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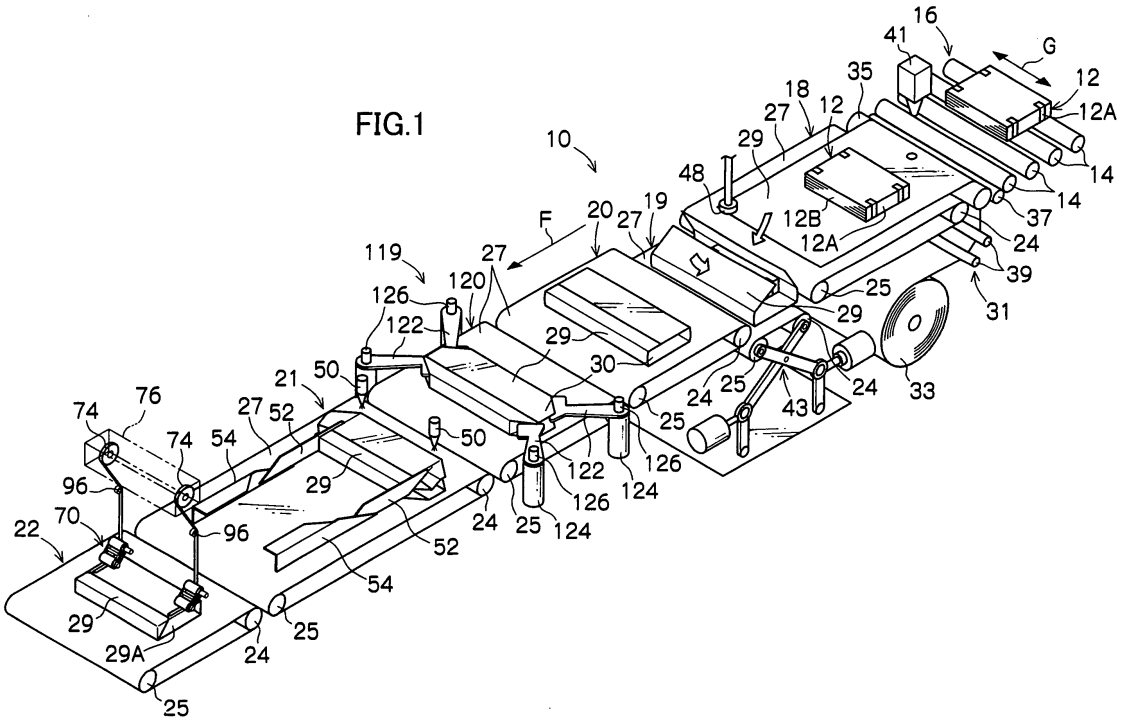
(54) **Planographic printing plate package, packaging apparatus, and packaging method**

(57) A planographic printing plate package formed by valley-folding side surfaces at both end portions of packaging paper in which a bundle of planographic printing plates processed into a predetermined length is wrapped in a tubular manner, superposing upper surfaces and lower surfaces of both end portions of the packaging paper, and folding back and joining together the upper surfaces and the lower surfaces toward the upper side of the planographic printing plates, wherein points of intersection where pairs of valley fold lines formed at the time of the valley folding intersect each other are positioned higher than fold-back lines in the upper surfaces of both end portions of the packaging paper. A package and a packaging apparatus and packaging method for the package are provided which can block the entrance of light from outside in a packaged state.

FIG.1



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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a planographic printing plate package and to a packaging apparatus and a packaging method therefor.

Description of the Related Art

[0002] A planographic printing plate, i.e. planographic printing plate precursor, is a plate which is made by individually administering, or appropriately combining and administering, a surface treatment such as graining, anodization, and chemical conversion to a support such as an aluminium plate or a steel plate, and then applying a photosensitive composition (including a thermosensitive composition in this photosensitive composition) to the support.

[0003] Such planographic printing plates are processed into a predetermined product size by cutting a band-like web, which is a product material, with a slitter along the longitudinal direction and cutting the band-like web with a cutter along the transverse direction.

[0004] As shown in FIGS. 15Ato 15C, planographic printing plates that have been processed into a product size in this manner are stacked on top of each other to form a bundle 130 (photosensitive plate bundle, or PS plate bundle) comprising a given number of plates, and the bundle 130 is packaged in inner packaging paper 131 that is light-blocking and moisture-proof (see Japanese Patent Application Publication (JP-A) No. 2002-234272).

[0005] However, as shown in FIGS. 16A and 16B, side surfaces 132C of ear portions 132 positioned at both end portions of the inner packaging paper 131 and end surfaces 130A of the PS plate bundle 130 become substantially parallel in a state where they are overlapped. For this reason, when light enters from the side surfaces 132C of the ear portions 132 of the inner packaging paper 131 (refer to the arrow in FIG. 16B), the end surfaces 130A of the bundle 130 of planographic printing plates become exposed through a gap or the like between the side surfaces 132C of the ear portions 132 and the end surfaces 130A of the PS plate bundle 130.

SUMMARY OF THE INVENTION

[0006] The present invention has been made in view of the above circumstance and provides a planographic printing plate (planographic printing plate precursor) package and packaging apparatus that can block the entrance of light from outside in a packaged state.

[0007] A first aspect of the invention provides a planographic printing plate package formed by valley-folding side surfaces at both end portions of packaging paper in which a bundle of planographic printing plates processed into a predetermined length is wrapped in a tubular manner, superposing upper surfaces and lower surfaces of both end portions of the packaging paper, and folding back and joining together the upper surfaces and the lower surfaces toward the upper side of the planographic printing plates, wherein points of intersection where pairs of valley fold lines formed at the time of the valley folding intersect each other are positioned higher than fold-back lines in the upper surfaces of both end portions of the packaging paper.

[0008] In the prior art described above, when the side surfaces of the end portions of packaging paper are folded such that pairs of valley fold lines formed when the side surfaces of the end portions of the packaging paper have been valley-folded become parallel to each other (such that they are at right angles with respect to the height-direction edges of the bundle of planographic printing plates), the side surface portions of both end portions of the packaging paper and the end surfaces of the planographic printing plates (end surfaces of the planographic printing plates positioned at both end portion sides of the package) become substantially parallel.

[0009] For this reason, in this state, when upper surfaces and lower surfaces of both end portions of the packaging paper are superposed, folded toward the upper side of the packaging paper, and joined together, the potential arises for light entering from the side surfaces of both end portions of the packaging paper to be guided to the end surfaces of the planographic printing plates through gaps between the side surfaces of both end portions of the packaging paper and the end surfaces of the planographic printing plates and for the end surfaces of the planographic printing plates to be exposed. The potential also arises for outside air to enter through these gaps and cause condensation.

[0010] Consequently, in the first aspect of the present invention, the side surfaces of the end portions of the packaging paper are folded such that the pairs of valley fold lines formed when the side surfaces have been valley-folded intersect each other, and it is ensured that these points of intersection between the valley fold lines become higher than the fold-back lines in the upper surfaces of both end portions of the packaging paper.

[0011] Thus, the side surfaces of the end portions of the packaging paper become slanted (upright) with respect to the end surfaces of the planographic printing plates. For this reason, shielding walls are created by the valley fold portions (regions at the inner sides of the valley fold lines) of the end portions of the packaging paper and the upper surfaces and lower surfaces of the end portions of the packaging paper.

[0012] In other words, paths to the end surfaces of the planographic printing plates for light entering from the side surfaces of the end portions of the packaging paper are blocked by the shielding walls, so that the end surfaces of the planographic printing plates can be prevented from being exposed. Further, because the entrance of outside air is also prevented by the shielding walls, the

problem of condensation also does not arise.

[0013] A second aspect of the invention provides a packaging apparatus that packages planographic printing plates by valley-folding side surfaces at both end portions of packaging paper in which a bundle of planographic printing plates processed into a predetermined length is wrapped in a tubular manner, superposing upper surfaces and lower surfaces of both end portions of the packaging paper, and folding back and joining together the upper surfaces and the lower surfaces toward the upper side of the planographic printing plates, wherein points of intersection where pairs of valley fold lines formed at the time of the valley folding intersect each other are positioned higher than fold-back lines in the upper surfaces of both end portions of the packaging paper.

[0014] Because the second aspect of the invention is configured as described above, the side surfaces of the end portions of the packaging paper are folded such that the pairs of valley fold lines formed when the side surfaces have been valley-folded intersect each other, and it is ensured that these points of intersection between the valley fold lines become higher than the fold-back lines in the upper surfaces of both end portions of the packaging paper. Thus, shielding walls are created by the valley fold portions (regions at the inner sides of the valley fold lines) of the end portions of the packaging paper and the upper surfaces and lower surfaces of the end portions of the packaging paper. In other words, paths to the end surfaces of the planographic printing plates for light entering from the side surfaces of the end portions of the packaging paper are blocked by the shielding walls, so that the end surfaces of the planographic printing plates can be prevented from being exposed. Further, because the entrance of outside air is also prevented by the shielding walls, the problem of condensation also does not arise.

[0015] Moreover, a third aspect of the invention provides a method of packaging planographic printing plates comprising: valley-folding side surfaces at both end portions of packaging paper in which a bundle of planographic printing plates processed into a predetermined length is wrapped in a tubular manner; superposing upper surfaces and lower surfaces of both end portions of the packaging paper; and folding back and joining together the upper surfaces and the lower surfaces toward the upper side of the planographic printing plates, wherein points of intersection where pairs of valley fold lines formed at the time of the valley folding intersect each other are positioned higher than fold-back lines in the upper surfaces of both end portions of the packaging paper.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] An embodiment of the present invention will be described in detail based on the following figures, wherein:

FIG. 1 is a perspective view showing the schematic configuration of a packaging apparatus pertaining to the embodiment of the invention;

FIGS. 2A and 2B are side views for describing packaging by a holding guide plate, a lifting guide plate, and a paper holding member in the packaging apparatus pertaining to the embodiment of the invention;

FIGS. 3A to 3C are side views for describing the raising and lowering of a belt conveyor by a lift mechanism and the gluing of inner packaging paper by holding levers and a gluing plate in the packaging apparatus pertaining to the embodiment of the invention;

FIG. 4 is a perspective view showing a state where tuckers in the packaging apparatus pertaining to the embodiment of the invention have moved away from a belt conveyor;

FIG. 5 is a perspective view for describing the folding of side surfaces of ear portions of the inner packaging paper by the tuckers in the packaging apparatus pertaining to the embodiment of the invention;

FIG. 6 is a perspective view for describing the folding of the side surfaces of the ear portions of the inner packaging paper by the tuckers in the packaging apparatus pertaining to the embodiment of the invention;

FIG. 7 is a plan view for describing the folding angle of the side surfaces of the ear portions of the inner packaging paper by the tuckers in the packaging apparatus pertaining to the embodiment of the invention;

FIGS. 8A and 8B are perspective views for describing the folded state of the side surfaces of the ear portions of the inner packaging paper in the packaging apparatus pertaining to the embodiment of the invention;

FIG. 9 is a perspective view for describing the downward folding of the ear portions of the inner packaging paper by upstream guide plates in the packaging apparatus pertaining to the embodiment of the invention;

FIG. 10 is a perspective view for describing the upward folding of the ear portions of the inner packaging paper by downstream guide plates in the packaging apparatus pertaining to the embodiment of the invention;

FIG. 11 is a perspective view for describing the folding, toward the upper surface of the inner packaging paper, of leading end portions of the ear portions of the inner packaging paper by the downstream guide plates in the packaging apparatus pertaining to the embodiment of the invention;

FIG. 12 is a cross-sectional view for describing the folding of the ear portions of the inner packaging paper by the packaging apparatus pertaining to the embodiment of the invention;

FIGS. 13A and 13B are perspective views for describing the taping of the inner packaging paper by

taping mechanisms in the packaging apparatus pertaining to the embodiment of the invention;

FIG. 14A is a perspective view for describing the folding of the ear portions of the inner packaging paper by the packaging apparatus pertaining to the embodiment of the invention, and FIG. 14B is a cross-sectional view;

FIGS. 15A to 15C are step diagrams for describing a method of packaging planographic printing plates; and

FIG. 16A is a perspective view for describing a conventional packaging method, and FIG. 16B is a cross-sectional view thereof.

DETAILED DESCRIPTION OF THE INVENTION

[0017] A method of packaging planographic printing plates pertaining to an embodiment of the present invention will be described below with reference to FIG. 1.

[0018] FIG. 1 shows an automatic packaging apparatus 10 to which the method of packaging planographic printing plates pertaining to the embodiment of the present invention is applied. The automatic packaging apparatus 10 is for automatically packaging, with inner packaging paper 29 that is light-blocking and moisture-proof, a bundle 12 of photosensitive printing plates (called "PS plate bundle 12" below) that have been cut into a predetermined product size. It will be noted that, in FIG. 1, arrow F represents the direction in which the PS plate bundle 12 is conveyed in the automatic packaging apparatus 10, and arrow G represents a path width direction that is orthogonal to the conveyance direction.

[0019] The PS plate bundle 12 is formed by stacking together a number of photosensitive printing plates corresponding to a product size or the like and two sheets of cardboard and fixing these with adhesive tape. The cardboard is placed on the lowermost portion and the uppermost portion of the PS plate bundle 12 and protects the photosensitive printing plates.

[0020] Here, the photosensitive printing plates and the sheets of cardboard are rectangular. Thus, the PS plate bundle 12 has a rectangular parallelepiped outer shape, its dimension in the thickness direction changes in accordance with the number of photosensitive printing plates included in the PS plate bundle 12, and its dimensions in the horizontal and vertical directions orthogonal to the thickness direction change in accordance with the product size of the photosensitive printing plates.

[0021] A roller conveyor 16 is disposed at the most upstream side of the automatic packaging apparatus 10 in the conveyance direction. The roller conveyor 16 includes plural conveyance rollers 14 that are cylindrical (or column-shaped). The conveyance rollers 14 are disposed at a constant pitch along the conveyance direction and are supported by an apparatus frame (not shown) such that their axes of rotation run parallel to the path width direction. When the PS plate bundle 12 is fed from upstream, the roller conveyor 16 causes the conveyance rollers 14 to rotate and convey the PS plate bundle 12 at a constant speed downstream.

[0022] Six belt conveyors 18, 19, 20, 21, 22 and 120 are disposed in the automatic packaging apparatus 10 downstream of the roller conveyor 16 in the conveyance direction. The belt conveyor 18 includes a pair of cylindrical rollers 24 and 25 and a loop-like conveyor belt 27 that is stretched around the outer peripheral surfaces of the rollers 24 and 25.

[0023] Here, the roller 24 that is upstream in the conveyance direction serves as a drive roller that rotates as a result of torque being transmitted thereto by a drive mechanism (not shown), and the roller 25 that is downstream in the conveyance direction serves as a driven roller that rotates following the roller 24 as a result of the torque that is transmitted thereto by the conveyor belt 27. Further, the belt conveyors 19, 20, 21, 22 and 120 have the same structure as the belt conveyor 18, and each includes a pair of rollers 24 and 25 and a conveyor belt 27.

[0024] The automatic packaging apparatus 10 includes an inner packaging paper feeding mechanism 31 for feeding the inner packaging paper 29 from a gap between the roller conveyor 16 and the belt conveyor 18. The inner packaging paper feeding mechanism 31 rotatably supports, below the belt conveyor 18, an inner packaging paper roll 33 in which the inner packaging paper 29 is wound in a coiled manner.

[0025] The inner packaging paper feeding mechanism 31 includes a feed roller 35 and a pinch roller 37, which are disposed between the roller conveyor 16 and the belt conveyor 18, and plural guide rollers 39, which guide the inner packaging paper 29 leading out from the inner packaging paper roll 33 to a nip portion between the feed roller 35 and the pinch roller 37.

[0026] As shown in FIGS. 2A and 2B, the leading end portion of a plate spring-like holding guide plate 110 is supported above the feed roller 35 of the inner packaging paper feeding mechanism 31 in a cantilever state. The holding guide plate 110 guides the inner packaging paper 29 fed from the feed roller 35 and the pinch roller 37 such that the inner packaging paper 29 is led out downstream in the conveyance direction along the upper surface of the belt conveyor 18.

[0027] A comb-like lifting guide plate 112 is disposed downstream of the holding guide plate 110 and inside the loop formed by the conveyor belt 27 of the belt conveyor 18. The comb-like lifting guide plate 112 is supported such that it is swingable about a support shaft portion 112A that is disposed such that its axis is parallel to those of the rollers 24 and 25 of the belt conveyor 18. The comb-like lifting guide plate 112 is urged in the clockwise direction around the support shaft portion 112A, and the leading end side of the lifting guide plate 112 is positioned higher than the belt conveyor 18. Further, a paper holding member 114 is supported downstream of the lifting guide plate 112 in a cantilever state above the belt conveyor 18.

[0028] When the PS plate bundle 12 is conveyed to a predetermined position by the roller conveyor 16, the inner packaging paper feeding mechanism 31 causes the feed roller 35 to rotate. Thus, the leading end portion of the inner packaging paper 29 is guided by the holding guide plate 110 and is led out toward the downstream side of the belt conveyor 18 in the conveyance direction. When the PS plate bundle 12 is conveyed onto the belt conveyor 18 by the roller conveyor 16, the PS plate bundle 12 merges with the inner packaging paper 29 and is placed on the belt conveyor 18 via the inner packaging paper 29.

[0029] The inner packaging paper feeding mechanism 31 reels out the inner packaging paper 29 from the inner packaging paper roll 33 at a speed that is equal to the conveyance speed of the belt conveyor 18. At this time, as shown in FIG. 2A, the lifting guide plate 112 lifts up the leading end portion of the inner packaging paper 29. Thereafter, as shown in FIG. 2B, when the PS plate bundle 12 makes contact with the lifting guide plate 112 via the inner packaging paper 29, the lifting guide plate 112 is pushed under the belt conveyor 18 by the weight of the PS plate bundle 12. Further, as shown in FIG. 2B, the paper holding member 114 folds, toward the upper surface side of the PS plate bundle 12, the leading end portion of the inner packaging paper 29 lifted up by the lifting guide plate 112 and conveyed downstream.

[0030] When the inner packaging paper feeding mechanism 31 reels out a length of the inner packaging paper 29 corresponding to the outer shape of the PS plate bundle 12, the inner packaging paper 29 is cut with a cutter (not shown) disposed downstream of the feed roller 35. Here, the inner packaging paper 29 is cut into a length equal to the sum of a predetermined overlap and the outer circumferential length along the conveyance direction and the width direction. The PS plate bundle 12 is placed on the center portion of the upper surface of the inner packaging paper 29 in the path width direction and is conveyed together with the inner packaging paper 29 by the belt conveyor 18 onto the downstream belt conveyor 19.

[0031] A glue spraying device 41 is disposed above the feed roller 35 of the inner packaging paper feeding mechanism 31 in the automatic packaging apparatus 10. The glue spraying device 41 sprays fluid glue just before the inner packaging paper 29 is cut by the inner packaging paper feeding mechanism 31, and drips the glue onto the trailing end portion of the upper surface of the inner packaging paper 29.

[0032] The conveyance-direction length of the belt conveyor 19 disposed downstream of the belt conveyor 18 is set slightly larger than the length of the PS plate bundle 12. As shown in FIGS. 3A to 3C, the belt conveyor 19 is supported such that it is movable upward and downward by a lift mechanism 43. As shown in FIG. 3A, the lift mechanism 43 retains the belt conveyor 19 at the same height as the upstream and downstream belt conveyors 18 and 20 when the PS plate bundle 12 is conveyed by the belt conveyor 19.

[0033] The belt conveyor 19 temporarily stops when it conveys the PS plate bundle 12 to a central position on the belt conveyor 19 in the conveyance direction. At this time, both width-direction end portions of the inner packaging paper 29 spread between the undersurface of the PS plate bundle 12 and the belt conveyor 19 are caused to be led out.

[0034] When the belt conveyor 19 on which the PS plate bundle 12 has been placed temporarily stops, as shown in FIG. 3B, the lift mechanism 43 lowers the belt conveyor 19 from the conveyance position at the same height as the belt conveyors 18 and 20. Thus, the belt conveyor 19 is lowered and the upstream end portion of the inner packaging paper 29 is folded upward by the belt conveyor 18.

[0035] A pair of holding levers 45 and 46 and a gluing plate 48 are disposed above the belt conveyor 19. Here, the holding levers 45 and 46 are respectively coupled to eccentric cam mechanisms (not shown) which operate to simultaneously lower and swing the holding levers 45 and 46. Further, the gluing plate 48 is coupled to a piston mechanism (not shown) that supports the gluing plate 48 above the path width-direction center portion of the upper surface of the belt conveyor 19 and operates to reciprocally move the gluing plate 48 upward and downward.

[0036] As shown in FIG. 3B, when the belt conveyor 19 is lowered by the lift mechanism 43 from the conveyance position, first, the downstream holding lever 45 folds upstream the downstream end portion of the inner packaging paper 29 leading upward from a side end surface 12B of the PS plate bundle 12, and causes this downstream end portion of the inner packaging paper 29 to come into close contact with the upper surface of the PS plate bundle 12. Next, the upstream holding lever 46 folds downstream the upstream end portion of the inner packaging paper 29 leading upward from a side end surface 12B of the PS plate bundle 12, and causes this upstream end portion of the inner packaging paper 29 to come into close contact with the upper surface of the PS plate bundle 12 via the downstream end portion of the inner packaging paper 29.

[0037] When the holding levers 45 and 46 cause both end portions of the inner packaging paper 29 to come into close contact with the upper surface of the PS plate bundle 12, as shown in FIG. 3C, the gluing plate 48 is lowered and presses the upstream end portion of the inner packaging paper 29 against the downstream end portion of the inner packaging paper 29. At this time, the glue dripped onto the upstream end portion of the inner packaging paper 29 is positioned above the path width-direction center portion of the upper surface of the belt conveyor 19.

[0038] Consequently, the inner packaging paper 29 becomes a tube in which the upstream end portion and the downstream end portion of the inner packaging paper 29 are glued together with the glue and both of whose end portions in the path width direction are open. The

gluing plate 48 presses the inner packaging paper 29 against the upper surface of the PS plate bundle 12 until the glue hardens and the upstream end portion and the downstream end portion of the inner packaging paper 29 are reliably glued together. Then, the gluing plate 48 is raised and returned by the piston mechanism to the standby position shown in FIG. 3A.

[0039] When the gluing plate 48 returns to the standby position, the belt conveyor 19 is returned to the conveyance position by the lift mechanism 43, resumes conveyance of the PS plate bundle 12, and conveys the PS plate bundle 12 to the downstream belt conveyor 20. The belt conveyor 20 conveys the PS plate bundle 12 toward a folding device 119 that is further downstream.

[0040] The folding device 119 is disposed with the belt conveyor 120. When the PS plate bundle 12 is conveyed onto the belt conveyor 120 (or, after the inner packaging paper 29 has been folded by tuckers 122, which will be described later), as shown in FIG. 4, the tuckers 122 move away from the belt conveyor 120 such that they do not hinder the conveyance of the PS plate bundle 12 that is conveyed.

[0041] Further, the folding device 119 is disposed with receiving plates (not shown) that receive upper surfaces 30A of ear portions 30 of the inner packaging paper 29 sticking outward in the path width direction from end surfaces 12A of the PS plate bundle 12. The PS plate bundle 12 is conveyed between the receiving plates and the belt conveyor 120.

[0042] A pair of columnar support portions 124 is disposed on both side portions of the belt conveyor 120, and a shaft 126 stands on the upper surface of each of the support portions 124. An unillustrated stepping motor is connected to the shafts 126, and the shafts 126 become rotatable by the driving of the stepping motor.

[0043] Further, spatula-like tuckers 122 are fixed to the shafts 126. As shown in FIGS. 4 to 6, the tuckers 122 swing a predetermined angle parallel to the belt conveyor 120 and above the belt conveyor 120 by the driving of the stepping motor. The tuckers 122 are made thinner than the height of the PS plate bundle 12 and are configured to make contact with the centers of side surfaces 30C of the ear portions 30 of the inner packaging paper 29.

[0044] Tabular contact plates 122A that have substantially quadrilateral shapes in plan view are disposed on the leading end portions of the tuckers 122. The contact plates 122A are wider than fixed portions 122B that are fixed to the shafts 126. Further, in mutually adjacent tuckers 122, the surfaces of the contact plates 122A that face each other are formed such that the contact plates 122A become narrower toward the fixed portions 122B, and the leading end portions of the contact plates 122A are sharp. Thus, it is ensured that the contact plates 122A reliably contact predetermined positions of the side surfaces 30C of the ear portions 30 of the inner packaging paper 29.

[0045] As shown in FIG. 7, the leading end portions of the contact plates 122A of the tuckers 122 (hypothetical line P represents the locus of movement of the leading end portions of the contact plates 122A) contact the side surfaces 30C of the ear portions 30 of the inner packaging paper 29 in a state where the leading end portions of the contact plates 122A slant θ_2 (a range of θ_1 (about 45 degrees) to θ_3 (about 75 degrees) is preferable; here, θ_2 = about 60 degrees) with respect to height-direction edges 12C of the PS plate bundle 12.

[0046] Then, as shown in FIGS. 6 and 7, valley fold lines S of valley folds are formed in the side surfaces 30C of the ear portions 30 in a state where the side surfaces 30C of the ear portions 30 slant θ_2 with respect to the height-direction edge 12C of the PS plate bundle 12 using the receiving plates and the belt conveyor 120 as a cradle (it will be noted that, in FIG. 7, the height-direction edge 12C should actually be represented by dots, but for the sake of convenience, it is represented by a line). At this time, as shown in FIG. 8A, the valley fold lines S intersect with each other vertically at points Q.

[0047] Then, after the tuckers 122 have moved away from the belt conveyor 120 such that they do not hinder the conveyance of the PS plate bundle 12 that is conveyed, the PS plate bundle 12 is further conveyed onto the downstream belt conveyor 21.

[0048] It will be noted that, although the tuckers 122 here are made thinner than the height of the PS plate bundle 12 and are configured to make contact with the centers of the side surfaces 30C of the ear portions 30 of the inner packaging paper 29, each of the tuckers 122 may also be configured by two tuckers above and below, and each of the tuckers 122 may be caused to respectively contact the side surfaces 30C and the upper surfaces 30A of the ear portions 30 and the side surfaces 30C and lower surfaces 30B of the ear portions 30 to fold the side surfaces 30C of the ear portions 30.

[0049] A pair of air nozzles 50 is disposed above the upstream end portion of the belt conveyor 21. The air nozzles 50 are disposed such that they correspond to both path width-direction end portions of the PS plate bundle 12 conveyed on the belt conveyor 21, are connected to a high-pressure air source (not shown) comprising an air tank and a compressor, and blow high-pressure air onto the inner packaging paper 29 housing the PS plate bundle 12 conveyed on the belt conveyor 21. At this time, the high-pressure air from the air nozzles 50 is blown onto the ear portions 30 of the inner packaging paper 29. Thus, the ear portions 30 of the inner packaging paper 29 are pushed in the direction of the belt conveyor 21 and are prevented from curling or rising.

[0050] Further, a pair of upstream guide plates 52 is disposed above the belt conveyor 21 downstream of the air nozzles 50, and a pair of downstream guide plates 54 is disposed downstream of the pair of upstream guide plates 52. Here, the pair of upstream guide plates 52 and the pair of downstream guide plates 54 are supported by a support frame (not shown) disposed above the belt conveyor 21, and are configured such that their positions

are adjustable in the path width direction.

[0051] As shown in FIG. 9, the upstream guide plates 52 are formed in substantial parallelogram tabular shapes and are supported such that their thickness direction coincides with the path width direction and such that their longitudinal direction coincides with the conveyance direction. On the lower end sides of the upstream guide plates 52, slanted guide surfaces 56 that are slanted with respect to the upper surface of the belt conveyor 21 are disposed on the upstream end portions of the upstream guide plates 52 in the conveyance direction, and parallel guide surfaces 58 that are parallel to the upper surface of the belt conveyor 21 are disposed downstream of the slanted guide surfaces 56. The slanted guide surfaces 56 of the upstream guide plates 52 are slanted such that the interval between them and the belt conveyor 21 gradually becomes narrower in the conveyance direction, and a minute gap is formed between the parallel guide surfaces 58 and the belt conveyor 21.

[0052] On the upper end sides of the upstream guide plates 52, as shown in FIG. 9, slanted surfaces 60 that are slanted such that they gradually become closer to the belt conveyor 21 in the conveyance direction are formed on the downstream end portions of the upstream guide plates 52 in the conveyance direction. Here, the positions of the upstream guide plates 52 are adjusted in the path width direction using as references the end surfaces 12A of the PS plate bundle 12 conveyed on the belt conveyor 21, and the upstream guide plates 52 are fixed at positions slightly outward with respect to the end surfaces 12A of the PS plate bundle 12. Further, the downstream end portions of the upstream guide plates 52 are disposed such that they partially overlap the upstream end portions of the downstream guide plates 54 in regard to the conveyance direction and are inside the upstream end portions of the downstream guide plates 54 in regard to the path width direction.

[0053] As for the inner packaging paper 29 conveyed on the belt conveyor 21, the ear portions 30 pushed in the direction of the belt conveyor 21 by the high-pressure air from the air nozzles 50 are inserted between the upstream guide plates 52 and the belt conveyor 21. In a state where the ear portions 30 have been inserted between the slanted guide surfaces 56 of the upstream guide plates 52 and the belt conveyor 21, the inner packaging paper 29 is conveyed downstream by the belt conveyor 21 and the tubular ear portions 30 are pushed in the direction of the belt conveyor 21 by the slanted guide surfaces 56. Thus, the upper surfaces 30A of the ear portions 30 are brought closer to the lower surfaces 30B and come into close contact with the lower surfaces 30B in the vicinity of the terminal end portions of the slanted guide plates 56.

[0054] Moreover, when the inner packaging paper 29 is conveyed downstream by the belt conveyor 21, the ear portions 30 are inserted between the parallel guide surfaces 58 and the belt conveyor 21. Thus, as shown in FIG. 10, the ear portions 30, whose upper surfaces 30A and lower surfaces 30B have been brought into close contact with each other, are maintained in a state where they are pushed onto the belt conveyor 21 by the parallel guide surfaces 58.

[0055] As shown in FIG. 10, tabular side plate portions 62 are disposed on the downstream guide plates 54. The side plate portions 62 are formed such that they are slender in the conveyance direction and are supported such that their longitudinal direction coincides with the conveyance direction and their thickness direction coincides with the path width direction. Standing upper guide surfaces 64 that are slanted such that they become further distanced from the belt conveyor 21 in the conveyance direction are disposed on upper end portions of the side plate portions 62.

[0056] Further, top plate portions 66 that are bent inward from the upper ends of the side plate portions 62 are disposed downstream of the standing upper guide surfaces 64 on the downstream guide plates 54. The top plate portions 66 are tabular and formed such that they are parallel to the upper surface of the belt conveyor 21. Further, folding guide surfaces 68 that slant inward in the conveyance direction are disposed on upstream end portions of the top plate portions 66. Here, the distance from the upper surface of the belt conveyor 21 to the undersides of the top plate portions 66 is substantially equal to the thickness of the PS plate bundle 12.

[0057] When the leading end portions, in the conveyance direction, of the ear portions 30 of the inner packaging paper 29 folded by the upstream guide plates 52 reach the downstream end portions of the upstream guide plates 52, the ear portions 30 ride up over the standing upper guide surfaces 64 of the downstream guide plates 54. When the inner packaging paper 29 is conveyed downstream by the belt conveyor 21 in this state, the inner packaging paper 29 moves downstream and the ear portions 30 are lifted upward along the standing upper guide surfaces 64.

[0058] Then, the ear portions 30 are led out above the PS plate bundle 12 in a state where the upper surfaces 30A and the lower surfaces 30B of the ear portions 30 are superposed. This operation of folding the ear portions 30 above the PS plate bundle 12 is conducted in the vicinity of the upstream end portions of the standing upper guide surfaces 64 that overlap the downstream end portions of the upstream guide plates 52 in the conveyance direction.

[0059] The leading end portions, in the conveyance direction, of the ear portions 30 of the inner packaging paper 29 that have been folded upward by the standing upper guide surfaces 64 contact the folding guide surfaces 68 positioned on the upstream end portions of the top plate portions 66. When the inner packaging paper 29 is conveyed downstream from this state, as shown in FIG. 11, the folding guide surfaces 68 fold the leading end portions of the ear portions 30 inward.

[0060] Both end portions of the PS plate bundle 12 are inserted under the top plate portions 66 together with the

leading end portions of the ear portions 30 that have been folded inward. Here, because the distance from the upper surface of the belt conveyor 21 to the undersides of the top plate portions 66 is substantially equal to the thickness of the PS plate bundle 12, the top plate portions 66 and the conveyor belt 27 stretched between the rollers 24 and 25 nip the ear portions 30 of the inner packaging paper 29 and cause the ear portions 30 to come into close contact with the upper surface of the inner packaging paper 29 as the inner packaging paper 29 moves downstream (see FIG. 12). As a result, the PS plate bundle 12 conveyed downstream of the downstream guide plates 54 by the belt conveyor 21 becomes packaged by the inner packaging paper 29.

[0061] Because the downstream guide plates 54 are disposed at positions slightly outward with respect to the end surfaces 12A of the PS plate bundle 12 and extend parallel to the end surfaces 12A of the PS plate bundle 12, as shown in FIG. 12, the upper surfaces 30A and the lower surfaces 30B of the ear portions 30 come into close contact with each other and the ear portions 30 are folded by the side plate portions 62 at positions about 10 mm away from the end surfaces 12A of the PS plate bundle 12.

[0062] Here, as shown in FIGS. 8A and 8B and FIG. 12, the upper surfaces 30A and the lower surfaces 30B of the ear portions 30 come into close contact with each other at points Q where the upper and lower valley fold lines S of the valley folds formed in the side surfaces 30C of the ear portions 30 of the inner packaging paper 29 intersect each other. Additionally, it is ensured that these points Q become higher than fold-back lines L in the upper surfaces 30A of the ear portions 30.

[0063] As shown in FIG. 1, a pair of taping mechanisms 70 is disposed above the belt conveyor 22 downstream of the belt conveyor 21. The taping mechanisms 70 are supported by a support frame (not shown) disposed above the belt conveyor 22 such that their positions are adjustable by the support frame in the path width direction. Additionally, the positions of the taping mechanisms 70 are adjustable in the path width direction such that pressure rollers 84 are disposed at positions corresponding to the ear portions 30 of the inner packaging paper 29 conveyed on the belt conveyor 22.

[0064] Further, a tape feeding unit 76, in which tape reels 74 wound with adhesive tape 72 are loaded, is disposed for the taping mechanisms 70, and each of the taping mechanisms 70 includes a pair of roller frames 80 that are parallel to each other. Idle rollers 82 and pressure rollers 84 are disposed between the roller frames 80 at their upstream end portions and their downstream end portions, and intermediate rollers 85 are disposed between the idle rollers 82 and the pressure rollers 84. The rollers 82 and 84 are supported such that they are rotatable around support shaft portions (not shown) that are parallel to the path width direction.

[0065] Motor units 86 are disposed on the outer sides of the roller frames 80 and supported such that the idle rollers 82 coupled coaxially with the support shaft portions of the pressure rollers 84 are rotatable. Drive pulleys 92 are coaxially coupled to the motor units 86, and loop-like belts 94 are wound around the drive pulleys 92 and driven pulleys 90.

[0066] Thus, the pressure rollers 84 are coupled to the motor units 86 via the drive pulleys 92, the belts 94, and the driven pulleys 90. Further, as shown in FIG. 1, guide rollers 96 are disposed between the tape feeding unit 76 and the pairs of roller frames 80 in the taping mechanisms 70 and guide the adhesive tape 72 led out from the tape reels 74 of the tape feeding unit 76 to taping units 78.

[0067] Further, actuators (not shown) such as piston drivers are coupled to the end portions of the roller frames 80 at the pressure roller 84 sides, and the taping units 78 are caused by the operation of the actuators to swing from the standby position shown in FIG. 13A to the taping position shown in FIG. 13B. Then, when the taping of the adhesive tape 72 is completed, the taping units 78 in the taping position are returned to the standby position.

[0068] Here, roller surfaces 84A of the pressure rollers 84 are moved away from the inner packaging paper 29 packaging the PS plate bundle 12 on the belt conveyor 22 when the taping units 78 are in the standby position, and press against the inner packaging paper 29 packaging the PS plate bundle 12 on the belt conveyor 22 when the taping units 78 are in the taping position.

[0069] The pressure rollers 84 pressing against the inner packaging paper 29 press, with the roller surfaces 84A, the adhesive tape 72 in a region spanning the ear portions 30 of the inner packaging paper 29 and the upper surface of the inner packaging paper 29. At this time, because the linear speed of the roller surfaces 84A is made substantially equal to the conveyance speed of the belt conveyor 22, the adhesive tape 72 is reeled out downstream in the conveyance direction at a speed equal to the conveyance speed of the belt conveyor 22 by frictional force with the roller surfaces 84A.

[0070] Consequently, the inner packaging paper 29 packaging the PS plate bundle 12 is conveyed downstream by the belt conveyor 22, the adhesive tape 72 is adhered from the downstream end portion of the region spanning the ear portions 30 of the inner packaging paper 29 and the upper surface of the inner packaging paper 29, and the adhesive tape 72 is cut above the downstream end portion of the inner packaging paper 29 by cutting blades 98 lowered by actuators (not shown) such as piston drive mechanisms.

[0071] Thus, the ear portions 30 of the inner packaging paper 29 are taped to the upper surface of the inner packaging paper 29 by the adhesive tape 72, and the inner packaging paper 29 is retained in a state where it packages the PS plate bundle 12 until the adhesive tape 72 is removed.

[0072] As the inner packaging paper 29 used in the automatic packaging apparatus 10 described above, kraft paper to which polyester in which aluminum foil has been dissolved is adhered (aluminum kraft paper), or

kraft paper with a grammage of 100 g or less coated with a light-blocking agent and a moisture-proofing agent, is used.

[0073] Next, the action of the method of packaging planographic printing plates pertaining to the present embodiment will be described.

[0074] Conventionally, when the side surfaces of the ear portions of inner packaging paper are folded such that pairs of valley fold lines formed when the side surfaces of the ear portions of the inner packaging paper have been valley-folded become parallel to each other, the side surface portions of the ear portions of the inner packaging paper and the end surfaces of the PS plate bundle become substantially parallel.

[0075] For this reason, in this state, as shown in FIGS. 16A and 16B, when upper surfaces 132A and lower surfaces 132B of the ear portions 132 of the inner packaging paper 131 are superposed, folded toward the upper side of the inner packaging paper 131, and joined together with adhesive tape 72, the potential arises for light entering from the side surface portions 132C of the ear portions 132A of the inner packaging paper 131 to be guided to the end surfaces 130A of the PS plate bundle 130 through gaps between the side surface portions 132C of the ear portions 132A and the end surfaces 130A of the PS plate bundle 130. The potential also arises for outside air to enter through these gaps and cause condensation.

[0076] Consequently, in the present embodiment, as shown in FIGS. 8A and 8B and FIG. 12, the side surfaces 30C of the ear portions 30 of the inner packaging paper 29 are folded such that the pairs of valley fold lines S formed when the side surfaces 30C have been valley-folded intersect each other, and it is ensured that the points Q of intersection between the valley fold lines S become higher than the fold-back lines L in the upper surfaces 30A of the ear portions 30 of the inner packaging paper 29.

[0077] Thus, the side surfaces 30C of the ear portions 30 of the inner packaging paper 29 become slanted (upright) with respect to the end surfaces 12A of the PS plate bundle 12. For this reason, shielding walls are created by the valley fold portions (regions at the inner sides of the valley fold lines S) of the ear portions 30 of the inner packaging paper 29 and the upper surfaces 30A and the lower surfaces 30B of the ear portions 30 of the inner packaging paper 29. In other words, paths to the end surfaces 12A of the PS plate bundle 12 for light entering from the side surfaces 30C of the ear portions 30 of the inner packaging paper 29 are blocked by the shielding walls, so that the end surfaces 12A of the PS plate bundle 12 can be prevented from being exposed. Further, because the entrance of outside air is also prevented by the shielding walls, the problem of condensation also does not arise.

[0078] In the present embodiment, as shown in FIG. 7, the valley fold lines S were formed as a result of the side surfaces 30C of the ear portions 30 of the inner packaging paper 29 being valley-folded by the folding device 119 in a state where the side surfaces 30C were slanted θ_2 with respect to the height-direction edges 12C of the PS plate bundle 12. However, it suffices for the points Q of intersection where the pairs of valley fold lines S formed when the side surfaces 30C have been valley-folded to be higher than the fold-back lines L in the upper surfaces 30A of the ear portions 30 of the inner packaging paper 29 at the time packaging is completed. Thus, it is not invariably necessary for the valley fold lines S to be formed by the folding device 119, and the invention may also be configured such that valley fold lines S that intersect each other are formed in the coarse of folding resulting from the upstream guide plates 52 and the downstream guide plates 54.

Claims

1. A planographic printing plate package formed by valley-folding side surfaces at both end portions of packaging paper in which a bundle of planographic printing plates processed into a predetermined length is wrapped in a tubular manner, superposing upper surfaces and lower surfaces of both end portions of the packaging paper, and folding back and joining together the upper surfaces and the lower surfaces toward the upper side of the planographic printing plates,
   wherein points of intersection where pairs of valley fold lines formed at the time of the valley folding intersect each other are positioned higher than fold-back lines in the upper surfaces of both end portions of the packaging paper.

2. The planographic printing plate package of claim 1, wherein the bundle of the planographic printing plates comprises a stack of substantially rectangular planographic printing plates, and the side surfaces lead out from the bundle of the planographic printing plates and include parallel surfaces in the direction of the stack.

3. The planographic printing plate package of claim 1, wherein the points of intersection are positioned at edge portions of the packaging paper.

4. A packaging apparatus that packages planographic printing plates by valley-folding side surfaces at both end portions of packaging paper in which a bundle of planographic printing plates processed into a predetermined length is wrapped in a tubular manner, superposing upper surfaces and lower surfaces of both end portions of the packaging paper, and folding back and joining together the upper surfaces and the lower surfaces toward the upper side of the planographic printing plates,
   wherein points of intersection where pairs of valley fold lines formed at the time of the valley folding in-

tersect each other are positioned higher than fold-back lines in the upper surfaces of both end portions of the packaging paper.

5. The planographic printing plate packaging apparatus of claim 4, wherein the bundle of the planographic printing plates comprises a stack of substantially rectangular planographic printing plates, and the side surfaces lead out from the bundle of the planographic printing plates and include parallel surfaces in the direction of the stack.

6. The planographic printing plate packaging apparatus of claim 4, wherein the points of intersection are positioned at edge portions of the packaging paper.

7. The planographic printing plate packaging apparatus of claim 4, further including
a mechanism that conveys, along a predetermined conveyance path, the packaging paper in which the bundle of the planographic printing plates is wrapped in a tubular manner, and
a tucker mechanism that is positioned at both sides of the conveyance path, enters and exits the conveyance path, and forms the valley folds at the side surfaces at both end portions of the packaging paper.

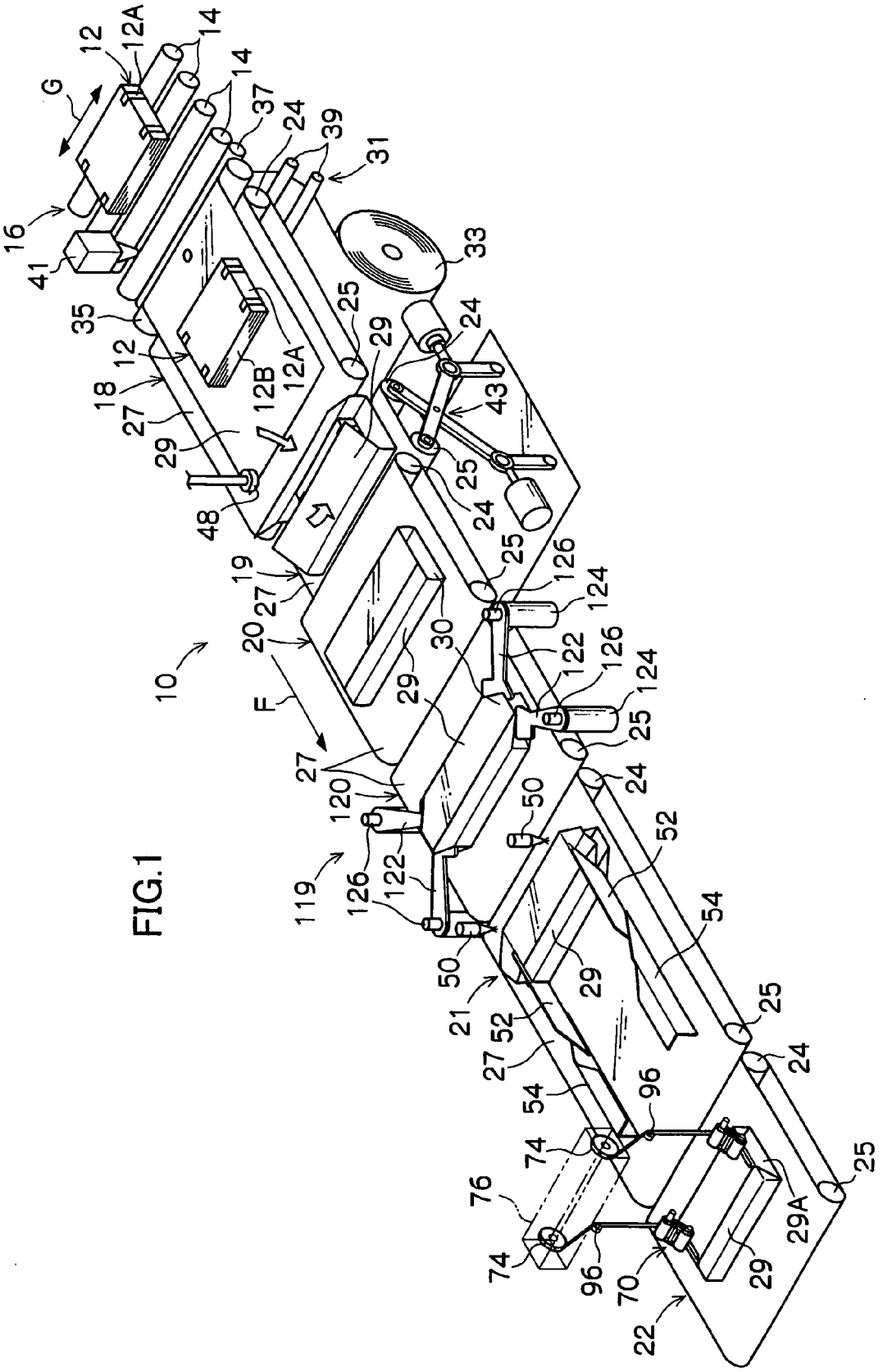
8. A method of packaging planographic printing plates comprising:

valley-folding side surfaces at both end portions of packaging paper in which a bundle of planographic printing plates processed into a predetermined length is wrapped in a tubular manner;
superposing upper surfaces and lower surfaces of both end portions of the packaging paper; and
folding back and joining together the upper surfaces and the lower surfaces toward the upper side of the planographic printing plates,

wherein points of intersection where pairs of valley fold lines formed at the time of the valley folding intersect each other are positioned higher than fold-back lines in the upper surfaces of both end portions of the packaging paper.

9. The planographic printing plate packaging method of claim 8, wherein the bundle of the planographic printing plates comprises a stack of substantially rectangular planographic printing plates, and the side surfaces lead out from the bundle of the planographic printing plates and include parallel surfaces in the direction of the stack.

10. The planographic printing plate packaging method of claim 8, wherein the points of intersection are positioned at edge portions of the packaging paper.


G
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12A
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12B
12A
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29A
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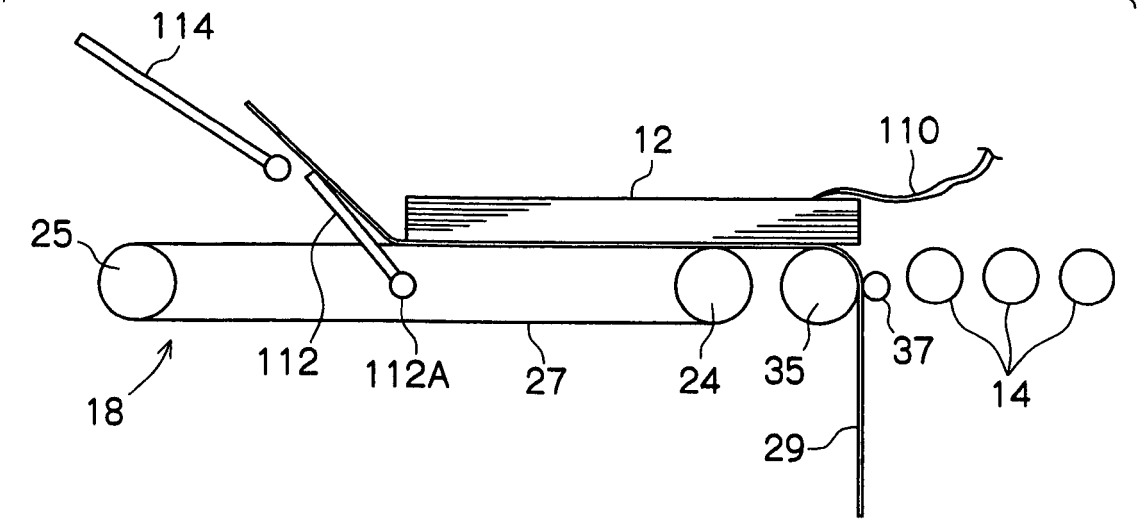
FIG.1

FIG.2A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112A
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FIG.2B

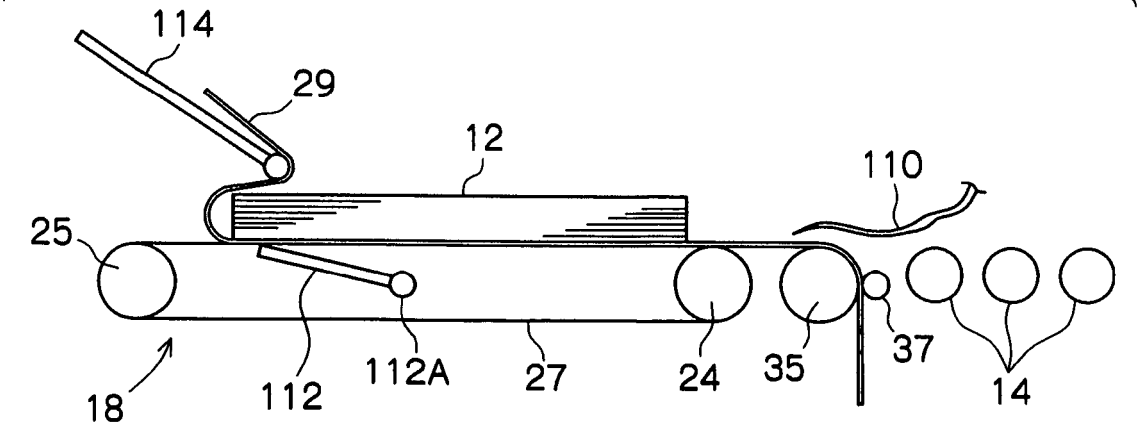
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FIG.3A

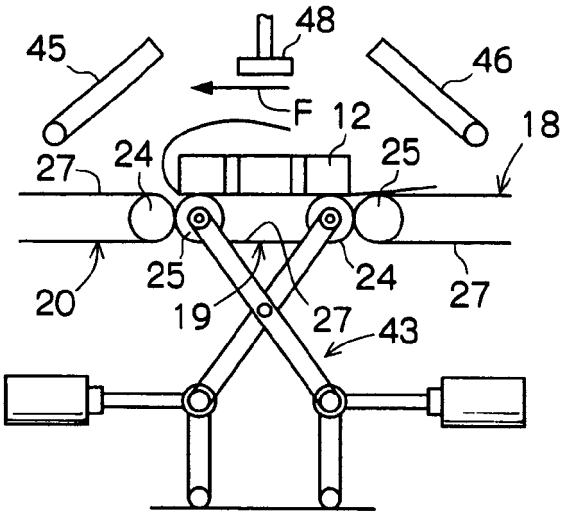


FIG.3B

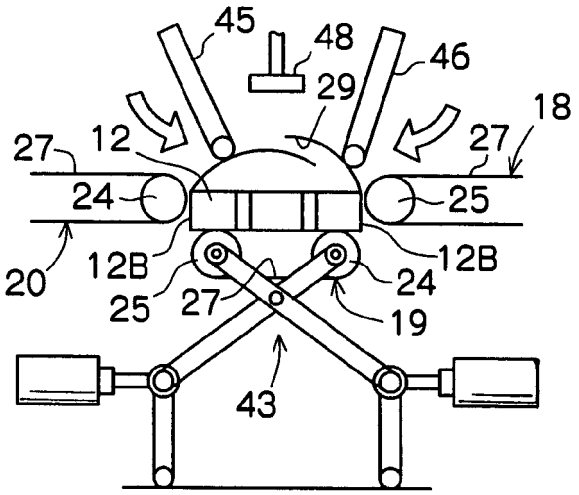


FIG.3C

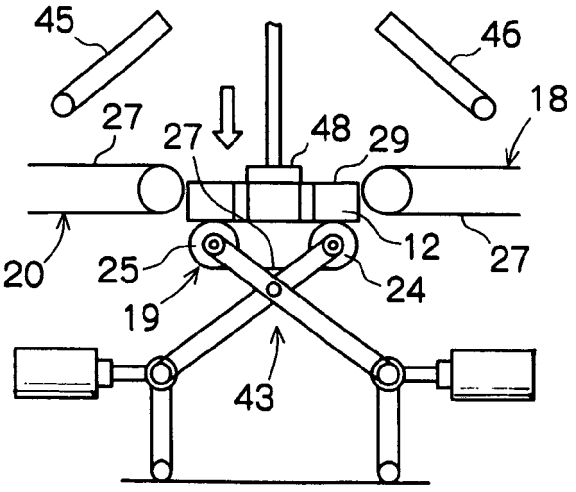


FIG.4

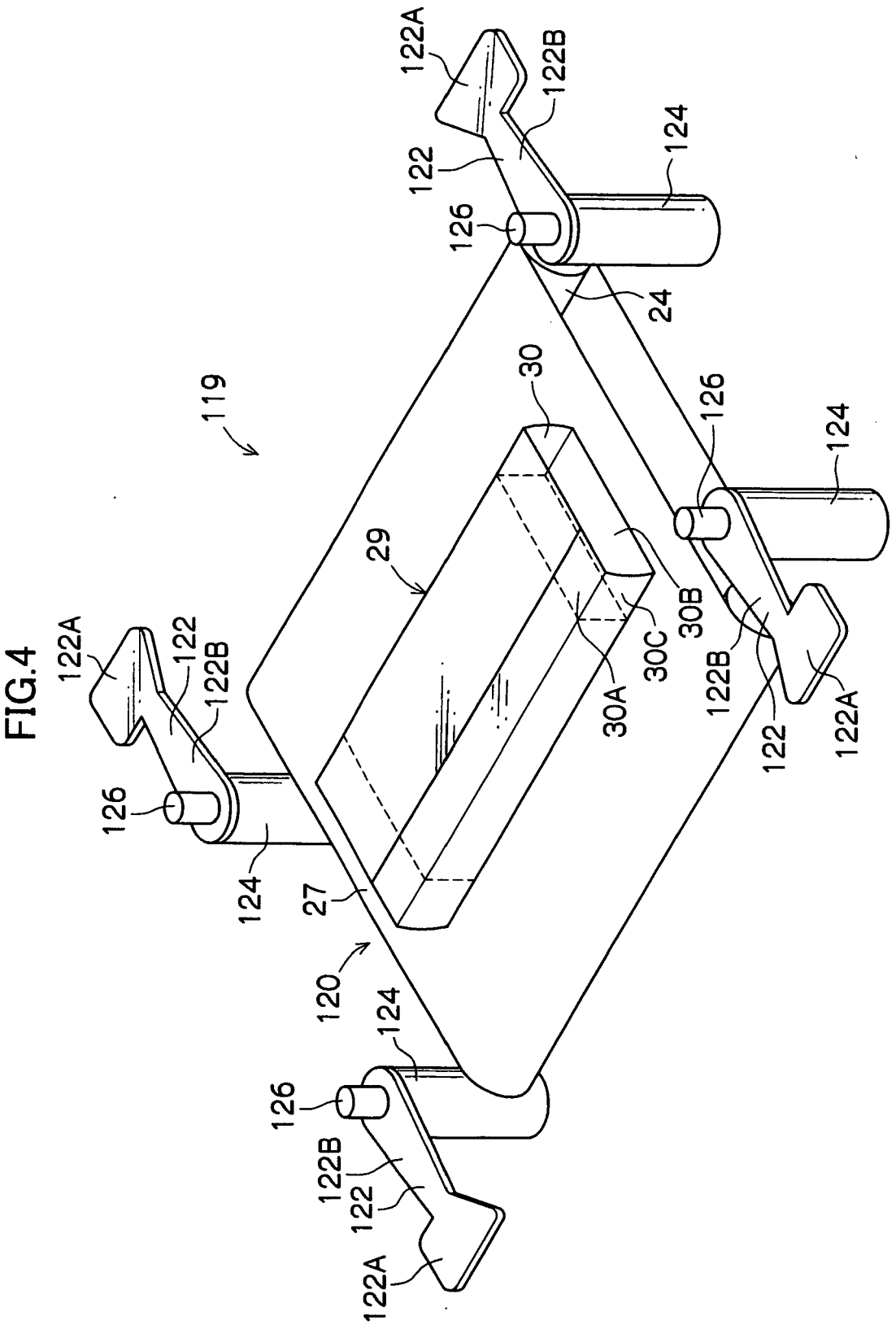


FIG.5

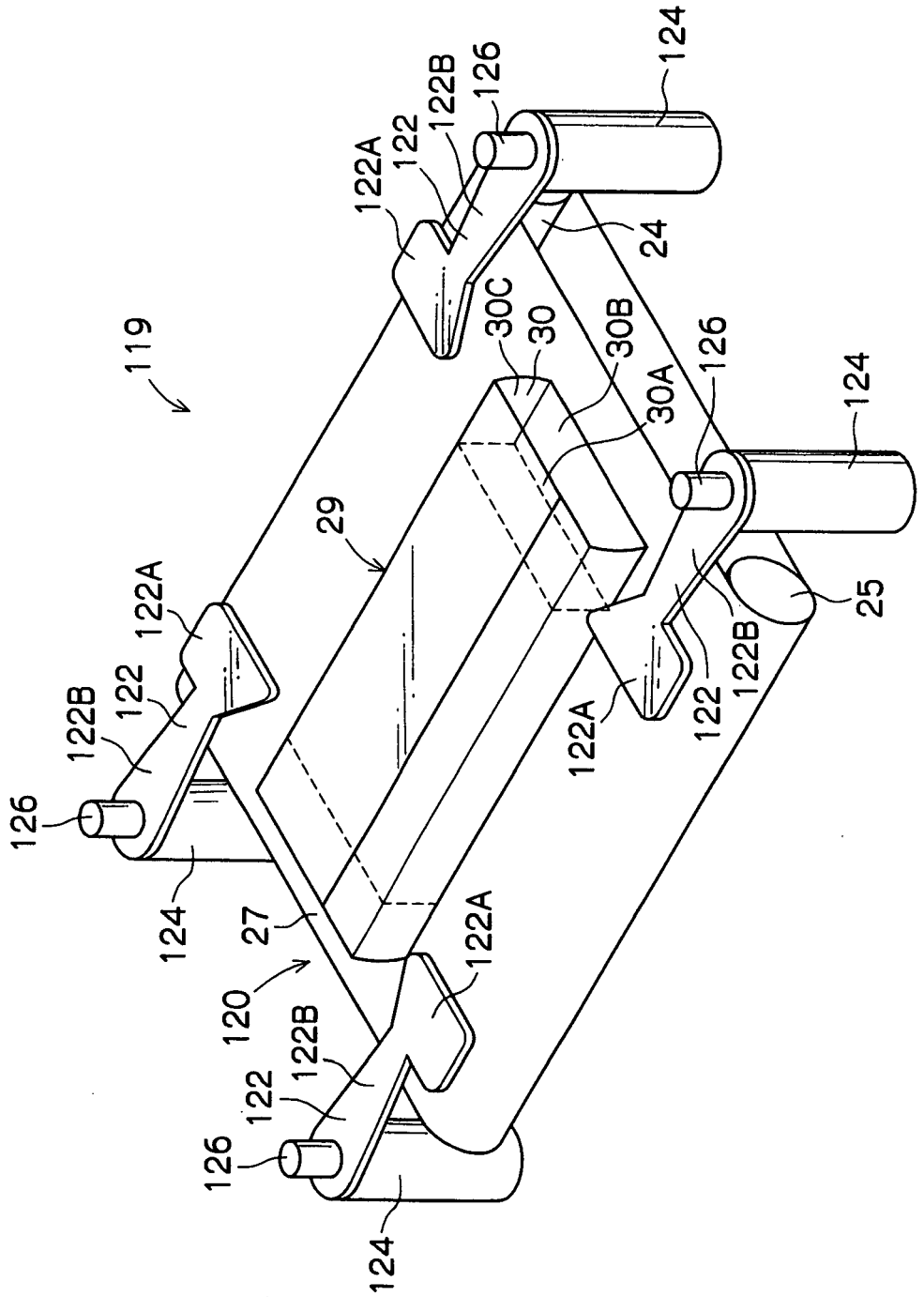
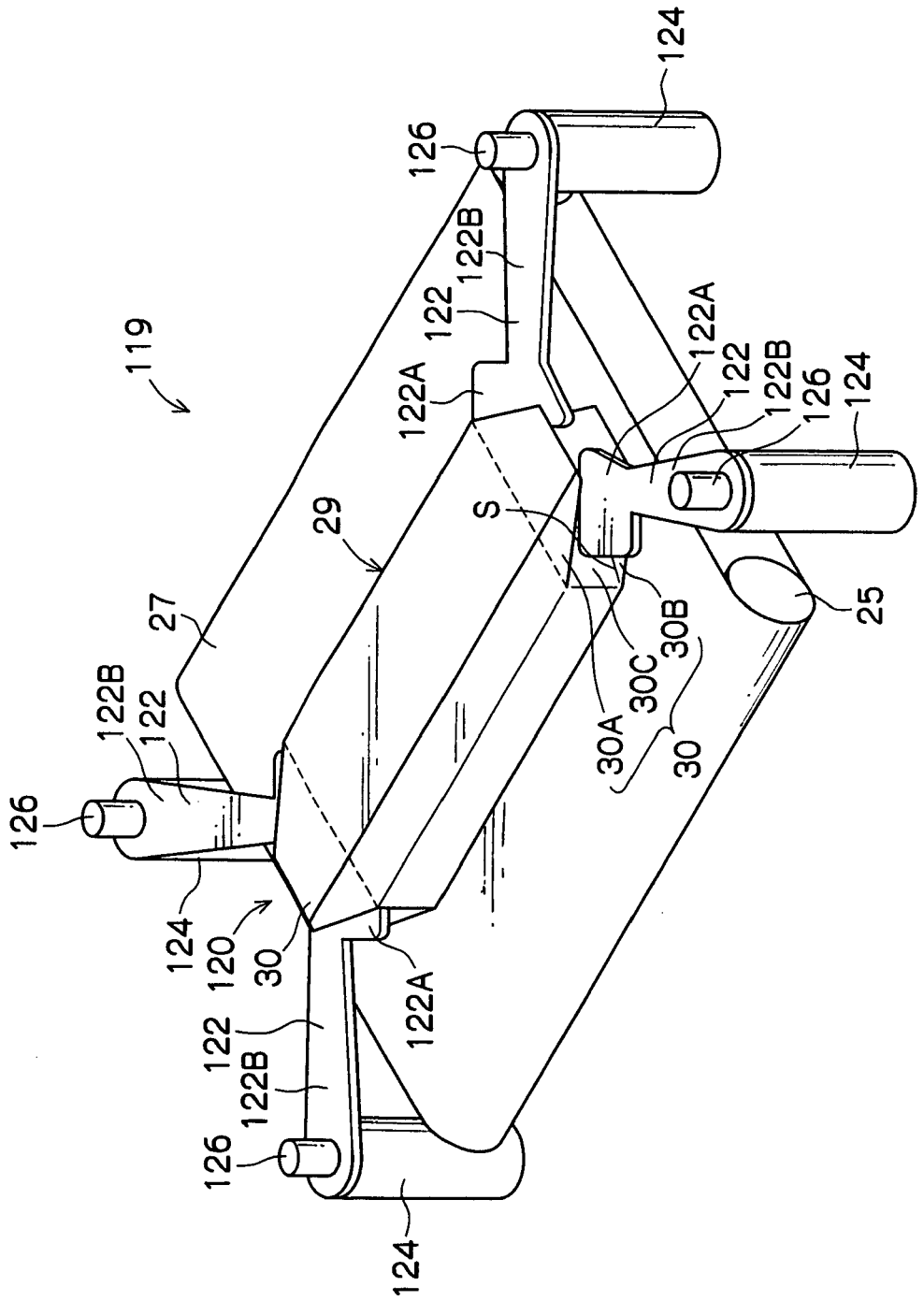


FIG.6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122A
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122B
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29
S
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122A
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122B
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FIG.7

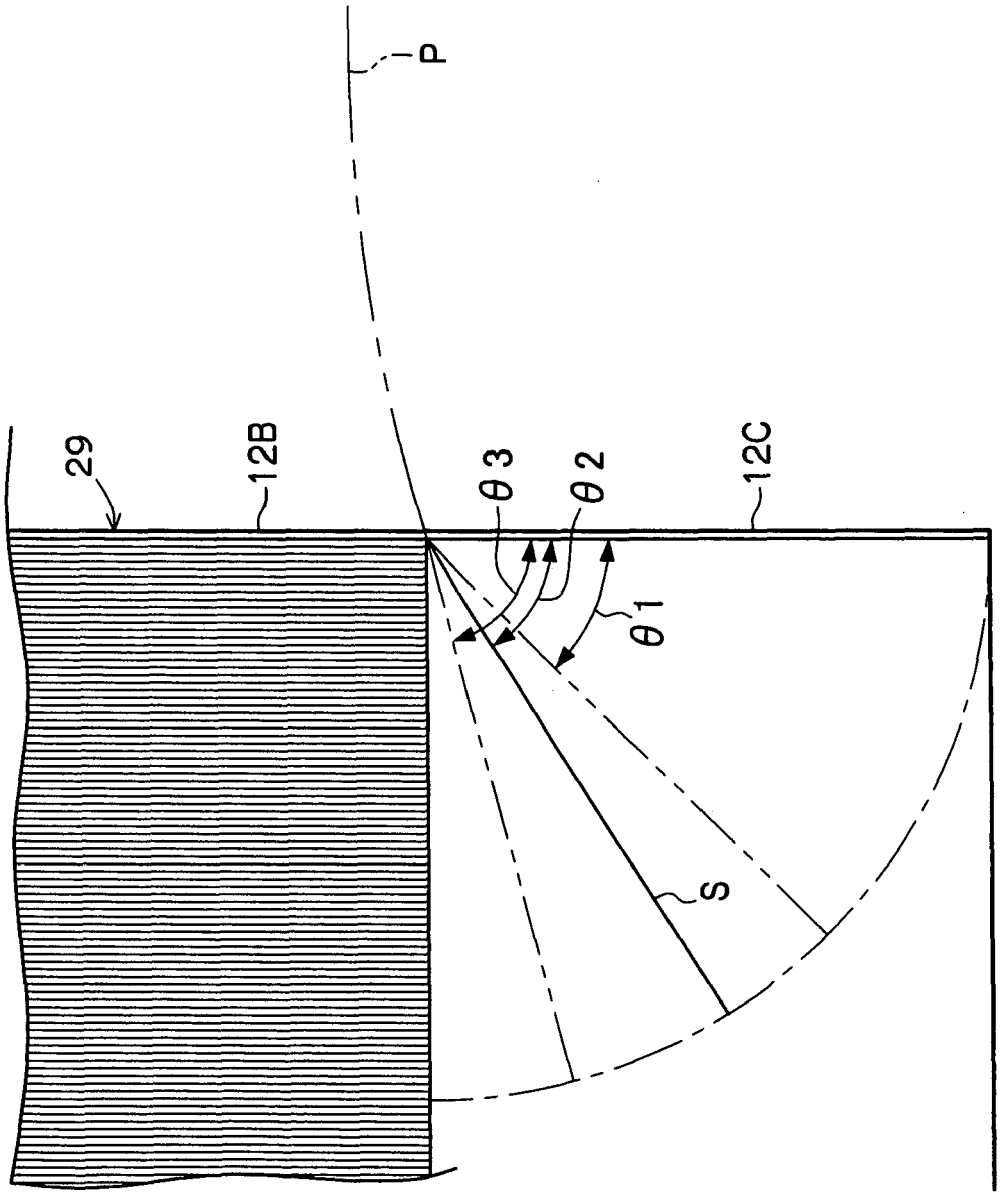


FIG.8A

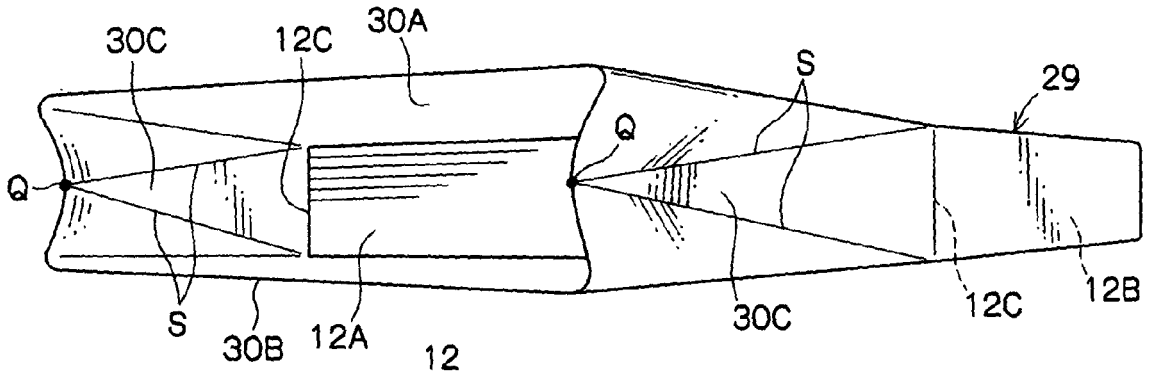


FIG.8B

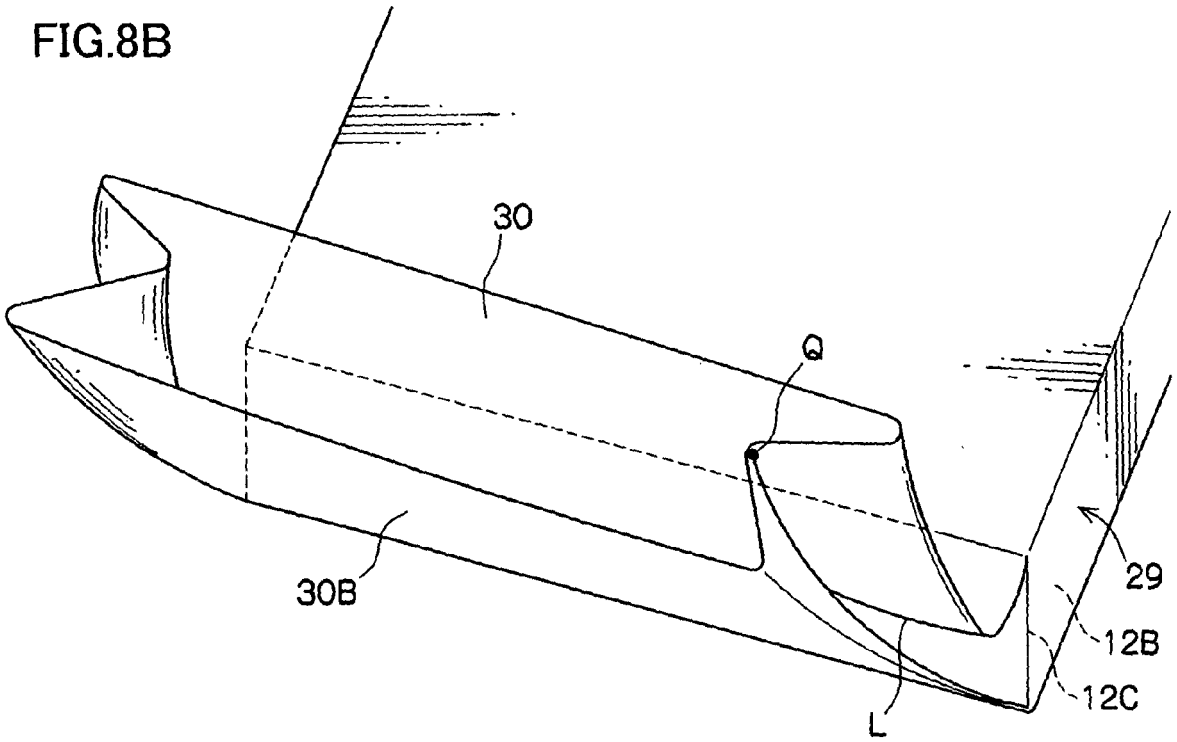
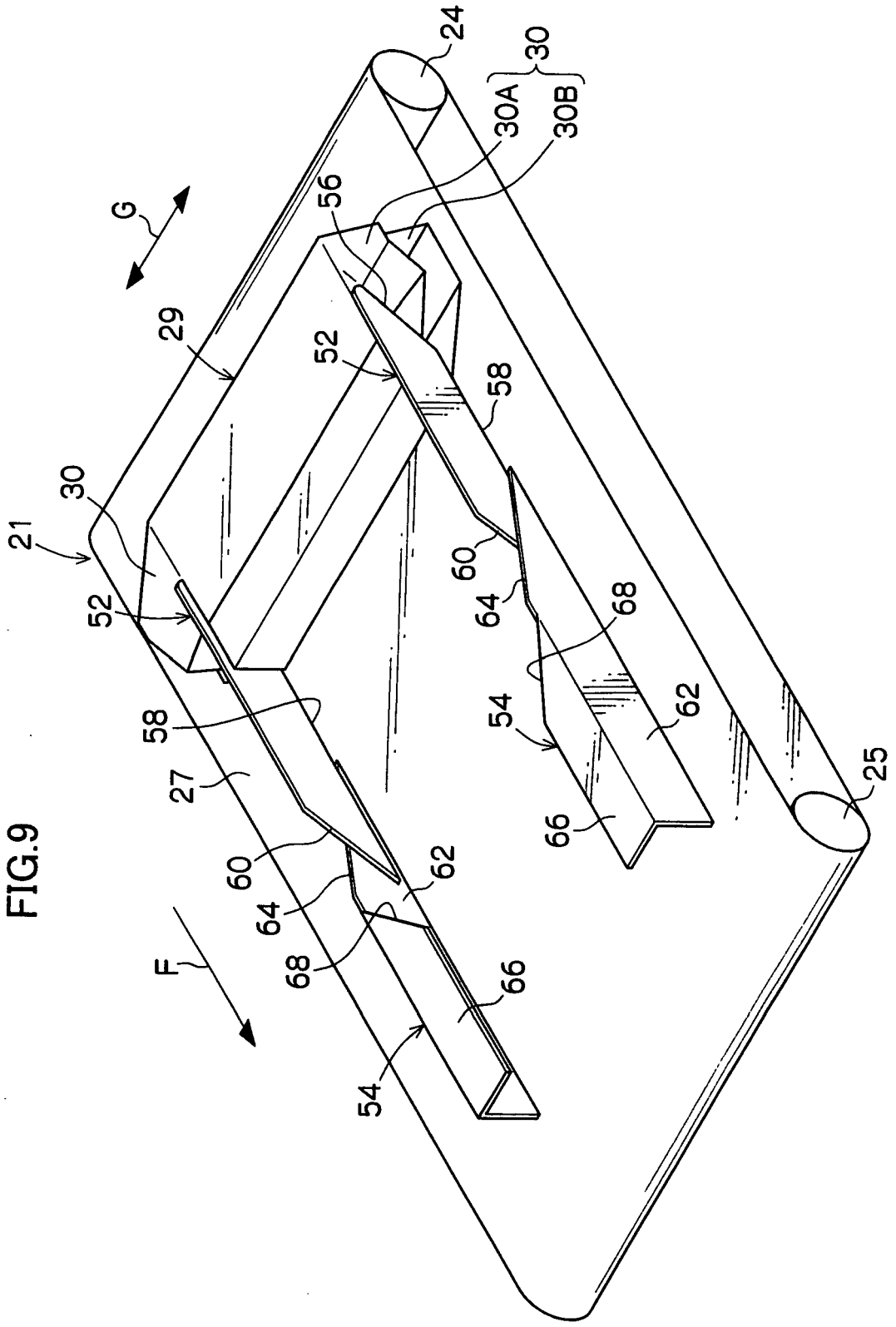


FIG.9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F
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54

FIG.10

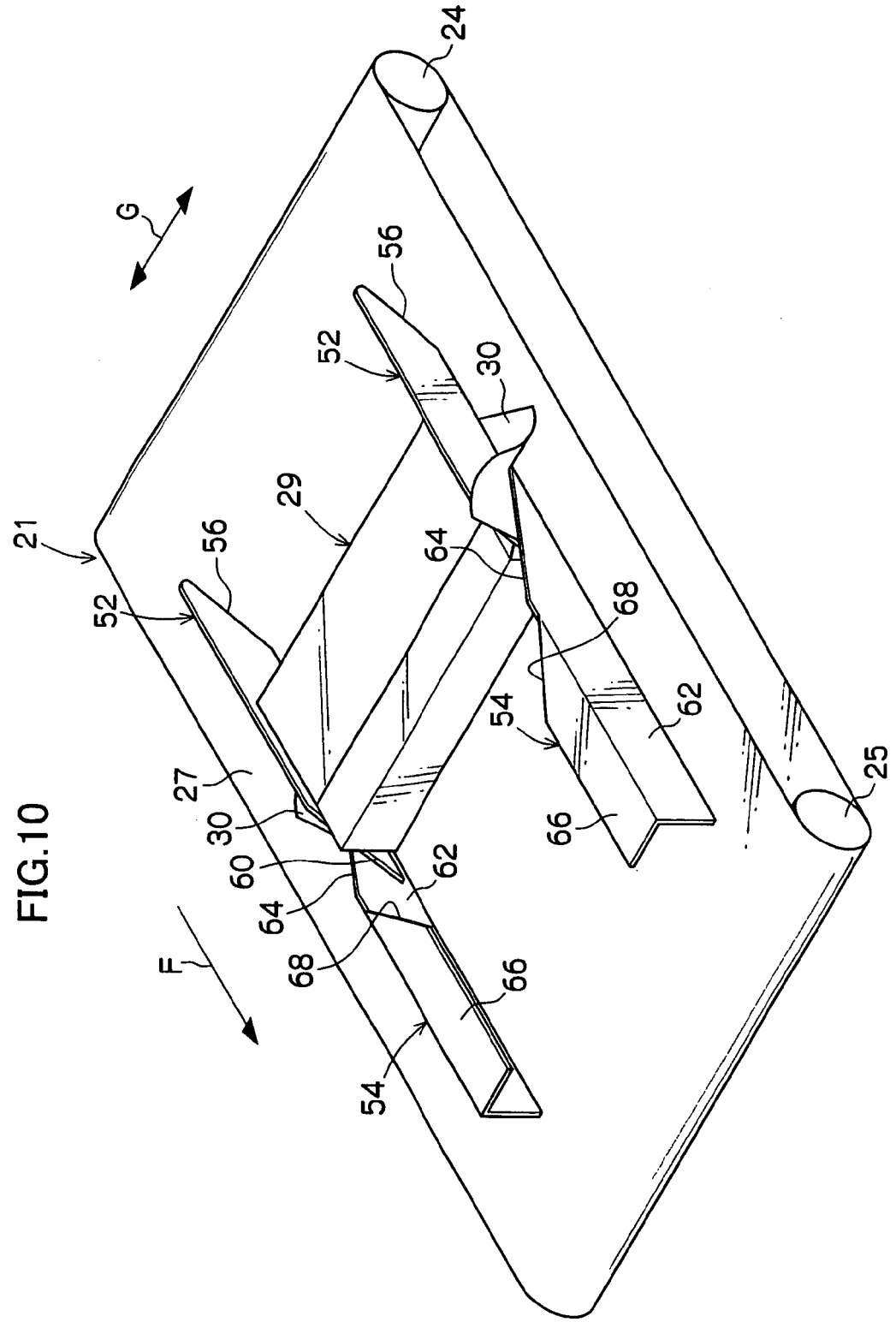


FIG.11

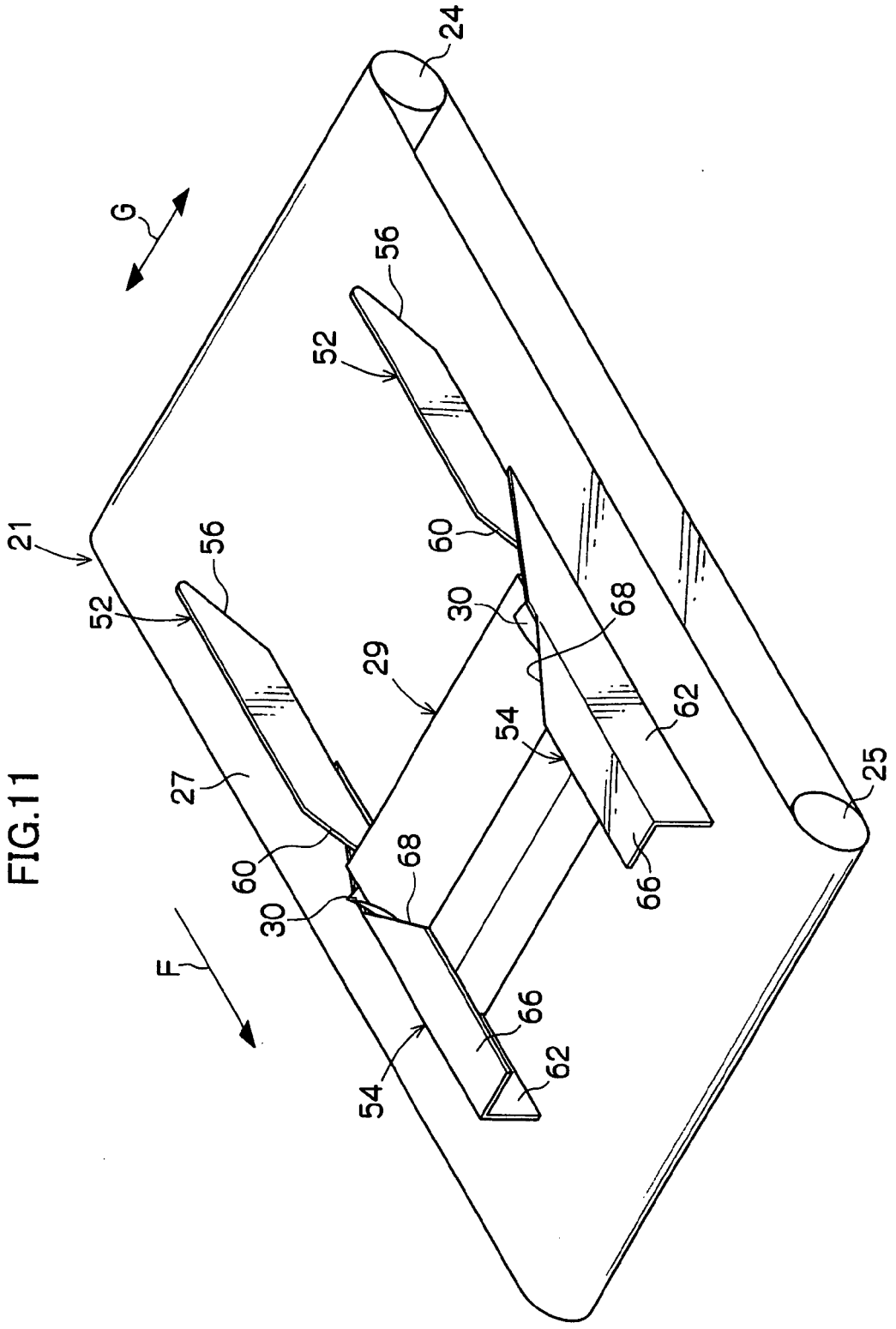


FIG.12

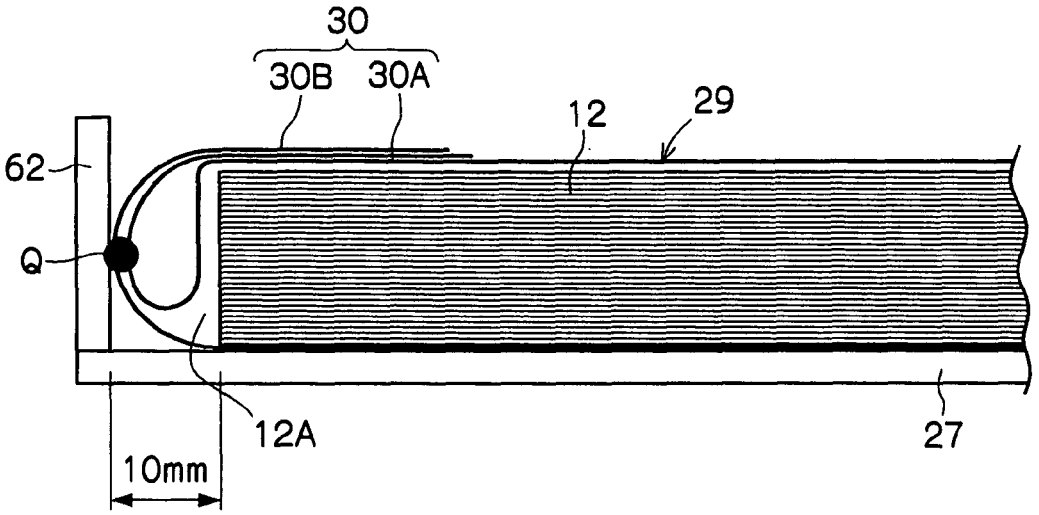


FIG.13A

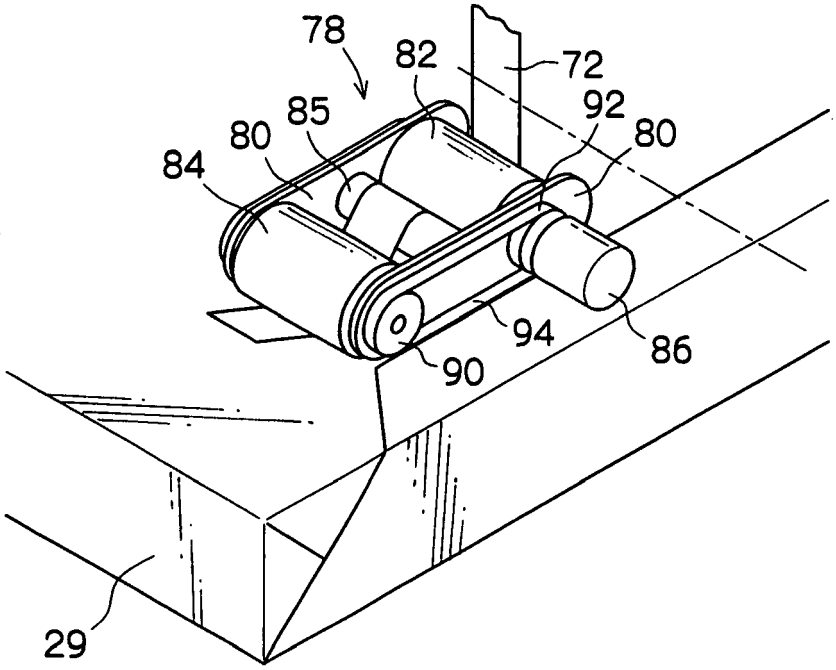


FIG.13B

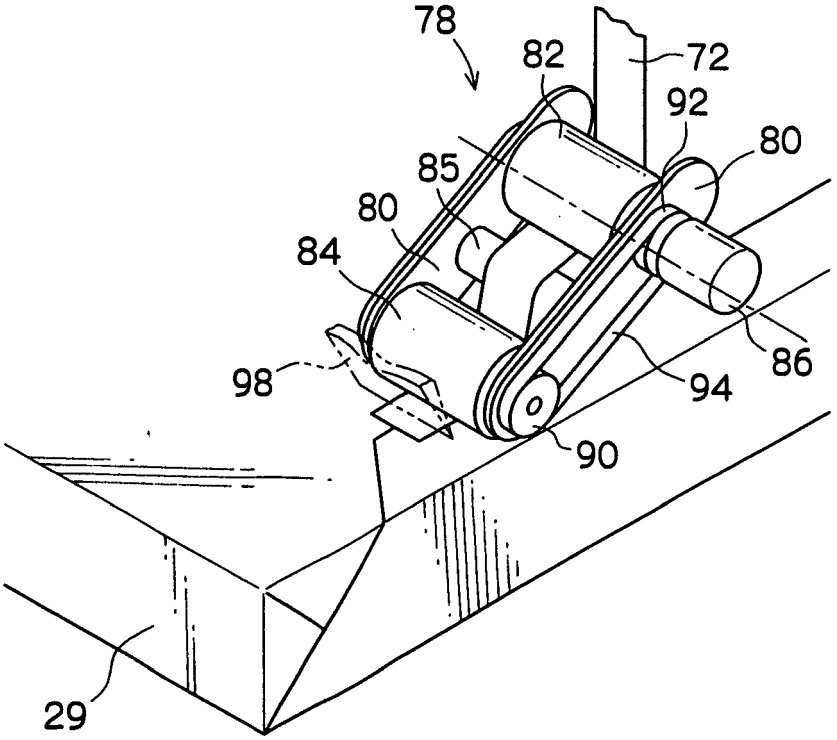


FIG.14A

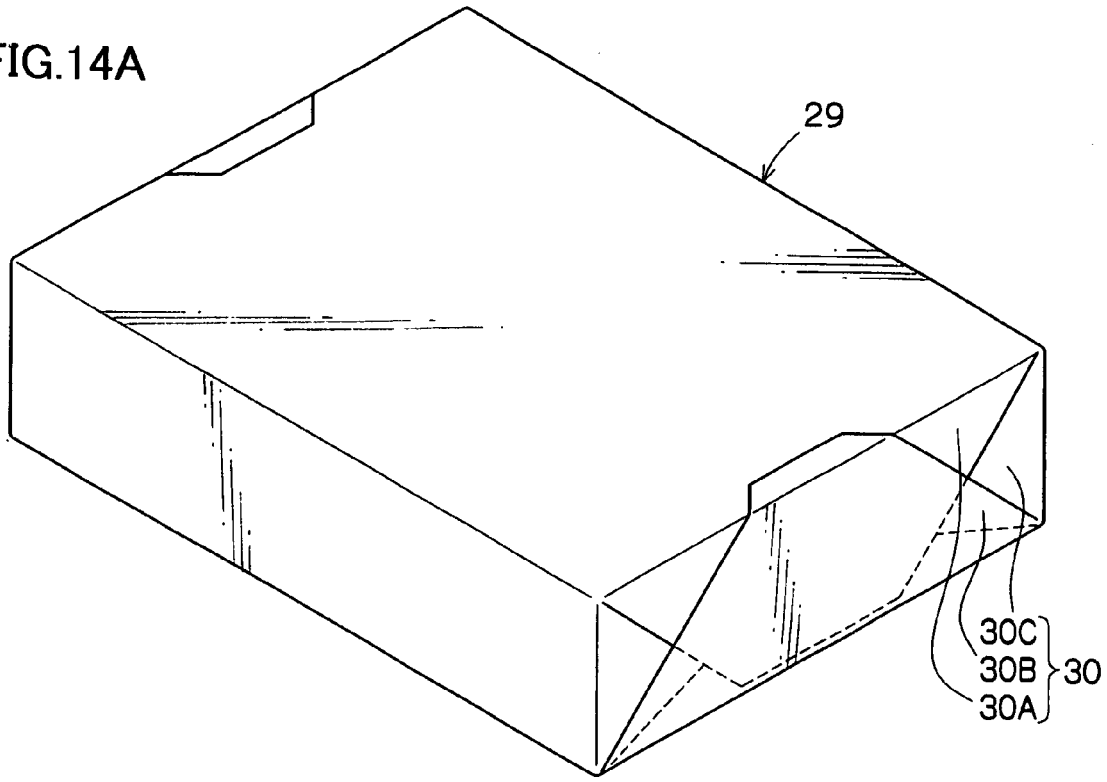


FIG.14B

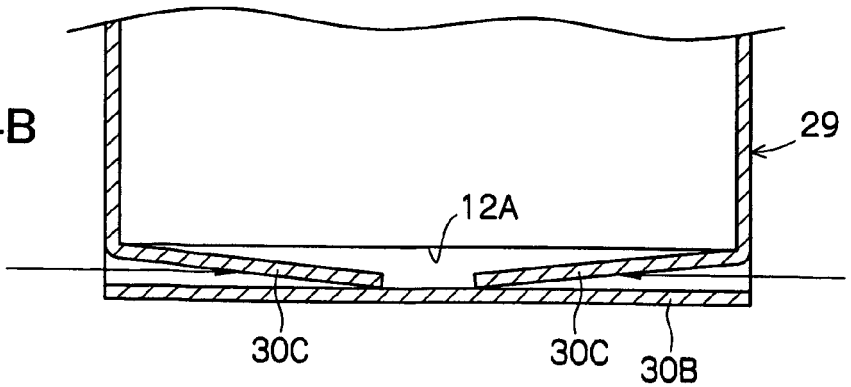


FIG.15A

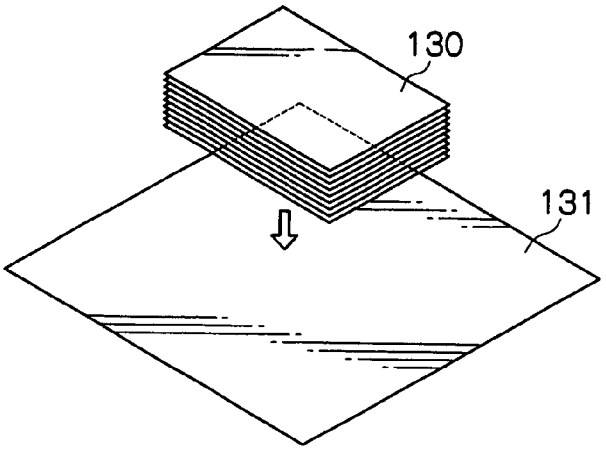


FIG.15B

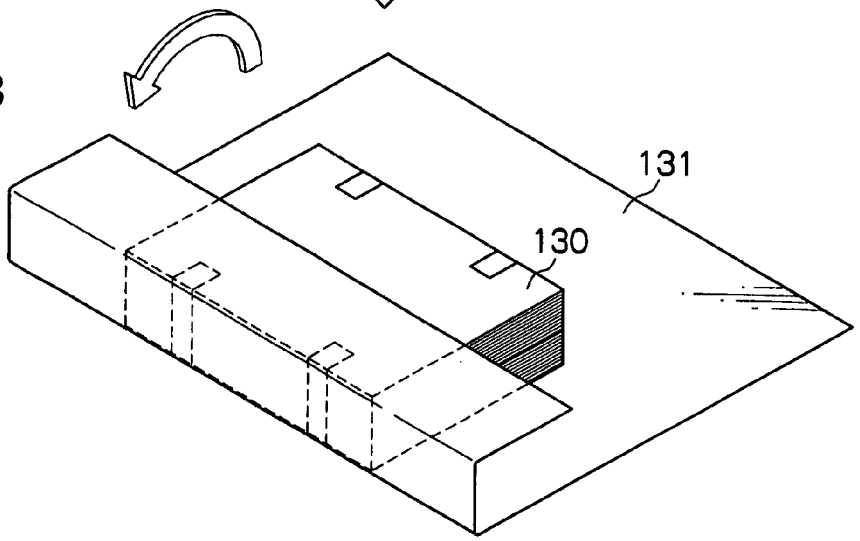


FIG.15C

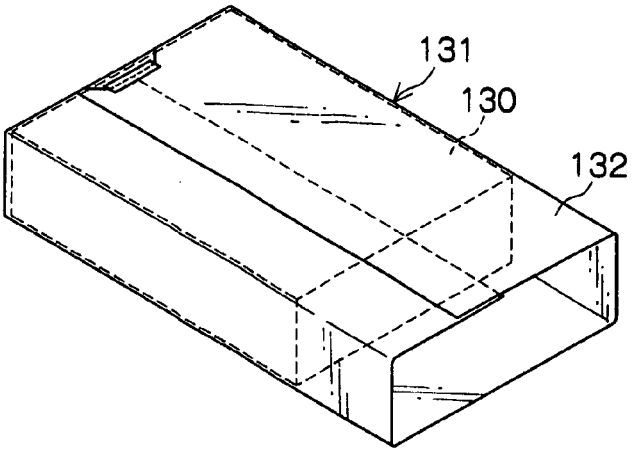


FIG.16A

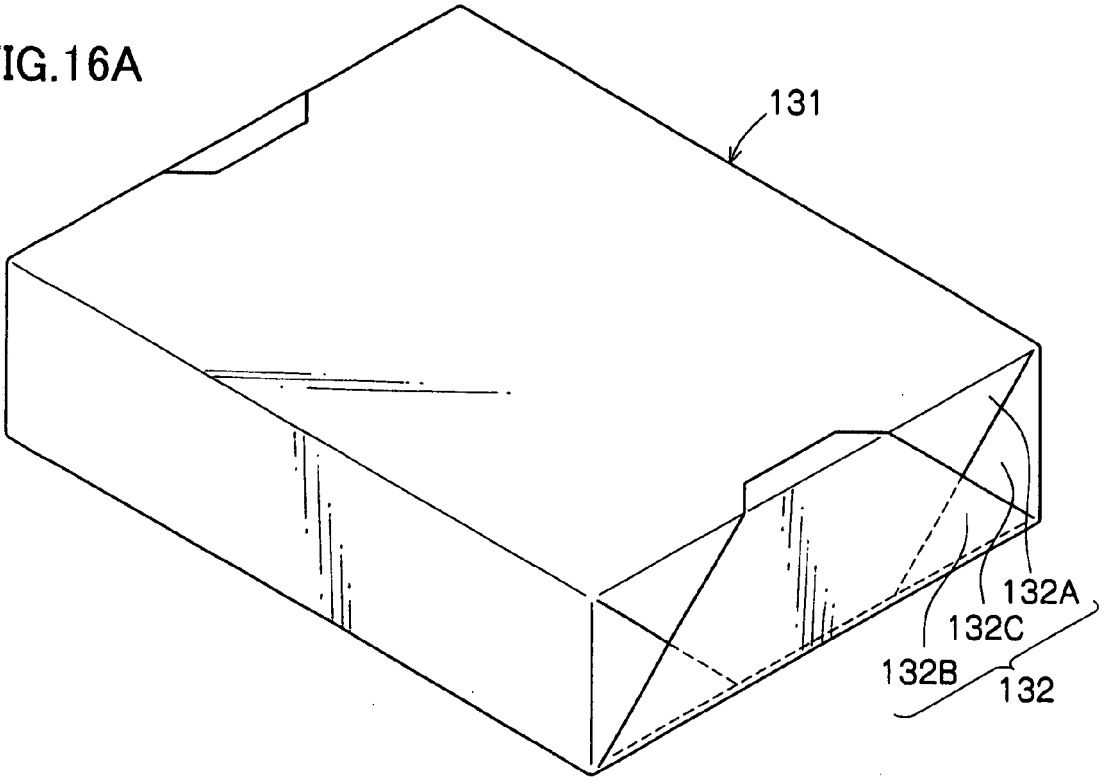
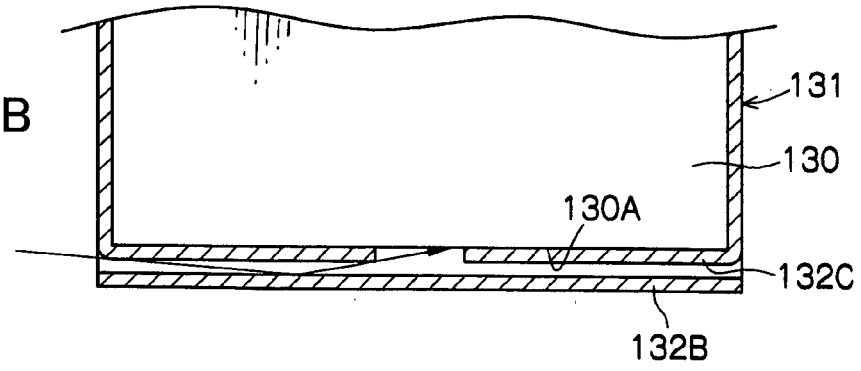


FIG.16B



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Patent documents cited in the description

- JP 2002234272 A **[0004]**