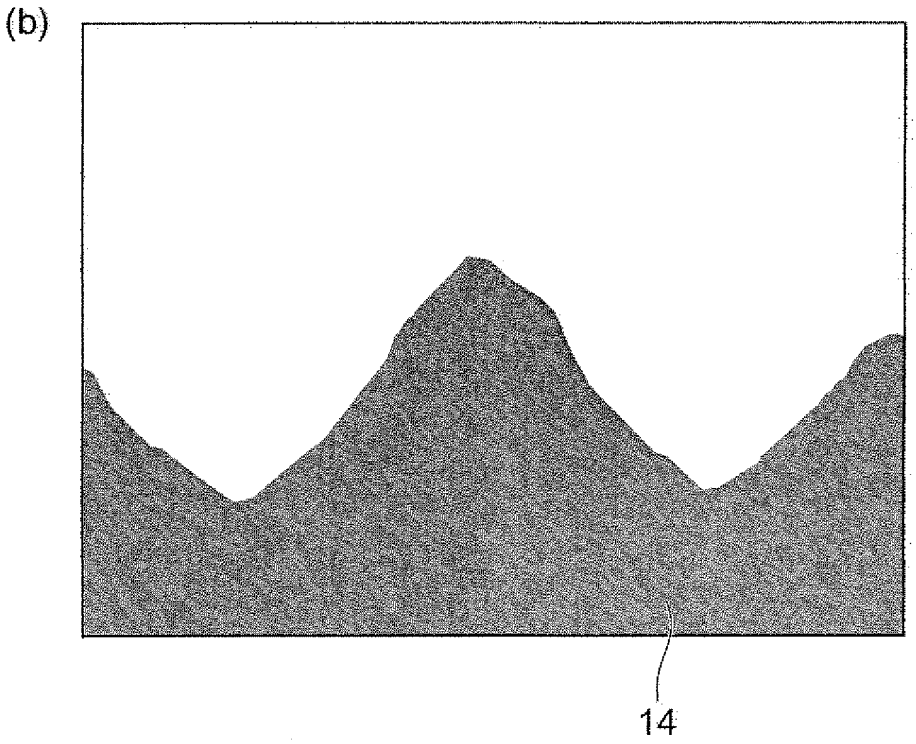


*Fig.8*



**INTERNATIONAL SEARCH REPORT**

International application No.
PCT/JP2008/070695

A. CLASSIFICATION OF SUBJECT MATTER
*B65D5/72*(2006.01)i, *B26D1/02*(2006.01)i, *B65D25/52*(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)
B65D5/72, B26D1/02, B65D25/52

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 1996-2009
Kokai Jitsuyo Shinan Koho 1971-2009 Toroku Jitsuyo Shinan Koho 1994-2009

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 | Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 045133/1991(Laid-open No. 132028/1992) (Toppan Printing Co., Ltd.), 07 December, 1992 (07.12.92), Full text; all drawings (Family: none) | 1-10 |
| Y | CD-ROM of the specification and drawings annexed to the request of Japanese Utility Model Application No. 078501/1992(Laid-open No. 000694/1996) (Isamu KONDO), 23 April, 1996 (23.04.96), Par. Nos. [0009] to [0014]; Fig. 1 (Family: none) | 1-10 |

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

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|---|---|
| 08 January, 2009 (08.01.09) | 20 January, 2009 (20.01.09) |
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## REFERENCES CITED IN THE DESCRIPTION

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