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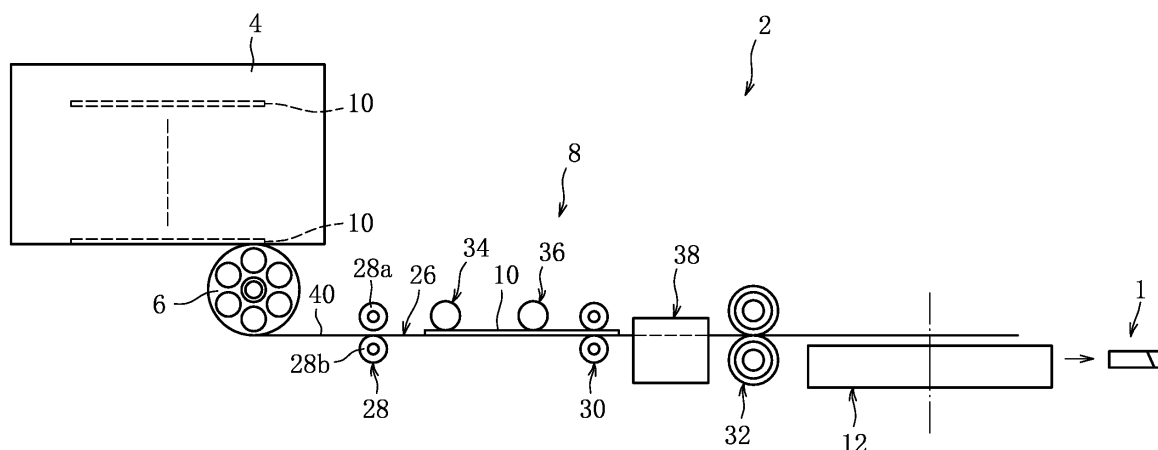
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(54) **BLANK SUPPLY DEVICE AND BLANK SUPPLY METHOD USING SAME**

(57) A supply apparatus (8) adapted to supply blank (10) used to form a box (14) of a package to a packaging machine (12), the supply apparatus includes a transfer path (26) adapted to transfer the blank piece by piece along a transfer surface (40), and a pair of rollers (30) rotatably placed on opposite sides of the transfer surface and provided with pressing regions (46, 52) on an outer circumferential surfaces (42c, 44c) to feed the blank while

pressing a strip region (24) of the blank corresponding to a square edge (16) of the box, wherein one (42) of the pair of rollers has a large number of blades (48) in the pressing region of the roller, and when the blank passes between the pair of rollers, the blades form a large number of cut lines (58, 90, 94, 96) in the strip region of the blank to reduce bending strength of the strip region.

FIG. 1



Description

Technical Field

[0001] The present invention relates to a blank supply apparatus and a blank supply method using the blank supply apparatus, and more particularly, to a supply apparatus adapted to supply blank used to form package boxes such as hinged-lid packages of cigarettes to a packaging machine as well as a blank supply method using the supply apparatus.

Background Art

[0002] Patent Document 1 discloses a package production apparatus for printing a material web according to a package design cutting off blank from the material web, and performing stamping and embossing on the blank.

Prior Art Document

Patent Document

[0003] Patent Document 1: International Publication WO 2013/037463 Pamphlet

Summary of the Invention

Problems to be solved by the Invention

[0004] Some package boxes are configured such that square edges along a longitudinal direction of the boxes are shaped in the form of round edges. To produce such a box, it is necessary to create folding lines in regions of the round edges of the blank used to form the box and perform preliminary process during forming.

[0005] Conventionally, processing of spread blank before folding has been entrusted to a printer who prints on the blank. Specifically, the printer prints on material web before the material web is separated into individual pieces of blank and performs, for example, platen-based stamping using a platen. In so doing, the folding lines described above are also formed as pressure lines all at once by embossing and at the same time the material web is cut into individual pieces of blank.

[0006] These days, package boxes require designs full of variations often requiring complicated geometries for stamping sites and folding lines. When the geometries of folding lines vary, it is necessary to prepare platens for the different geometries, resulting in increased production costs. Moreover, to form folding lines reliably on the blank, compared to when only stamping sites are formed on the blank, subtle adjustments of pressing pressure on the platen are necessary, and the entire platen has to be pressed uniformly. If pressing force of the platen is not appropriate or not uniform, the folding lines formed on the blank can get too shallow or too deep. Such trouble

with folding lines depends also on basis weight and density of the material web used for the blank.

[0007] If the folding lines formed on the blank is too shallow, repulsive force (restoring force) of blank tending to return to a pre-folding flat state increases, and thus round edges are hard to form in a process of folding the box on a packaging machine. Consequently, the box might swell unintentionally, eventually resulting in detachment of adhesive sections from each other due to the swelling and making the box and thus the package defective.

[0008] On the other hand, when folding lines formed on the blank are too deep, the platen will bite into the material web excessively, making it difficult to separate the platen from the material web. Also, adjacent sections in the blank may be separated by a folding line, which might make the blank defective.

[0009] Also, in a preliminary process during forming of the package box, in addition to producing folding lines on the blank, a preliminary folding step of giving fold geometries to the blank may be carried out by preliminarily folding the blank.

[0010] In such a preliminary folding step, the repulsive force of the blank tending to return to a pre-folding flat state is small especially when blank with a small paper thickness is used. Consequently, in the case of an inside flap in which a folding location of the blank is positioned on an inner side of the box, the inside flap assumes a posture of being inclined excessively toward the inner side of the box. This causes the inside flap to be spaced away from an outside flap located outside the box during forming of the box making it impossible to superimpose and properly bond the opposed flaps by gluing or the like, which might make the box and thus the package defective.

[0011] The present invention has been made in view of the above problem and has an object to provide a blank supply apparatus and a blank supply method using the blank supply apparatus, where the apparatus and method can control folding geometries of blank, thereby reduce quality variations of the blank, and easily improve productivity and quality of a box and thus a package.

Means for Solving the Problems

[0012] In order to achieve the above object, an aspect of the present invention is directed to providing a blank supply apparatus adapted to supply blank used to form a box of a package to a packaging machine, the supply apparatus comprising: a transfer path adapted to transfer the blank piece by piece along a transfer surface by extending from a supply source of the blank to the packaging machine; and a pair of rollers rotatably placed on opposite sides of the transfer surface and provided with a pressing region on an outer circumferential surface to feed the blank while pressing a strip region of the blank corresponding to a square edge of the box, wherein one of the pair of rollers has a large number of blades in the

pressing region, and when the blank passes between the pair of rollers, the blades form a large number of cut lines in the strip region of the blank to reduce bending strength of the strip region.

[0013] On the other hand, a blank supply method according to the present invention is a method for supplying blank used to form a box of a package to a packaging machine, the method comprising a cutting step of forming a large number of cut lines in the strip region of the blank to reduce bending strength of the strip region by transferring the blank piece by piece along a transfer surface from a supply source of the blank to a packaging machine while pressing a strip region of the blank corresponding to a square edge of the box.

Advantageous Effects of the Invention

[0014] According to the present invention, a blank supply apparatus and a blank supply method using the blank supply apparatus can control folding geometries of blank, and easily improve productivity and quality of blank, a box, and thus a package.

Brief Description of the Drawings

[0015]

FIG. 1 is a side view of a hinged-lid package making machine equipped with a blank supply apparatus according to a first embodiment of the present invention.

FIG. 2 is a plan view of the making machine of FIG. 1. FIG. 3 is a perspective view showing a box of the hinged-lid package of FIG. 1.

FIG. 4 is a plan view of non-folded, spread blank used to form the box of FIG. 3, as viewed from a rear surface which is to become an inner surface of the box.

FIG. 5 is a front view of transfer rollers of FIG. 1 as viewed from the side of a preliminary folding station. FIG. 6 is a plan view of blank which has passed the transfer rollers of FIG. 5, as viewed from the rear surface.

FIG. 7 is an enlarged sectional view of part of the blank of FIG. 6 with cut lines formed therein.

FIG. 8 is a front view of the preliminary folding station of FIG. 1 as viewed from the side of a folding turret.

FIG. 9 is a top view of the preliminary folding station of FIG. 8.

FIG. 10 is a front view showing a variation of a cutting roller of FIG. 5.

FIG. 11 is a front view showing a variation of a carrier roller of FIG. 5.

FIG. 12 is a plan view of blank which can be formed using the roller of FIG. 10 or 11.

FIG. 13 is a front view showing another variation of the cutting roller of FIG. 5.

FIG. 14 is a plan view of blank which can be formed

using the cutting roller of FIG. 13.

FIG. 15 is a perspective view showing a box formed of the blank of FIG. 14.

FIG. 16 is a front view showing another variation of the cutting roller of FIG. 5.

FIG. 17 is a plan view of blank which can be formed using the cutting roller of FIG. 16.

FIG. 18 is a perspective view showing a box formed of the blank of FIG. 17.

FIG. 19 is a perspective view showing a hinged-lid package with a lid open.

FIG. 20 is a top view of a preliminary folding station provided on a blank supply apparatus according to a second embodiment of the present invention.

FIG. 21 is a sectional view of a box formed of thin blank uniformly subjected to preliminary folding.

FIG. 22 is a sectional view of a box formed of thin blank subjected to preliminary folding on the preliminary folding station of FIG. 20.

FIG. 23 is a top view of a preliminary folding station, which is a variation of FIG. 20.

FIG. 24 is a top view of a preliminary folding station, which is another variation of FIG. 20.

25 Mode for Carrying out the Invention

[0016] Embodiments of the present invention will be described below with reference to the drawings.

30 <First embodiment>

[0017] FIG. 1 shows a side view of a making machine 2 of a hinged-lid package 1 (hereinafter referred to simply as a package 1), the making machine 2 being equipped with a blank supply apparatus according to a first embodiment of the present invention and FIG. 2 shows a plan view of the making machine 2. The making machine 2 includes a blank magazine (supply source) 4, a suction 6, a blank supply apparatus 8, a folding turret (packaging machine) 12 for a blank 10, and the like.

[0018] FIG. 3 is a perspective view showing a box 14 of the package 1 according to the present embodiment. Four square edges 16 of the box 14 along a longitudinal direction of the box are shaped into round edges, and according to the present embodiment, each of the square edges 16 are made up of a series of planes sloped step-by-step.

[0019] FIG. 4 is a plan view of non-folded, spread blank 10 used to form the box 14 of FIG. 3, as viewed from a rear surface 18 which is to become an inner surface of the box 14.

[0020] The blank 10 roughly includes a center section 20 in center and a pair of flap sections 22 formed on opposite sides of the center section 20. Each flap section 22 is made up of a group of inside flaps 22a disposed in a longitudinal center of the blank 10 and positioned inside the box 14 during forming of the box 14, a group of outside flaps 22b placed on opposite ends of the blank 10 in the

longitudinal direction and positioned outside the box 13 during forming of the box 14.

[0021] An adhesive surface 22a1 to which glue or the like has been applied is formed on each inside flap 22a as shown in FIG. 4 and the inside and outside flaps 22a and 22b opposed to each other are glued together via the adhesive surfaces 22a1 during forming of the box 14. Also, the blank 10 is formed to have strip regions 24 corresponding to the square edges 16 of the box 14. The strip regions 24 are formed in two places over the center section 20 and the paired flap sections 22, extending in parallel to a longitudinal axis of the blank 10 along the transfer path 26 (see FIGS. 1 and 2) provided on the supply apparatus 8.

[0022] As shown in FIGS. 1 and 2, many pieces of blank 10 shown in FIG. 4 are stacked in a blank magazine 4. The blank 10 is sucked piece by piece out of a bottom of the blank magazine 4 by the suction 6 and drawn out in succession toward the supply apparatus 8.

[0023] The supply apparatus 8 includes the transfer path 26, transfer rollers 28, 30, and 32, transfer disks 34 and 36, a preliminary folding station 38, and the like.

[0024] The transfer path 26 extends from the blank magazine 4 to the preliminary folding station 38 and eventually to the folding turret 12 and transfers the blank 10 piece by piece along a transfer surface 40 of the transfer path 26 using the transfer rollers 28 and 30 and transfer disks 34 and 36. The transfer rollers 28 and 30 and transfer disks 34 and 36 are placed at appropriate intervals in such a way as to be able to transfer the blank 10 drawn out of the blank magazine 4 to the transfer path 26 and eventually to the folding turret 12 piece by piece in sequence.

[0025] The transfer rollers 28 are made up of a pair of rollers 28a and 28b placed rotatably on opposite sides of the transfer surface 40. When the blank 10 passes between the rollers 28a and 28b, the pair of rollers 28a and 28b sandwiches the blank 10 while rotating at same peripheral velocity and transfer the blank 10 by feeding piece by piece along the transfer path 26. The transfer rollers 30 feed and transfer the blank 10 in a manner similar to the transfer rollers 28.

[0026] The transfer disks 34 and 36 are rotatably placed on an upper side of the transfer surface 40, and as the blank 10 passes under the transfer disks 34 and 36, the transfer disks 34 and 36 transfer the blank 10 by extruding the blank 10 forward on the transfer path 26.

[0027] FIG. 5 is a front view of the transfer rollers 30 as viewed from the side of a preliminary folding station 38. The transfer rollers 30 are placed immediately upstream of the preliminary folding station 38 and made up of a cutting roller 42 placed on an upper side of the transfer surface 40 and a carrier roller 44 placed under the transfer surface 40.

[0028] The cutting roller 42 is equipped with a driving shaft 42b adapted to rotationally drive a roller body 42a in the direction of an arrow. On the roller body 42a, i.e., an outer circumferential surface 42c of the cutting roller

42, strip-like pressing regions 46 are formed, respectively, at positions corresponding to the above-mentioned strip regions 24 of the blank 10. In the pressing regions 46, a large number of blades 48 are formed all around the outer circumferential surface 42c. Each of the blades 48 has a tip 48a along a circumferential direction of the outer circumferential surface 42c, the tip 48a of the blade 48 has been processed into an acute-angled V-shape, and the blades 48 are substantially equal in tip length. Also, the roller body 42a and driving shaft 42b are detachably attached to each other with a bolt 50.

[0029] On the other hand, the carrier roller 44 is equipped with a driving shaft 44b adapted to rotationally drive a roller body 44a in the direction of an arrow. On the roller body 44a, i.e., an outer circumferential surface 44c of the carrier roller 44, strip-like pressing regions 52 are flatly formed, respectively, at positions corresponding to the regions 24 of the blank 10. Also, the roller body 44a and driving shaft 44b are detachably attached to each other with a bolt 54.

[0030] The blades 48 formed in the pressing regions 46 on the outer circumferential surface 42c of the cutting roller 42 protrude toward the pressing regions 52 on the outer circumferential surface 44c of the carrier roller 44 with a predetermined gap G provided therebetween. The driving shaft 42b of the cutting roller 42 and the driving shaft 44b of the carrier roller 44 are coupled to a gap adjustment apparatus 56. The gap adjustment apparatus 56 is configured to be able to adjust the gap G between the cutting roller 42 and carrier roller 44 by moving up and down the driving shafts 42b and 44b.

[0031] FIG. 6 is a plan view of the blank 10 which has passed the transfer rollers 30, as viewed from a rear surface 18. When the blank 10 passes between the pair of the cutting roller 42 and carrier roller 44, the blank 10 is fed by pressing the strip regions 24 of the blank 10 with the pressing regions 46 of the cutting roller 42 and pressing regions 52 of the carrier roller 44. In so doing, the blades 48 cut into the rear surfaces 18 of the strip regions 24 by a predetermined depth along thickness of the blank 10 and thereby form a large number of cut lines 58 in the rear surfaces 18. The cut lines 58 extend in parallel to the longitudinal axis of the blank 10 thereby reduce thickness of the strip regions 24 of the blank 10, and thereby reduce bending strength of the strip regions 24. Also, the gap G between the pair of the cutting roller 42 and carrier roller 44 is established according to depth of cut lines 58 required of the blank 10.

[0032] FIG. 7 is an enlarged sectional view of part of the blank 10 with cut lines 58 formed therein. The gap G between the pair of the cutting roller 42 and carrier roller 44 is set to a range of, for example, 20% to 50% the thickness T (e.g., 0.25 mm to 0.35 mm) of the blank 10. In this case, as shown in FIG. 7, a large number of cut lines 58 of a predetermined depth D in a range of, for example, 50% to 80% the thickness T of the blank 10 are formed in the blank 10, being shaped, for example, like an acute-angled valley (letter V).

[0033] As shown in FIGS. 1 and 2, the preliminary folding station 38 is placed at a preliminary folding position on the transfer path 26, where the preliminary folding position is established immediately downstream of the transfer rollers 30, i.e., the pair of the cutting roller 42 and carrier roller 44. When the blank 10 is placed at the preliminary folding position, the preliminary folding station 38 preliminarily folds the strip regions 24 of the blank 10, and gives folding shapes corresponding to the round edges of the box 14, and more specifically preliminary folding angles, to the strip regions 24 as shown in FIG. 3.

[0034] FIG. 8 is a front view of the preliminary folding station 38 as viewed from the side of the folding turret 12 and FIG. 9 is a top view of the preliminary folding station 38. The preliminary folding station 38 includes a preliminary folding guide 60, a table 62, two folding roller trains (folding elements) 64A and 64B, an elevator 66, and the like.

[0035] The preliminary folding guide 60 is placed on the table 62, with the blank 10 interposed therebetween.

[0036] The preliminary folding guide 60 has been formed into the shape of a plate, which has lateral edges 68 near opposite ends of the table 62. The lateral edges 68 extend along the transfer path 26, have an arc shape corresponding to the round edges of the box 14, and establish width of the transfer surface 40 by being placed on opposite sides of the preliminary folding guide 60. The lateral edges 68 are formed to have a radius of curvature R (e.g., 2.5 mm) smaller than a radius of curvature (e.g., 4 mm) of the round edges.

[0037] When the blank 10 is superimposed under the preliminary folding guide 60, the blank 10 is abutted by an undersurface 60a of the preliminary folding guide 60. On the undersurface 60a of preliminary folding guide 60, a convexly curved surface portion 70 is formed in a cross-sectional center of the preliminary folding guide 60, protruding downward, i.e., protruding in a direction opposite a folding direction of the flap sections 22.

[0038] Furthermore, concavely curved surface portions 72 depressed upward, i.e., depressed in the folding direction of the flap sections 22 are formed on the undersurface 60a of the preliminary folding guide 60, being linked, respectively, to opposite ends of the convexly curved surface portion 70 via smooth arcs. Via smooth arcs, the concavely curved surface portions 72 are linked, respectively, to lateral edges 68 positioned in neighborhoods.

[0039] The table 62 forms the transfer path 26, and when the blank 10 is superimposed under the preliminary folding guide 60, the blank 10 abuts a top 62a of the table 62 serving as the transfer surface 40 of the transfer path 26.

[0040] The top 62a of the table 62 is formed to have a concavely curved surface portion 74 and convexly curved surface portions 76 corresponding, respectively, to the convexly curved surface portion 70 and concavely curved surface portions 72 formed on the undersurface 60a of the preliminary folding guide 60. That is, the top 62a of

the table 62 has a geometry complementary to the undersurface 60a of the preliminary folding guide 60. Then, at the preliminary folding position, the center section 20 of the blank 10 is pressed by being sandwiched between the convexly curved surface portion 70 and concavely curved surface portions 72 of the preliminary folding guide 60 and the concavely curved surface portion 74 and convexly curved surface portions 76 of the table 62.

[0041] The folding roller trains 64A and 64B are placed near opposite ends of the lateral edges 68 of the preliminary folding guide 60 and provided with respective shafts 65A and 65B extending along the lateral edges 68. For example, one first folding roller (first folding member or first folding roller) 67a and three second folding rollers (second folding members or second folding rollers) 67b are rotatably supported on each of the shafts 65A and 65B.

[0042] The first folding roller 67a gives a preliminary folding angle to the inside flaps 22a by folding the inside flaps 22a while on the other hand, the second folding rollers 67b give a preliminary folding angle to the outside flaps 22b by folding the outside flaps 22b. On respective outer circumferential surfaces, the first and second folding rollers 67a and 67b form the first and second pressing surfaces 67a1 and 67b1 to be pressed against the lateral edges 68 via the strip regions 24.

[0043] According to the present embodiment, the first and second folding rollers 67a and 67b have circular cross sections of the same diameter, the first and second pressing surfaces 67a1 and 67b1 have the same radius of curvature, and when the preliminary folding angle is given, a distance between the first pressing surface 67a1 and lateral edge 68 is equal to a distance between the second pressing surface 67b1 and lateral edge 68.

[0044] The folding roller trains 64A and 64B are rotatably coupled to a linkage of the elevator 66, and when the elevator 66 operates, the folding rollers 67a and 67b move along tracks 78 indicated by arrows in FIG. 8 via the linkage.

[0045] Specifically, when the blank 10 is placed at the preliminary folding position, first the blank 10 placed on the table 62 is superimposed under the preliminary folding guide 60 while at the same time, the flap sections 22 including the strip regions 24 of the blank 10 protrude from the lateral edges 68.

[0046] Next, as the elevator 66 is operated, the folding rollers 67a and 67b move along the arc-shaped tracks 78 around outer sides of the lateral edges 68 located in respective neighborhoods of the folding rollers 67a and 67b and fold the flap sections 22 while pressing the strip regions 24 of the blank 10 along the lateral edges 68. The track along which each of the folding rollers 67a and 67b move is represented by a contact angle α (e.g., 160 degrees) of the folding roller 67a or 67b with respect to the lateral edge 68. In this way, the blank 10 having cut lines 58 is preliminarily folded at the preliminary folding station 38 creasing the strip regions 24 of the blank 10.

[0047] As shown in FIGS. 1 and 2, the blank 10 having

creases is fed from the transfer rollers 32 capable of transferring the blank 10 by maintaining the creases and transferred to the folding turret 12. The folding turret 12 is placed at a main folding position on the transfer path 26, where the main folding position is established downstream of the preliminary folding station 38. When the blank 10 is placed at the main folding position, the folding turret 12 forms the box 14 by folding the blank 10 and forms a completed package 1.

[0048] Specifically, the folding turret 12 is a turret type packaging machine equipped with a turret 80 and is rotated intermittently in the circumferential direction indicated by an arrow in FIG. 2. Plural pockets 82 are formed at equal intervals in an outer circumferential portion of the turret 80. Along with intermittent rotation of the turret 80, each pocket 82 is moved from an inlet 80a of the turret 80, at which a termination of the transfer path 26 is located, to an outlet 80b of the turret 80, from which packages 1 are carried out.

[0049] When one pocket 82 is placed at the inlet 80a of the turret 80, the blank 10 is pushed into the pocket 82 by a non-illustrated pusher. In so doing, the flap sections 22 are partly folded toward the center sections 20 along the cut lines 58 formed in the strip regions 24 of the blank 10. Subsequently, in a process in which the pocket 82 positioned at the inlet 80a of the turret 80 moves intermittently toward the outlet 80b of the turret 80, an inner pack containing cigarettes and inner frame are inserted into the blank 10 formed partly.

[0050] Furthermore, along with intermittent movement of the pocket 82, the blank 10 is folded. When the blank 10 goes out of the outlet 80b, glue is applied to part of the flap sections 22, and then the flap sections 22 are folded, and bonded to the center section 20. Then, finally the hinged-lid package 1 of cigarettes is formed as a completed product.

[0051] Thus, according to the present embodiment, as the cutting roller 42 of the transfer rollers 30 has a large number of blades 48 in the pressing regions 46 on the outer circumferential surface 42c of the cutting roller 42, a large number of cut lines 58 can be formed in the rear surfaces 18 of the strip regions 24 of the blank 10 corresponding to the square edges 16 of the box 14. Since the blank 10 smaller in surface area than the material web can be used as a workpiece, by forming cut lines 58 in individual pieces of the blank 10 in the process of supplying the blank 10 before packaging of the package 1, the thickness of the strip regions 24 of the blank 10 can be reduced reliably, thereby reducing the bending strength of the strip regions 24 effectively.

[0052] Specifically, the present embodiment can prevent swelling of the box 14 caused by excessive shallowness or excessive deepness of the folding lines formed on the blank 10, and thus prevent adhesive sections of the blank 10 from detaching from each other due to the swelling and prevent separation between adjacent sections in the blank 10, and eventually improve quality including formability of the box 14 and thus the package

1. Thus, the present embodiment can reliably form folding lines on the blank 10 without being affected by properties of the material web and easily improve productivity and quality of the blank 10, the box 14, and thus the package 1.

[0053] Also, since the supply apparatus 8 is equipped with the gap adjustment apparatus 56 adapted to adjust the gap between the pair of the cutting roller 42 and carrier roller 44, the depth of the cut lines 58 in the blank 10 can be adjusted easily. This makes it possible to further improve the productivity and quality of the box 14 and thus the package 1.

[0054] Also, the radius of curvature R of the lateral edges 68 of the preliminary folding guide 60 is smaller than the radius of curvature of the round edges of the box 14. Consequently, by allowing for a restoring force of the round edges of the box 14 tending to return to a flat state when the box 14 is formed, the blank 10 can be folded in a direction opposite the direction of restoring force during preliminary folding of the blank 10, making the blank 10 develop a stronger tendency to bend in this direction. Thus, the strip regions 24 of the blank 10 can be creased more strongly making it possible to still further improve the quality of the box 14 and thus the package 1.

[0055] Also, the convexly curved surface portion 70 and concavely curved surface portions 72 are formed on the undersurface 60a of the preliminary folding guide 60 and the blank 10 is superimposed between these parts and the corresponding concavely curved surface portion 74 and convexly curved surface portions 76 of the table 62. This makes it possible to fold the blank 10 in the direction opposite the direction of the above-mentioned restoring force of the round edges of the box 14, making the blank 10 to develop a stronger tendency to bend in this direction. Furthermore, smooth round edges can be formed easily. Thus, the strip regions 24 of the blank 10 can be creased still more strongly, making it possible to still further improve the quality of the box 14 and thus the package 1.

[0056] The present invention is not limited to the first embodiment described above, and various modifications are possible.

[0057] For example, according to the present embodiment, in the pressing regions 46 on the outer circumferential surface 42c of the cutting roller 42, the blades 48 are formed all around the outer circumferential surface 42c along the circumferential direction of the outer circumferential surface 42c. However, this is not restrictive, and the blade 48 may be arranged partially along the circumferential direction on the pressing regions 46 of the outer circumferential surface 42c, for example, as shown in FIG. 10.

[0058] Also, as shown in FIG. 11, concave portions 84 may be formed partially along a circumferential direction in the pressing regions 52 on the outer circumferential surface 44c of the carrier roller 44. In FIGS. 11 and 12, when the blank 10 is fed by the transfer rollers 30, by controlling rotational position of the cutting roller 42 or

carrier roller 44, the intermittent cut lines 58 can be formed in the strip regions 24 of the blank 10.

[0059] Specifically, as shown in FIG. 12, the box 14 and thus the package 1 can be formed, being designed such that of the strip regions 24 of the blank 10, cut lines 58 are not formed in a top wall 86 formed on a lid of the box 14 and a bottom wall 88 formed on a body of the box 14. This makes it possible to greatly expand design variations of the box 14 and thus package 1.

[0060] Also, the blades 48 may be partially varied in tip length in the circumferential direction of the pressing regions 52. This makes it possible to form cut lines 58 of different depths in the strip regions 24 of the blank 10. In this case, the strength of creasing the strip regions 24 of the blank 10 can be controlled, making it possible to still further improve the quality of the box 14 and thus the package 1.

[0061] Also, since the respective roller bodies 42a and 44a of the cutting roller 42 and carrier roller 44 are detachable, by replacing the roller bodies 42a and 44a, transfer rollers 30 of the forms shown in FIGS. 10 and 11 can be constructed easily. Also, it is easy to change the blank 10 to the form shown in FIG. 14 or 17 described later, and thus to change the box 14 to the form shown in FIG. 15 or 18.

[0062] Specifically, as shown in FIG. 13, the blades 48 of the cutting roller 42, provided in the pressing regions 46, may be shaped so as to have tips 48b inclined with respect to the circumferential direction of the outer circumferential surface 42c. In this case, as shown in FIG. 14, a large number of cut lines 90 inclined with respect to the longitudinal axis of the blank are formed in the strip regions 24 of the blank 10. Then, by selecting paper quality of the material web, it is possible to form a box 14 designed such that a slash pattern 92 can be seen through the square edges 16, which are to become round edges, as shown in FIG. 15.

[0063] Also, as shown in FIG. 16, blades 48 provided with first tips 48c and second tips 48d may be formed, the first tips 48c being inclined with respect to the circumferential direction of the outer circumferential surface 42c and the second tips 48d intersecting the first tips 48c. Such blades 48 can be formed by processing the pressing regions 46 into a mesh pattern by knurling or the like. In this case, as shown in FIG. 17, cut lines 94 inclined with respect to the longitudinal axis of the blank 10 and cut lines 96 intersecting the cut lines 94 are formed in large quantities in the strip regions 24 of the blank 10. Then, by selecting paper quality of the material web, it is possible to form a box 14 designed such that a mesh pattern 98 can be seen through the square edges 16, which are to become round edges, as shown in FIG. 18.

[0064] Also, as shown in FIG. 14 and 17, if cut lines 90, 94, and 96 inclined with respect to the longitudinal axis of the blank 10 are formed, even if one blade 48 somehow cut too deep into the strip region 24 of the blank 10, complete separation between adjacent sections of the blank 10 along the cut lines 90, 94, and 96 can be

avoided.

[0065] Also, although in the present embodiment, the cut lines 58, 90, 94, and 96 are formed in the rear surfaces 18 of the strip regions 24 of the blank 10, the cut lines 58, 90, 94, and 96 may be formed in regions other than the strip regions 24 of the blank 10 or in the surface of the strip regions 24. In this way, by the application of the present invention, various cut lines can be formed in various places according to the design required of the box 14.

[0066] Also, although in the present embodiment, the blank 10 is transferred with its longitudinal axis being placed along the transfer path 26, the blank 10 may be transferred with its longitudinal axis being placed in a direction orthogonal to the transfer path 26. In this case, the cut lines 58 can be formed in a square edge between the top wall 86 formed on the lid of the box 14 and the body of the box 14 or in a square edge between the body of the box 14 and the bottom wall 88 of the body, making it possible to further expand design variations of the box 14 and thus package 1.

[0067] Also, the numbers of transfer rollers 28, 30, and 32 and transfer disks 34 and 36 described in the present embodiment are not limited to those described in the present embodiment. For example, only the transfer rollers 30 provided with the cutting roller 42 may be installed immediately upstream of the preliminary folding station 38 without installing the transfer disks 34 and 36.

[0068] Also, although in the example described in the present embodiment, cut lines 58 are formed in the blank 10 used to form a hinged-lid package 1, the present invention can be applied to blank 10 used to form various packages or inner frames of packages in addition to the hinged-lid package 1.

[0069] FIG. 19 is a perspective view showing the hinged-lid package 1 with a lid 100 open. An inner frame 102 is bonded in a box 14 of the hinged-lid package 1. The blank 10 for the box 14 and blank 10 for the inner frame 102 differ in printed state required of the surface of the blank 10 with differences in product brand and have material properties differing in fiber basis weight (e.g., 200 to 250 g/m²) and density.

[0070] For example, 1 it is common practice to 2 allow the lid 100 to be restrained easily by the inner frame 102 by providing a convex portion (not illustrated) in part of the inner frame 102, and thereby make the lid 100 to close properly. In this case, to keep the convex portion from getting fatigued due to an increased number of times the lid 100 is opened and closed and keep the lid 100 from closing improperly, blank 10 made of a material with a relatively high fiber density (e.g., 0.8 to 1.0 g/cm³) is used for the inner frame 102. The present invention is applicable to blank 10 having material properties required from the inner frame 102 as well as from the box 14.

<Second embodiment>

[0071] A preliminary folding station provided on a blank

supply apparatus according to a second embodiment will be described below with reference to FIGS. 20 to 24. Note that mainly differences from the first embodiment will be described and that description of other components may be omitted by denoting the components in the drawings with the same reference numerals as the corresponding components in the first embodiment.

[0072] As shown in FIG. 20, in a preliminary folding station 104, the first pressing surface 67a1 of the first folding roller 67a and the second pressing surface 67b1 of the second folding roller 67b, are formed to have different radii of curvature. Specifically, according to the present embodiment, the first folding roller 67a has a circular cross section of a smaller diameter than the second folding roller 67b, the first pressing surface 67a1 is formed to have a smaller radius of curvature than the second pressing surface 67b1, and the distance between the first pressing surface 67a1 and lateral edge 68 is larger than the distance between the second pressing surface 67b1 and lateral edge 68 when the preliminary folding angle is given.

[0073] Thus, according to the present embodiment, when blank with a small paper thickness is used, the repulsive force of the blank tending to return to a pre-folding flat state is small. Consequently, for example, as with the first embodiment, if the first and second pressing surfaces 67a1 and 67b1 are set to have an equal radius of curvature by using the first and second folding rollers 67a and 67b of the same diameter, as shown in FIG. 21, the inside flaps 22a positioned inside the box 14 during forming of the box 14 assume a posture of being inclined too much toward the inner side of the box 14, increasing the preliminary folding angles of the inside flaps 22a. Consequently, the inside flaps 22a and outside flaps 22b get spaced away too much during forming of the box 14, making it impossible to superimpose and properly bond the opposed flaps by gluing or the like, which might make the box 14 and thus the hinged-lid package 1 defective.

[0074] In contrast, according to the second embodiment, the first folding roller 67a is set to have a circular cross section of a smaller diameter than the second folding roller 67b, and the first pressing surface 67a1 is set to have a smaller radius of curvature than the second pressing surface 67b1, and consequently the distance between the first pressing surface 67a1 and lateral edge 68 is made larger than the distance between the second pressing surface 67b1 and lateral edge 68 when the preliminary folding angle is given. This makes it possible to reduce the preliminary folding angle of the inside flaps 22a and thereby allows the strip regions 24 of the blank 10 to be creased weakly.

[0075] Thus, as shown in FIG. 22, the inside flaps 22a can be placed in an upright posture inside the box 14 during forming of the box 14. In this way, by performing the control of varying the folding shape between the inside flaps 22a and outside flaps 22b in a preliminary folding step of the blank 10, it is possible to reduce quality variations of the blank 10 and easily improve the produc-

tivity and quality of the box 14 and thus the hinged-lid package 1 as with the first embodiment.

[0076] The present invention is not limited to the second embodiment described above, and various modifications are possible.

[0077] For example, in a preliminary folding station 106 shown in FIG. 23, although the first and second folding rollers 67a and 67b are equal in diameter, the transfer surface 40 of the preliminary folding guide 60 is formed such that of the lateral edge 68, a first lateral edge 68a pressed by the first folding roller 67a will be smaller in width than a second folding roller 67b pressed by the second folding roller 67b.

[0078] Even in this case, the distance between the first pressing surface 67a1 and lateral edge 68 becomes larger than the distance between the second pressing surface 67b1 and lateral edge 68 when the preliminary folding angle is given. Thus, the preliminary folding angle of the inside flap 22a is decreased, eventually allowing the strip regions 24 to be creased weakly and thereby making it possible to place the inside flaps 22a in an upright posture inside the box 14 during forming of the box 14.

[0079] It is also possible to perform the control of varying the folding shape between the inside flaps 22a and outside flaps 22b by controlling the operation of the elevator 66 and thereby varying the contact angle α with respect to the lateral edges 68 between the first and second folding rollers 67a and 67b. Specifically, if the first folding roller 67a is set smaller in contact angle α than the second folding roller 67b, the preliminary folding angle of the inside flaps 22a is decreased, eventually allowing the strip regions 24 to be creased weakly and thereby making it possible to place the inside flaps 22a in an upright posture inside the box 14 during forming of the box 14.

[0080] Also, in a preliminary folding station 108 shown in FIG. 24, two folding block trains 108A and 108B are provided instead of the two folding roller trains 67a and 67b. Each of the folding block trains 108A and 108B is made up, for example, of one first folding block (first folding member or folding block) 110a and three second folding blocks (second folding members or folding blocks) 110b.

[0081] The folding blocks 110a and 110b are advanceably/retractably coupled to respective non-illustrated sliding mechanisms. The first folding block 110a gives a preliminary folding angle to the inside flaps 22a by folding the inside flaps 22a while on the other hand, the second folding blocks 110b give a preliminary folding angle to the outside flaps 22b by folding the outside flaps 22b.

[0082] In the first and second folding blocks 110a and 110b, first and second pressing surfaces 110a1 and 110b1 to be pressed against the lateral edges 68 via the strip regions 24 are formed in a concave surface opposed to the lateral edges 68 of the preliminary folding guide 60. The first pressing surface 110a1 is formed to have a larger radius of curvature than the second pressing surface 110b1. This decreases the preliminary folding angle

of the inside flap 22a, eventually allowing the strip regions 24 to be creased weakly and thereby making it possible to place the inside flaps 22a in an upright posture inside the box 14 during forming of the box 14.

[0083] Also, if a distance by which the first folding block 110a slides toward the lateral edge 68 is made smaller than a distance by which the second folding block 110b slides toward the lateral edge 68 by controlling the operation of the sliding mechanisms, the distance between the first pressing surface 110a1 and lateral edge 68 is made larger than the distance between the second pressing surface 110b1 and lateral edge 68 when the preliminary folding angle is given. This decreases the preliminary folding angle of the inside flaps 22a, eventually allowing the strip regions 24 to be creased weakly and thereby making it possible to place the inside flaps 22a in an upright posture inside the box 14 during forming of the box 14.

[0084] Finally, the present invention can be realized not only by a combination of the first and second embodiments, but also by the configuration of the second embodiment alone. That is, even if the cut lines 58 are not formed in the strip regions 24 of the blank 10 by the cutting roller 42, of course, it is possible to reduce quality variations of the blank 10 based solely on the strength of creasing the strip regions of the blank 10 at the preliminary folding station described above, and easily improve the productivity and quality of the box 14 and thus the hinged-lid package 1.

Explanation of Reference Signs

[0085]

1 Hinged-lid package (package)
 4 Blank magazine (supply source)
 8 Supply apparatus
 10 Blank
 12 Folding turret (packaging machine)
 14 Box
 16 Square edge
 18 Rear face
 22 Flap section
 22a Inside flap
 22b Outside flap
 24 Strip region
 26 Transfer path
 30 Transfer roller (pair of rollers)
 38 Preliminary folding station
 40 Transfer surface
 42 Cutting roller (one of rollers)
 42c Outer circumferential surface
 44 Carrier roller (other of rollers)
 44c Outer circumferential surface
 46 Pressing region
 48 Blade
 48a Tip along circumferential direction of outer circumferential surface

48b Tip inclined with respect to circumferential direction of outer circumferential surface
 48c First tip inclined with respect to circumferential direction of outer circumferential surface
 48d Second tip intersecting the first tip
 52 Pressing region
 56 Gap adjustment apparatus
 58 Cut line
 60 Preliminary folding guide
 64A, 64B Folding roller train (folding element)
 67a First folding roller (first folding member, folding roller)
 67a1 First pressing surface
 67b Second folding roller (second folding member, folding roller)
 67b1 Second pressing surface
 68 Lateral edge
 70 Convexly curved surface portion
 72 Concavely curved surface portion
 78 Track
 84 Recess
 90 Cut line
 94 Cut line
 96 Cut line
 108A, 108B Folding block train (folding element)
 110a First folding block (first folding member, folding block)
 110a1 First pressing surface
 110b Second folding block (second folding member, folding block)

Claims

1. A blank supply apparatus adapted to supply blank used to form a box of a package to a packaging machine, the supply apparatus comprising:
 - a transfer path adapted to transfer the blank piece by piece along a transfer surface by extending from a supply source of the blank to the packaging machine; and
 - a pair of rollers rotatably placed on opposite sides of the transfer surface and provided with a pressing region on an outer circumferential surface to feed the blank while pressing a strip region of the blank corresponding to a square edge of the box, wherein
 - one of the pair of rollers has a large number of blades in the pressing region of the roller, and when the blank passes between the pair of rollers, the blades form a large number of cut lines in the strip region of the blank to reduce bending strength of the strip region.
2. The blank supply apparatus according to claim 1, further comprising a gap adjustment apparatus adapted to adjust a gap between the pair of rollers.

3. The blank supply apparatus according to claim 1, wherein the blades are provided partially in a circumferential direction of the pressing region.
4. The blank supply apparatus according to claim 1, wherein another of the pair of rollers is partially provided with a concave portion in a circumferential direction of the pressing region of the roller.
5. The blank supply apparatus according to any one of claims 1 to 4, wherein the pair of rollers form the cut lines in a rear face of the strip region of the blank, where the rear face becomes an inner surface of the box.
6. The blank supply apparatus according to any one of claims 1 to 5, wherein one of the pair of rollers is placed on an upper side of the transfer surface.
7. The blank supply apparatus according to any one of claims 1 to 6, wherein the blades are formed to have tips in the pressing region, the tips running along a circumferential direction of the outer circumferential surface.
8. The blank supply apparatus according to any one of claims 1 to 6, wherein in the pressing region, the blades are formed to have tips inclined with respect to a circumferential direction of the outer circumferential surface.
9. The blank supply apparatus according to any one of claims 1 to 6, wherein in the pressing region, the blades are formed to have first tips inclined with respect to a circumferential direction of the outer circumferential surface and second tips intersecting the first tips.
10. The blank supply apparatus according to any one of claims 7 to 9, wherein the tips of the blades have an acute-angled V-shape.
11. The blank supply apparatus according to claim 10, wherein the blades partially vary in tip length in a circumferential direction of the pressing region.
12. The blank supply apparatus according to any one of claims 1 to 11, wherein a longitudinal axis of the blank runs along the transfer path.
13. The blank supply apparatus according to any one of claims 1 to 12, further comprising a preliminary folding station placed at a preliminary folding position established downstream of the pair of rollers and adapted to preliminarily fold the strip region of the blank and give a preliminary folding angle to the strip region when the blank is placed at the preliminary folding position.
14. A blank supply apparatus adapted to supply blank used to form a box of a package to a packaging machine, the supply apparatus comprising:
 - a transfer path adapted to transfer the blank piece by piece along a transfer surface by extending from a supply source of the blank to the packaging machine;
 - a pair of rollers rotatably placed on opposite sides of the transfer surface and adapted to feed the blank; and
 - a preliminary folding station placed at a preliminary folding position established downstream of the pair of rollers and adapted to preliminarily fold the strip region of the blank and give a preliminary folding angle to the strip region when the blank is placed at the preliminary folding position.
15. The blank supply apparatus according to claim 13 or 14, wherein:
 - the preliminary folding station includes
 - a preliminary folding guide placed on the transfer path and provided with a lateral edge extending along the transfer path, where when the blank is placed at the preliminary folding position the blank is superimposed under the preliminary folding guide and a flap section of the blank protrudes from the lateral edge, the flap section being provided with the strip region, and
 - a folding element placed in a neighborhood of the lateral edge of the preliminary folding guide and provided with an axis extending along the lateral edge; and
 - the folding element folds the flap section by pressing the strip region along the lateral edge and thereby establishes the preliminary folding angle of the flap section with respect to the blank.
16. The blank supply apparatus according to claim 15, wherein:
 - in the strip region of the blank, the square edge is formed into a round edge; and
 - the lateral edge has a radius of curvature smaller than a radius of curvature of the round edge.
17. The blank supply apparatus according to claim 16, wherein:
 - the preliminary folding guide has a convexly curved surface portion protruding in a direction opposite a folding direction of the flap section; and
 - the blank is superimposed under the convexly curved surface portion at the preliminary folding position.

- 18.** The blank supply apparatus according to claim 17, wherein:

the preliminary folding guide is linked to opposite ends of the convexly curved surface portion via smooth arcs and the preliminary folding guide further includes a concavely curved surface portion depressed in the folding direction of the flap section and linked to the lateral edge, forming a smooth arc; and
the blank is superimposed under the convexly curved surface portion and the concavely curved surface portion at the preliminary folding position.

- 19.** The blank supply apparatus according to any one of claims 15 to 18, wherein:

the flap section includes an inside flap located inside the box during forming of the box and an outside flap located outside the box during the forming of the box;
the folding element includes a first folding member adapted to fold the inside flap and a second folding member adapted to fold the outside flap; and
the first and second folding members give different preliminary folding angles to the inside and outside flaps.

- 20.** The blank supply apparatus according to claim 19, wherein:

the first and second folding members respectively include first and second pressing surfaces adapted to give the preliminary folding angles to the strip region by pressing the strip region along the lateral edge; and
a distance between the first pressing surface and the lateral edge is larger than a distance between the second pressing surface and the lateral edge when the preliminary folding angles are given.

- 21.** The blank supply apparatus according to claim 19 or 20, wherein:

the lateral edge establishes width of the transfer surface by being disposed on opposite sides of the preliminary folding guide; and
the transfer surface is formed such that in the preliminary folding guide, a first lateral edge adapted to press the first folding member is smaller in width than a second lateral edge adapted to press the second folding member.

- 22.** The blank supply apparatus according to any one of claims 19 to 21, wherein the first and second folding

members are folding rollers adapted to fold the inside and outside flaps by moving along a track surrounding an outer side of the lateral edge, and pressing the strip region along the lateral edge.

- 23.** The blank supply apparatus according to any one of claims 19 to 21, wherein the first and second folding members are folding blocks adapted to fold the inside and outside flaps by moving in a direction of the lateral edge and pressing the strip region against the lateral edge.

- 24.** The blank supply apparatus according to any one of claims 1 to 23, wherein the package is a hinged-lid package.

- 25.** A method for supplying blank used to form a box of a package to a packaging machine, the method comprising
a cutting step of forming a large number of cut lines in the strip region of the blank to reduce bending strength of the strip region by transferring the blank piece by piece along a transfer surface from a supply source of the blank to a packaging machine while pressing a strip region of the blank corresponding to a square edge of the box.

- 26.** The method for supplying blank according to claim 25, further comprising a preliminary folding step of preliminarily folding the strip region of the blank and giving a preliminary folding angle to the strip region when the blank is placed at a preliminary folding position established downstream of the cutting step.

- 27.** A method for supplying blank used to form a box of a package to a packaging machine, the method comprising
a preliminary folding step of preliminarily folding the strip region of the blank and giving a preliminary folding angle to the strip region when the blank is placed at a preliminary folding position by transferring the blank piece by piece along a transfer surface from a supply source of the blank to a packaging machine.

- 28.** The method for supplying blank according to claim 26 or 27, wherein in the preliminary folding step, when the blank is placed at the preliminary folding position, the blank is superimposed on a preliminary folding guide, a flap section of the blank is caused to protrude from a lateral edge of the preliminary folding guide, the flap section being provided with the strip region, and the flap section is folded by pressing the strip region along the lateral edge by a folding element placed in a neighborhood of the lateral edge of the preliminary folding guide.

- 29.** The method for supplying blank according to claim 28, wherein:

the flap section includes an inside flap located inside the box during forming of the box and an outside flap located outside the box during the forming of the box;

the folding element includes a first folding member adapted to fold the inside flap and a second folding member adapted to fold the outside flap; and

in the preliminary folding step, the first and second folding members give different preliminary folding angles to the inside and outside flaps.

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FIG. 1

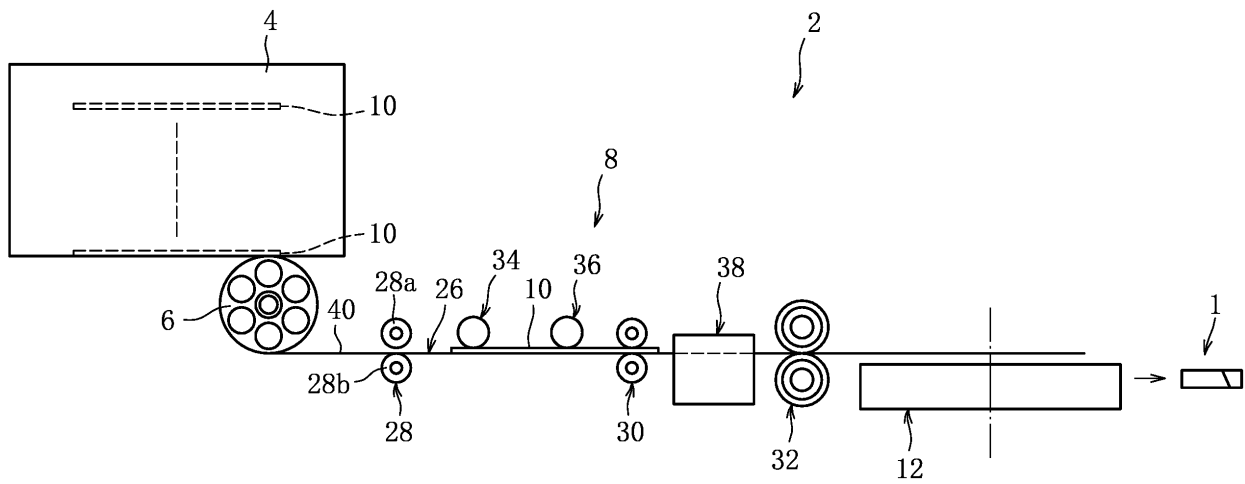


FIG. 2

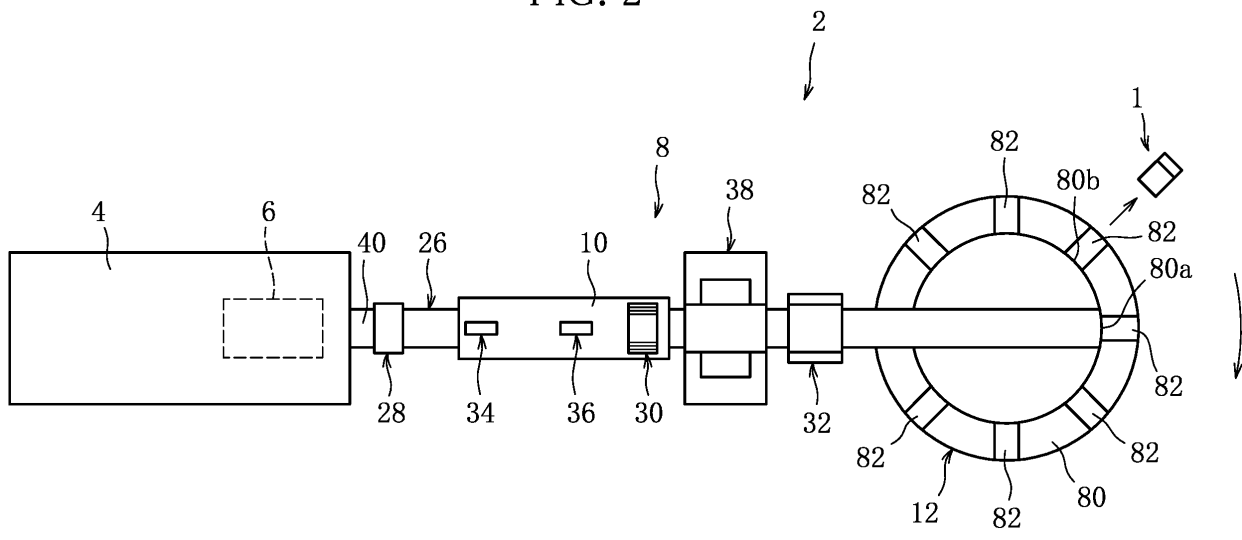


FIG. 3

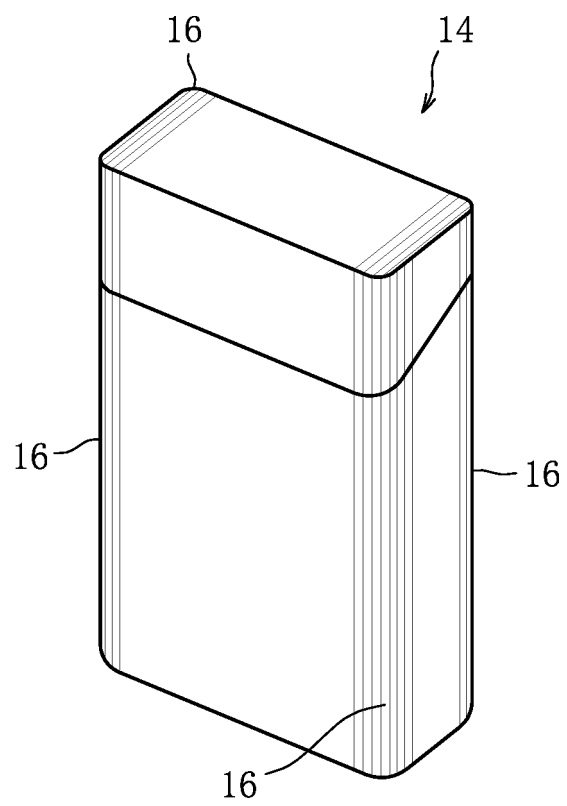


FIG. 4

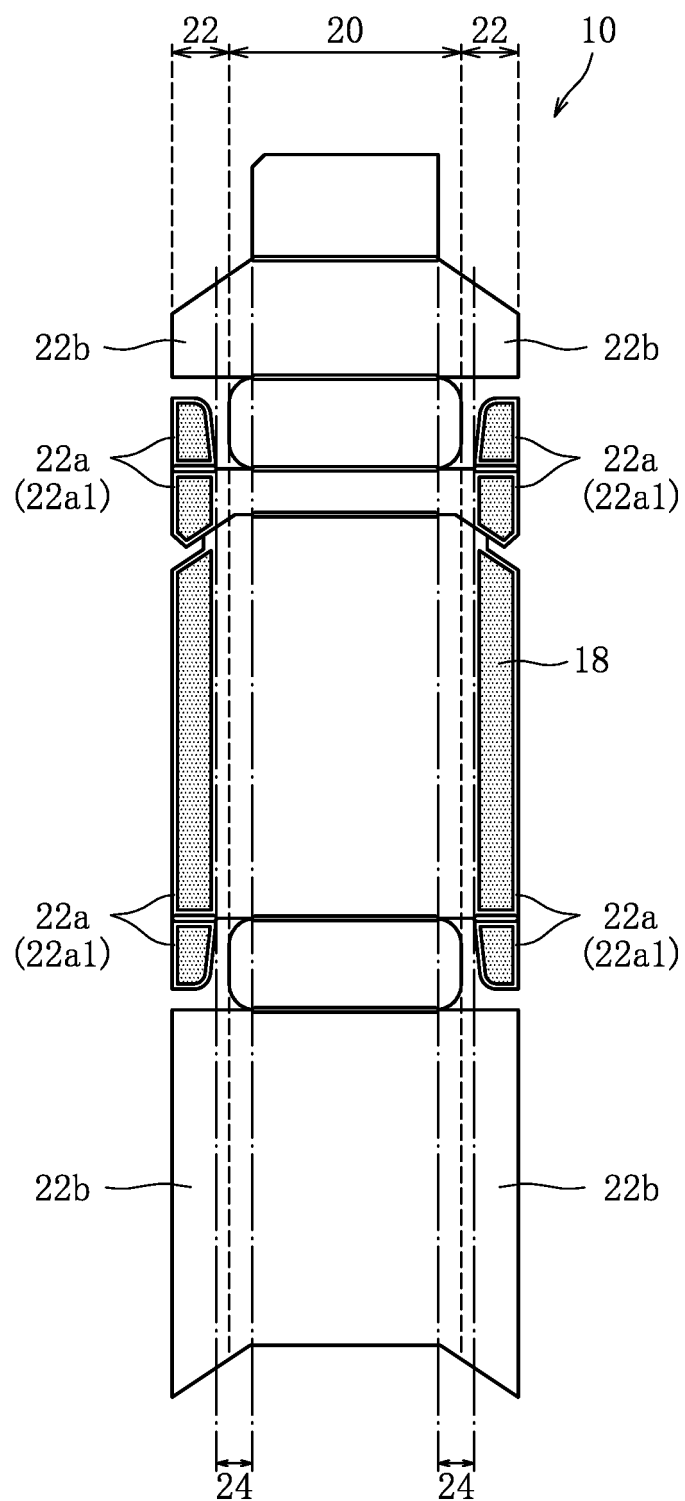


FIG. 5

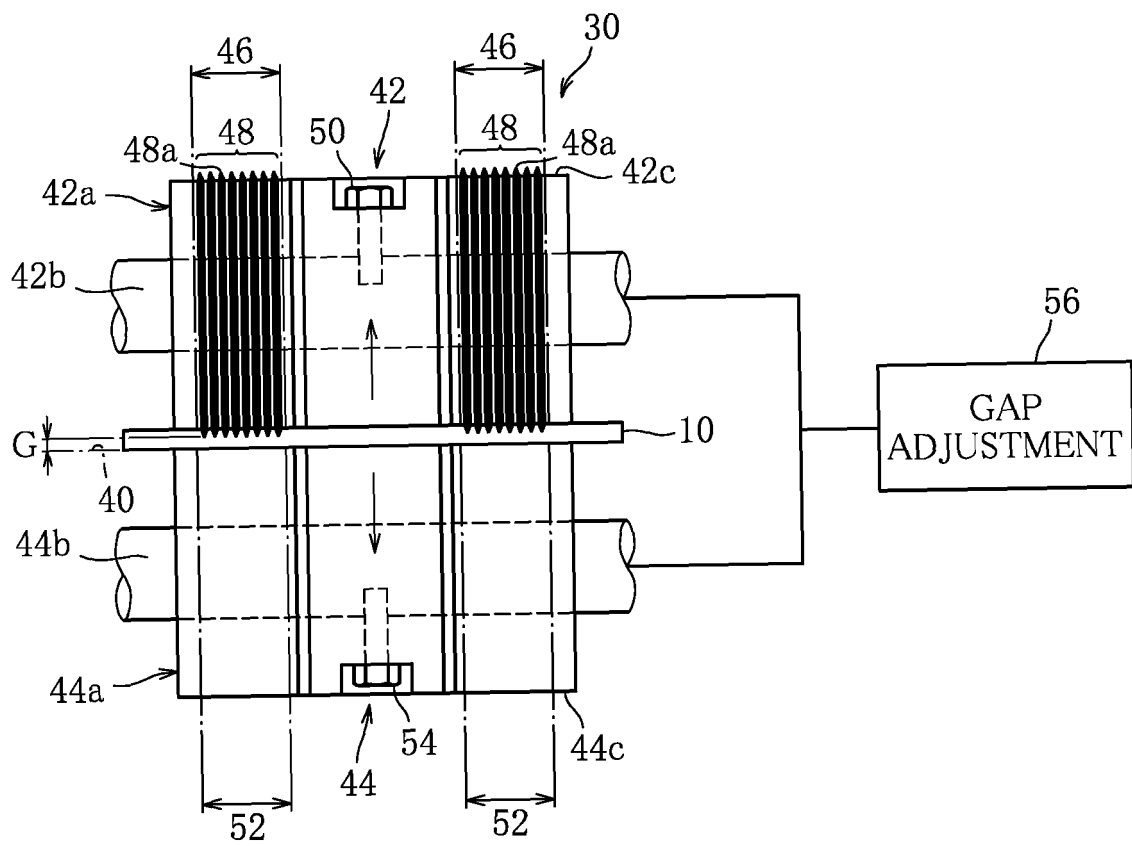


FIG. 6

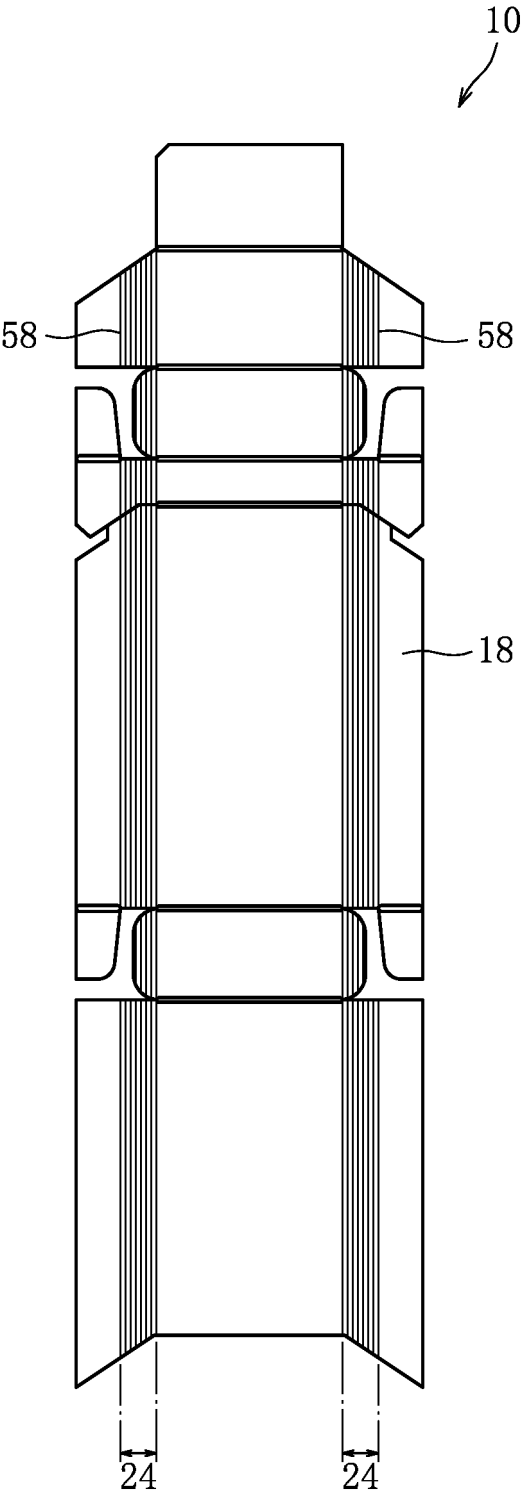


FIG. 7

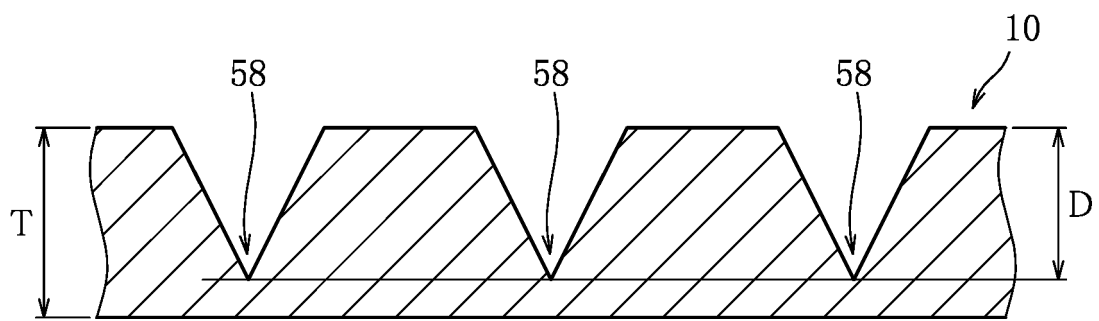


FIG. 8

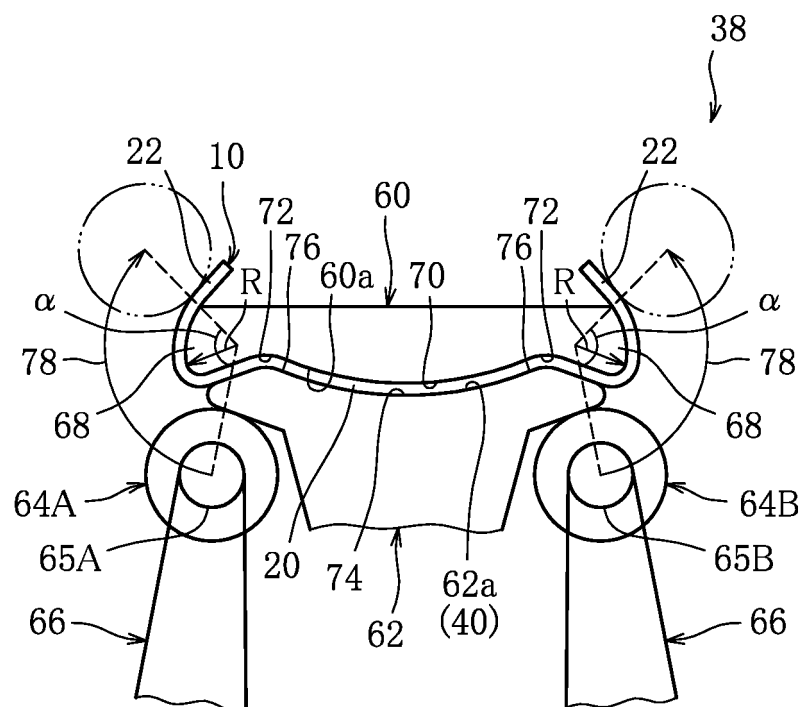


FIG. 9

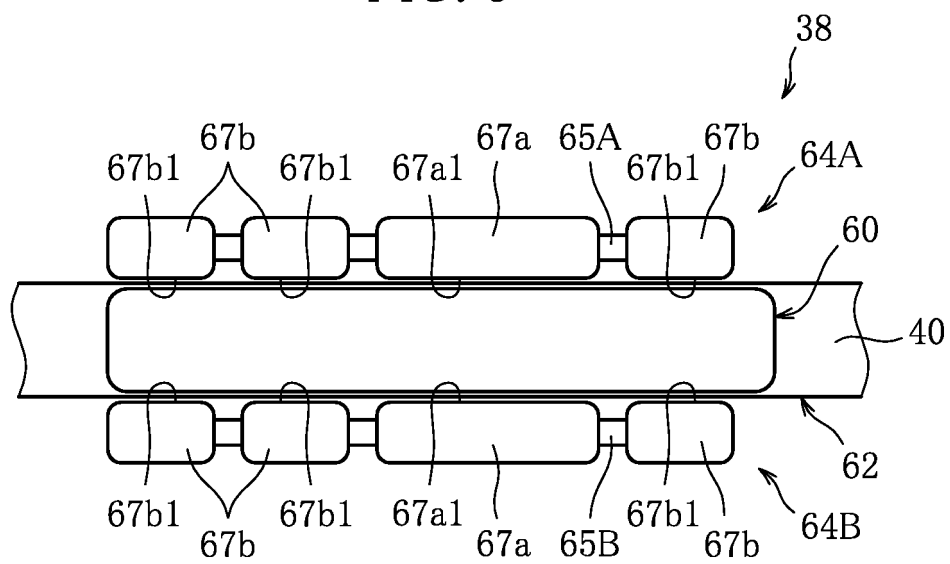


FIG. 10

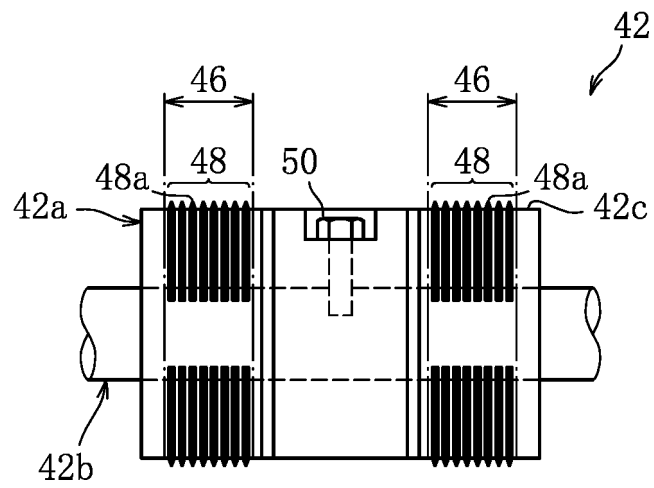


FIG. 11

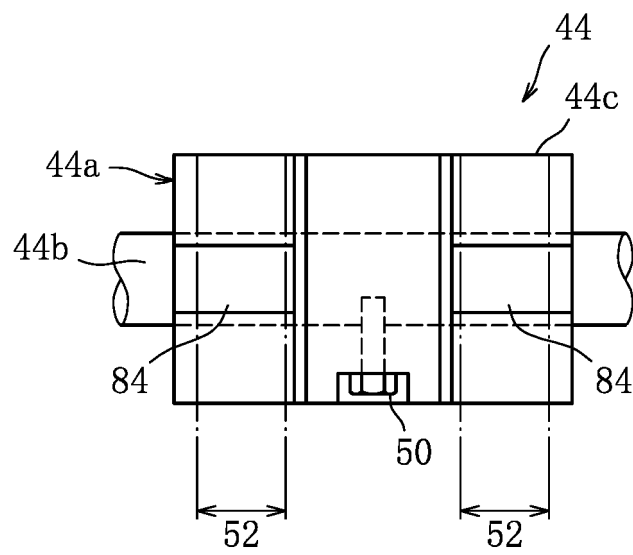


FIG. 12

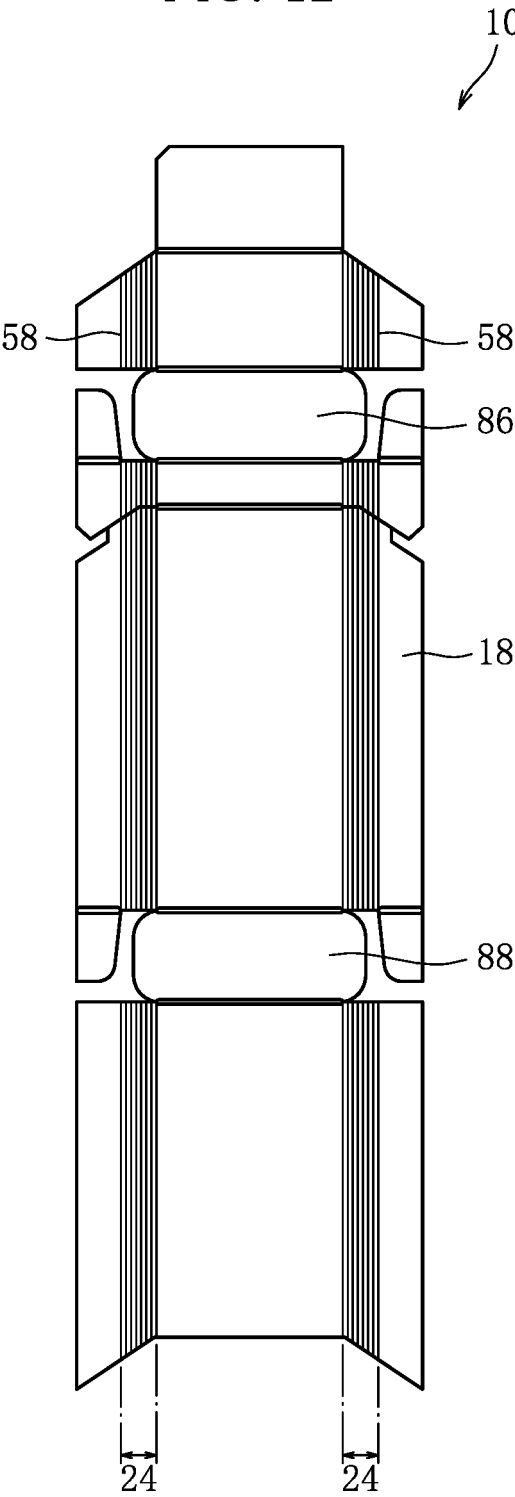


FIG. 13

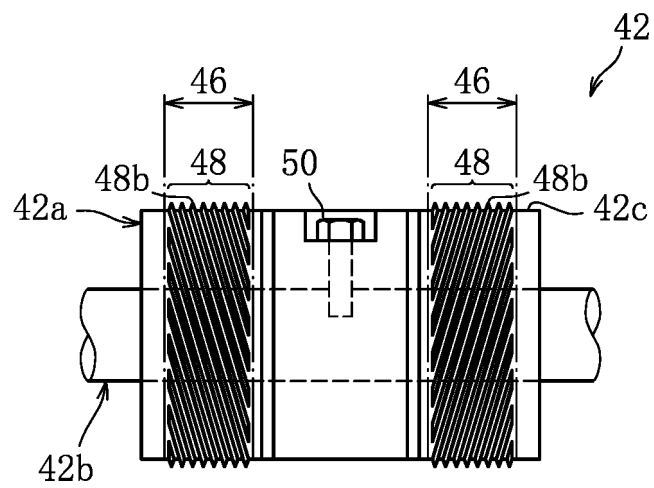


FIG. 14

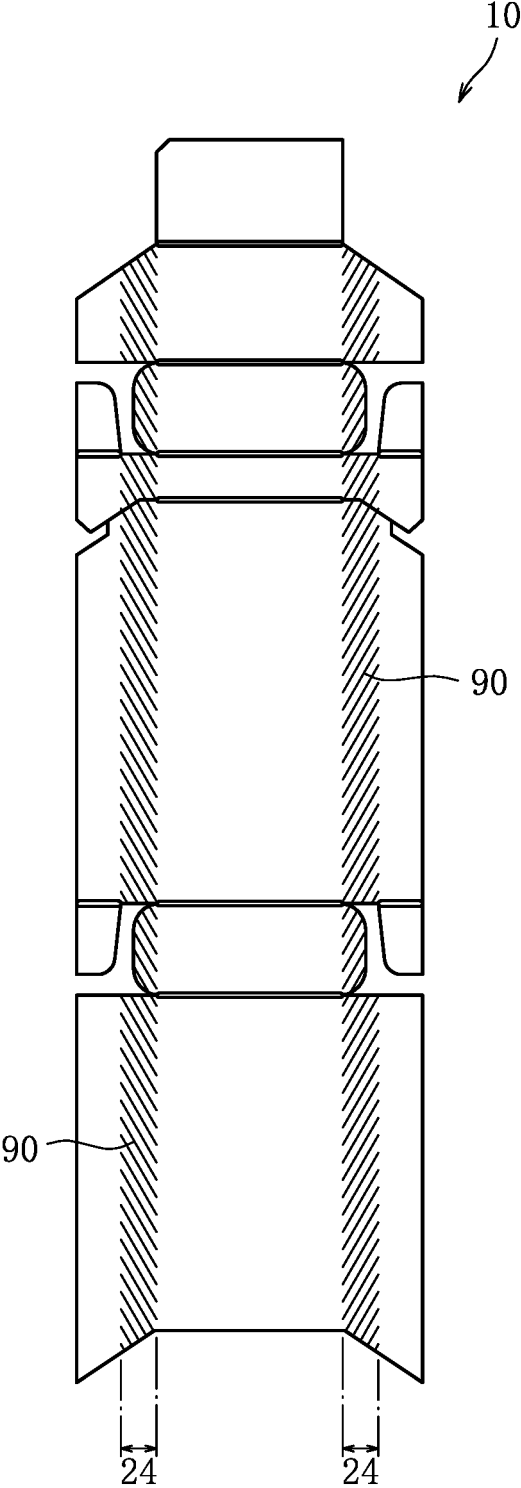


FIG. 15

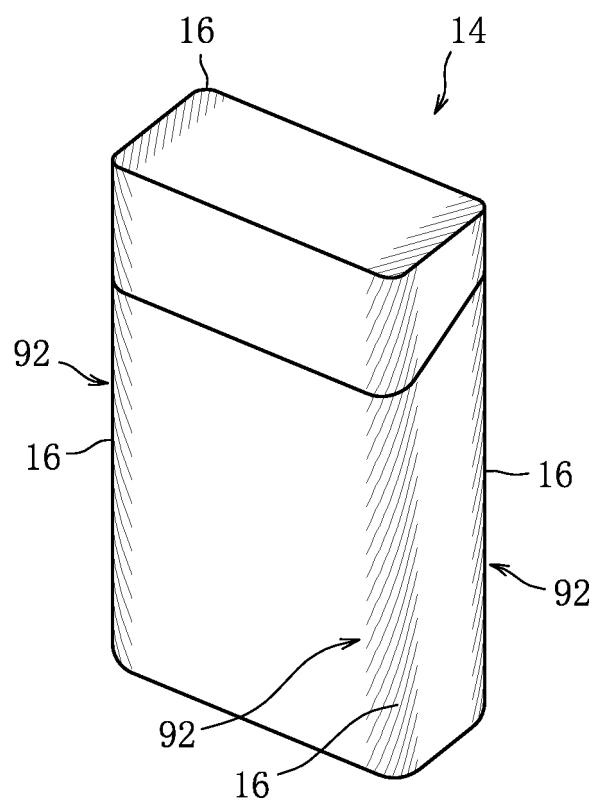


FIG. 16

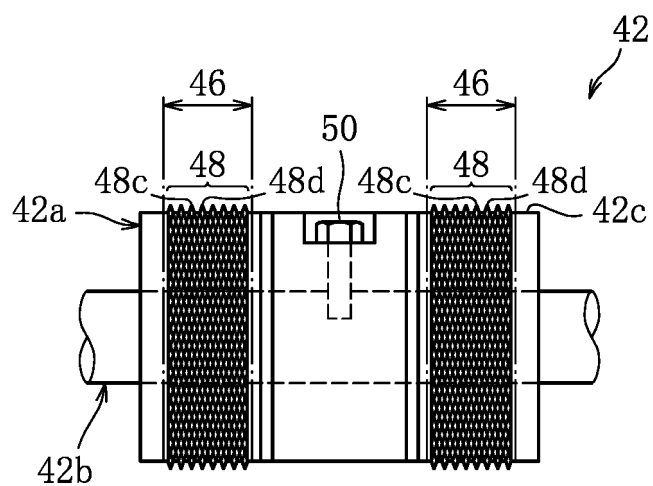


FIG. 17

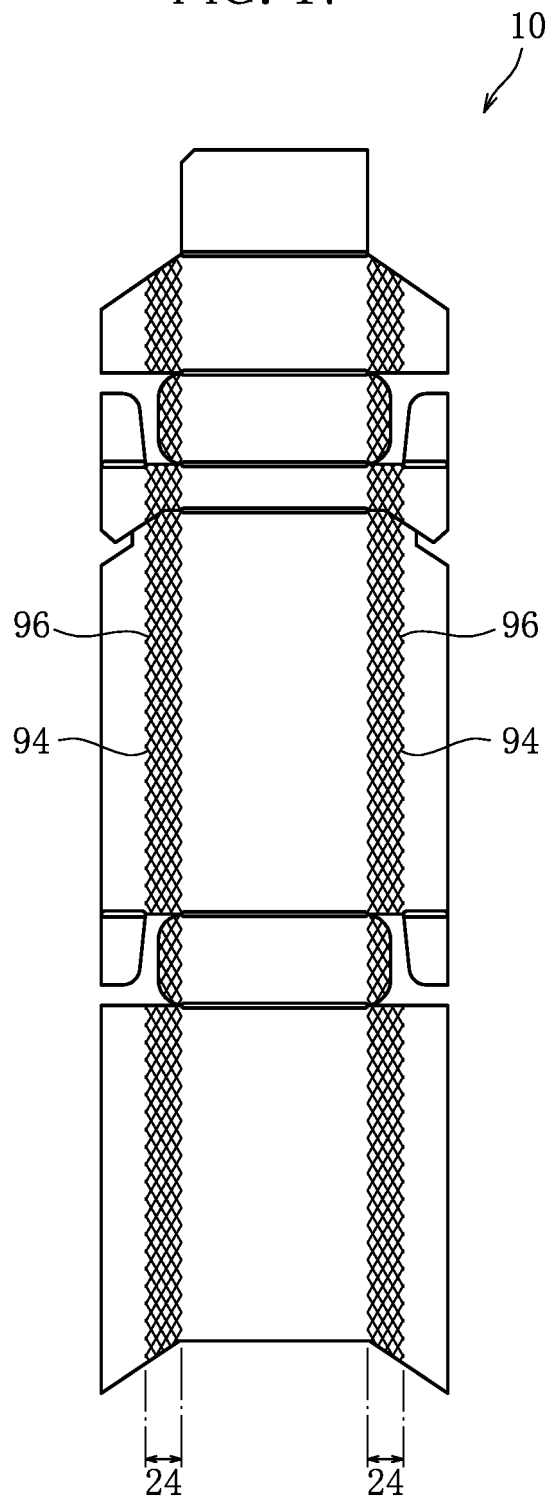


FIG. 18

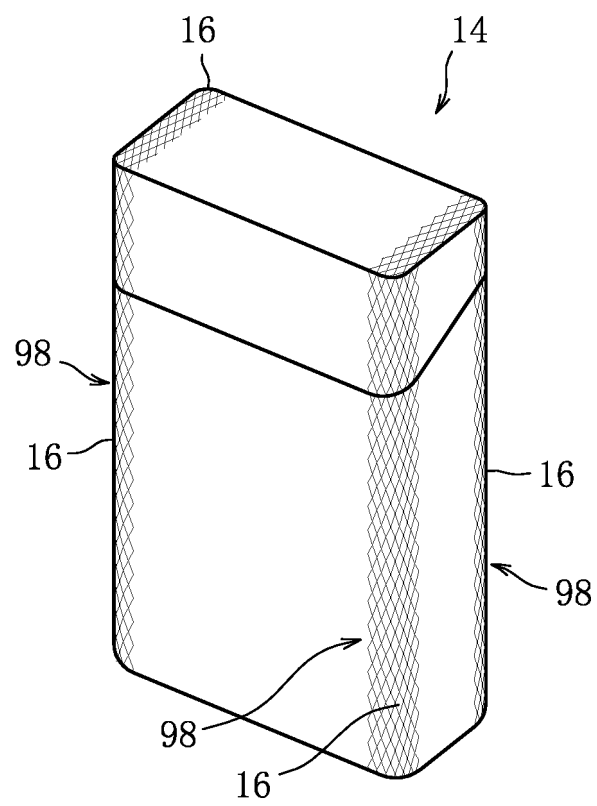


FIG. 19

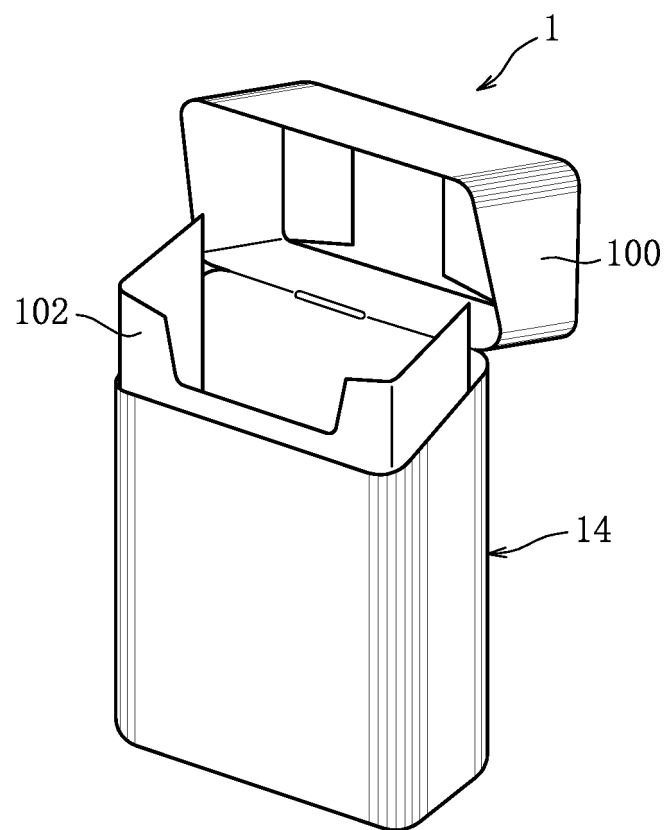


FIG. 20

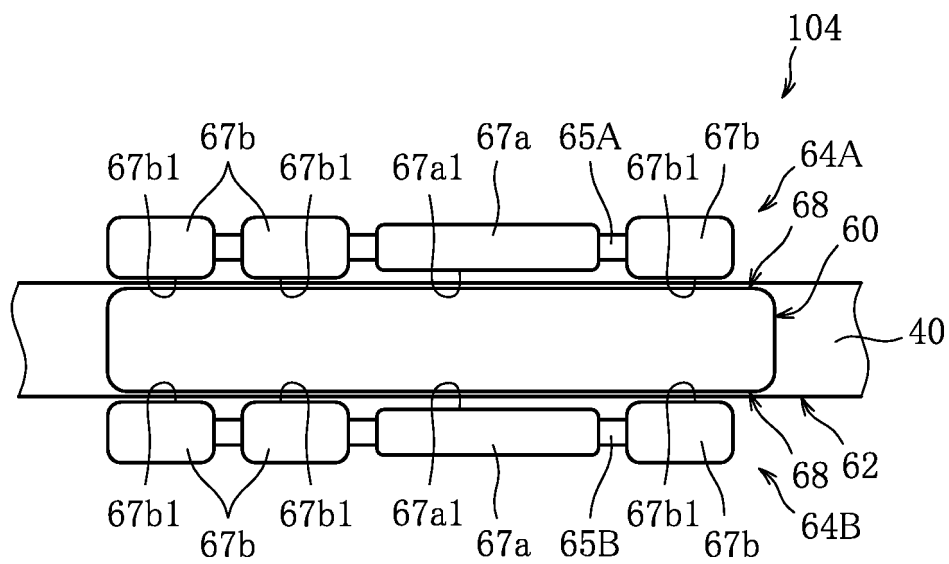


FIG. 21

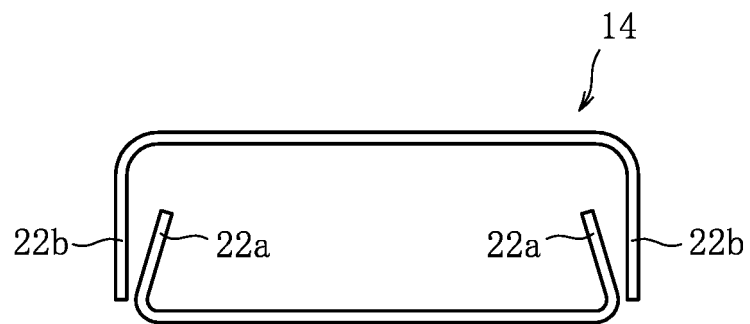


FIG. 22

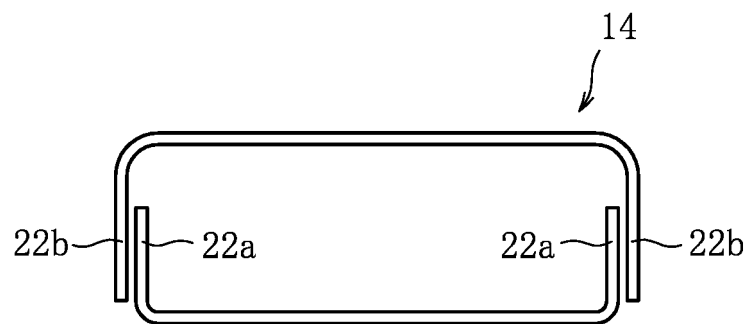


FIG. 23

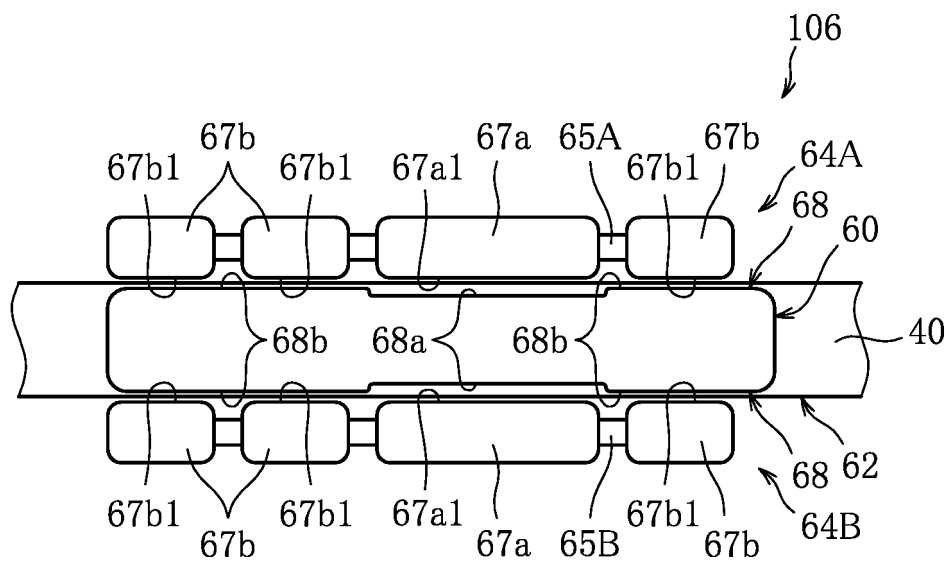
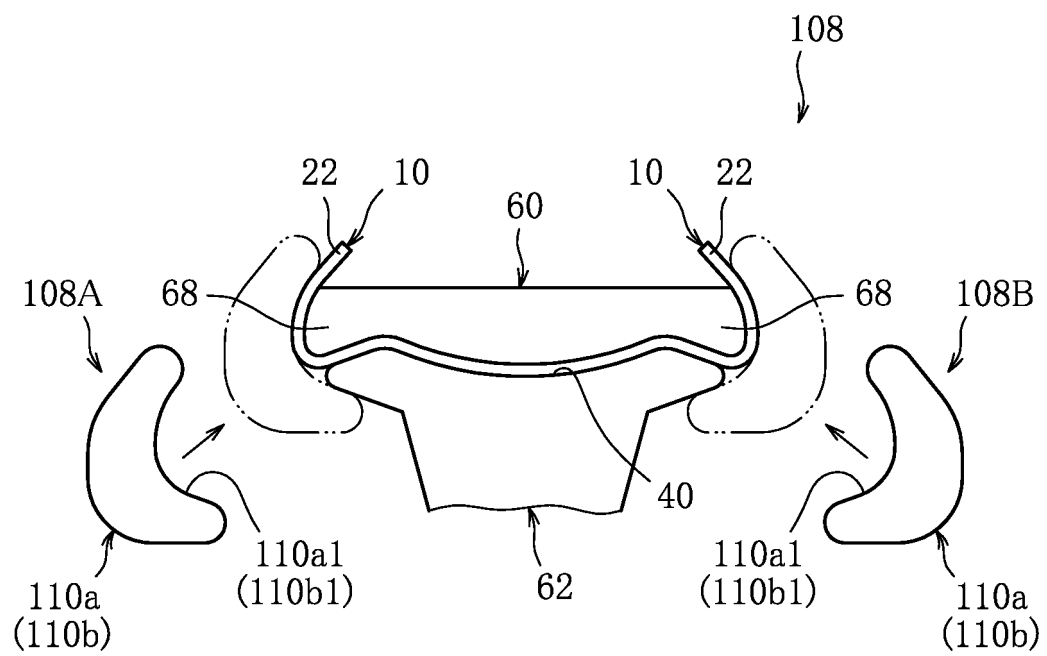


FIG. 24



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2015/074503

A. CLASSIFICATION OF SUBJECT MATTER

B65B19/22(2006.01)i, B65B43/00(2006.01)i, B65B61/02(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)

B65B19/22, B65B43/00, B65B61/02

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 1996-2015
 Kokai Jitsuyo Shinan Koho 1971-2015 Toroku Jitsuyo Shinan Koho 1994-2015

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	WO 2012/131834 A1 (Japan Tobacco Inc.), 04 October 2012 (04.10.2012), paragraphs [0006], [0021] to [0023], [0028] to [0029]; fig. 1 to 6 & US 2013/0341380 A1 paragraphs [0006], [0029] to [0031], [0038] to [0039]; fig. 1 to 5 & EP 2689923 A1	1-7, 25 8-18, 24, 26-28 19-23, 29
Y	WO 2008/136299 A1 (Japan Tobacco Inc.), 13 November 2008 (13.11.2008), entire text; all drawings & US 2010/0044255 A1 entire text; all drawings & EP 2141091 A1 & KR 10-2009-0133117 A & CN 101674989 A	8-12, 24

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

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Date of the actual completion of the international search
18 November 2015 (18.11.15)Date of mailing of the international search report
01 December 2015 (01.12.15)
 Name and mailing address of the ISA/
 Japan Patent Office
 3-4-3, Kasumigaseki, Chiyoda-ku,
 Tokyo 100-8915, Japan

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2015/074503

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	JP 2005-111991 A (G.D S.p.A.), 28 April 2005 (28.04.2005), entire text; all drawings & US 2005/0096203 A1 entire text; all drawings & EP 1522401 A2 & CN 1611347 A	13-18, 26-28
Y	JP 2004-155199 A (G.D S.p.A.), 03 June 2004 (03.06.2004), entire text; all drawings & US 2004/0142804 A1 entire text; all drawings & EP 1418045 A1 & CN 1509862 A	13-18, 26-28
A	JP 2003-104317 A (G.D S.p.A.), 09 April 2003 (09.04.2003), entire text; all drawings & US 2003/0093977 A1 entire text; all drawings & EP 1293431 A1 & CN 1408616 A	1-29
A	JP 2004-98586 A (Tadashi HASHIMOTO), 02 April 2004 (02.04.2004), entire text; all drawings (Family: none)	1-29

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

REFERENCES CITED IN THE DESCRIPTION

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