



(11) **EP 1 905 693 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention
of the grant of the patent:
21.09.2011 Bulletin 2011/38

(51) Int Cl.:
B65B 11/10 (2006.01) **B65B 43/10** (2006.01)
B65B 59/00 (2006.01)

(21) Application number: **07018948.5**

(22) Date of filing: **26.09.2007**

(54) **Packaging method and apparatus**

Verpackungsverfahren und -vorrichtung

Procédé et appareil d'emballage

(84) Designated Contracting States:
DE

(30) Priority: **27.09.2006 JP 2006263484**

(43) Date of publication of application:
02.04.2008 Bulletin 2008/14

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Description

[0001] The present invention relates to a method of packaging a lithographic printing plate bundle formed of stack lithographic printing plates and a packaging apparatus.

[0002] In the recent plate making method (including an electrophotographic plate making method), lithographic printing plates such as photosensitive printing plates and thermosensitive printing plates have been widely used to facilitate automation of plate making process. The lithographic printing plate is generally manufactured by subjecting a base plate such as a sheet-shaped or coil-shaped aluminum plate etc. to surface treatment such as graining, anodic oxidation, silicate treatment, and other chemical treatments singly or in appropriate combination, then coating the surface-treated plate with a photosensitive layer or a thermosensitive layer, and cutting the coated plate to a desired size after drying. After being manufactured, the lithographic printing plate is subjected to plate making treatment such as exposure, development, and gumming, and is set on a printing machine. Then, ink is applied to the lithographic printing plate set on the printing machine, and image transfer is accomplished, by which letters, images, and the like are printed on a paper surface.

[0003] The lithographic printing plates are manufactured and then stacked in the thickness direction, and the stacked bundle is wrapped in interior packaging paper such as kraft paper and is thereafter put in a packaging box to be handled as freight. As described in Japanese Patent Application Laid-Open No. 54-12996, a corrugated fiberboard is scored to provide bending lines, and cut with slots (notches), thereafter the board is folded into a box shape as the packaging box having an opening face of a bi-parting form. Since this packaging box is manufactured by folding one sheet of corrugated fiberboard, the lithographic printing plates can be packaged at a low cost.

[0004] In the case where many kinds of lithographic printing plate bundles having different sizes are packaged in such packaging boxes, two methods as described below are thought of. A first method is to prepare a corrugated fiberboard sheet (packaging material) on which score lines and slots have been formed in advance for each kind of lithographic printing plate. According to this method, a small economical packaging body can be formed in accordance with each product size, so that the lithographic printing plates can be transported efficiently. Also, since the packaging body has no wasteful space, the packaging material after use can be disposed of at a small expense. However, since the corrugated fiberboard sheets must be prepared for every size of lithographic printing plate, there arises a problem in that the stock space for the corrugated fiberboard sheets increases, and the work for changing over the corrugated fiberboard sheets according to the change in kinds of lithographic printing plate bundles requires time and labor.

[0005] A second method is to use packing such as side rails in the packaging box to fill the space between the box and the lithographic printing plate bundle without changing the corrugated fiberboard sheets. According to this method, the kinds of corrugated fiberboard sheets can be decreased, so that the control of corrugated fiberboard sheets and the work for changing over the corrugated fiberboard sheets at the time when the kinds of lithographic printing plate bundles are changed can be performed easily. However, large corrugated fiberboard sheets are used wastefully, so that there arises a problem in that the transportation efficiency decreases, and the disposal of the corrugated fiberboard sheets after transportation requires much time and labor.

[0006] As described above, with the packaging methods in the related art, as the kinds of lithographic printing plate bundles increase, there arises a problem of increased stock space for the corrugated fiberboard sheets and increased time and labor for the work for changing over the corrugated fiberboard sheets according to the change in kinds of lithographic printing plate bundles, or a problem of decreased transportation efficiency and increased quantity of disposed corrugated fiberboard sheets. The present invention has been made in view of the above circumstances.

[0007] US 2,353,419 discloses a machine for forming box blanks in order to produce "tailor-made" boxes by folding prepared blanks around articles to be packed. Said machine comprises a gauging device with three handwheels and three gauge bars connected thereto in order to gauge width, length and height of articles to be packed by turning said handwheels.

[0008] In US 6,170,231 B1 it is taught that standard sized blanks are custom trimmed to a size related to a desired pack size. Slotting and scoring means are adjusted to form the respective blank pattern so that the blank wraps neatly about a book pack to be packed.

[0009] It is an objective of the present invention to provide a method of packaging a lithographic printing plate bundle and a packaging apparatus in order to reduce labor power needed when changing types of lithographic printing plates.

[0010] According to the present invention, said objective is solved by a method of packaging a lithographic printing plate bundle according to independent claim 1, and by an apparatus according to independent claim 5.

[0011] Accordingly, the packaging material is selected in accordance with the information about the packaged article (size, kind, etc.), and the packaging pattern (for example, the positions of the score lines and the slots, and the sizes of the rib parts and the side rails) is determined to work the packaging material. Therefore, proper packaging can be performed according to the size of the packaged article, and the waste of packaging material can be kept at a minimum. Moreover, the packaging body after packaging can be made as small as possible, so that the transportation efficiency can be improved. Furthermore, the kinds of the prepared packaging materials

can be reduced, so that the stock space for the packaging material can be reduced.

[0012] Since the lithographic printing plate has a photosensitive layer or a thermosensitive layer, the lithographic printing plate bundle after being packaged is required not to move within the packaging body. The size and packaging pattern of the packaging material are determined in accordance with the information about the lithographic printing plate bundle, so that the lithographic printing plate bundle can be packaged so that the lithographic printing plate bundle after being packaged does not move, and therefore this packaging method is suitable for packaging the lithographic printing plate bundle.

[0013] The information about the article is inputted from a manufacturing apparatus which manufactures the article. Accordingly, since the information about the packaged article is inputted from the manufacturing apparatus, the size and packaging pattern of the packaging material can be changed automatically when the kinds of packaged articles are changed. Preferably, the packaging material is a corrugated fiberboard sheet.

[0014] Since the side rail member is provided at the side of the packaged article, the kinds of packaging materials can be decreased further.

[0015] Moreover, since the side rail member is made from the scrap produced when the packaging material is cut, the cost can be reduced.

[0016] Preferably, the packaging body forming step includes a rib part forming step of folding the packaging material to form a rib part at a side of the predetermined position where the lithographic printing plate bundle is placed in the packaging body forming step. Since the packaging pattern is determined for each packaged article, even in the case where the rib part is formed, the kinds of packaging materials can be prevented from increasing. That is to say, in the case where the rib part is formed, there arises a problem in that the kinds of packaging materials increase further; however, this problem can be solved accordingly.

[0017] Moreover, according to the present invention, the aforesaid objective is solved by a packaging apparatus according to independent claim 5.

[0018] Further preferred embodiments of the present invention are laid down in the further subclaims.

[0019] Accordingly, since the packaging material is selected based on the information (size, kind, etc.) about the packaged article, and the packaging pattern is determined to work the packaging material, proper packaging can be performed in accordance with each of the packaged articles, so that the waste of packaging material can be kept at a minimum. Moreover, since the packaging body after packaging can be made as small as possible, the transportation efficiency can be improved. Furthermore, since the kinds of the prepared packaging materials can be decreased, the stock space for the packaging material can be reduced.

[0020] Accordingly, since the packaging material is worked and packaging is performed in accordance with

the information about the packaged article, proper packaging can be performed for every packaged article. Therefore, even in the case where the kinds of packaged articles increase, the waste of packaging material can be kept at a minimum, and also the transportation efficiency of packaging bodies can be improved.

Fig. 1 is a block diagram showing a general configuration of a packaging apparatus;

Fig. 2 is a perspective view schematically showing a packaging procedure;

Figs. 3A to 3H are perspective views showing cutting positions of corrugated fiberboard;

Fig. 4 is a perspective view showing one example of a scoring section and a slot forming section;

Figs. 5A and 5B are views showing shapes of a rib part;

Fig. 6 is a perspective view showing a setting section for a lithographic printing plate bundle;

Figs. 7A and 7B are perspective views for explaining a folding section;

Fig. 8 is a perspective view schematically showing a side rail forming section; and

Fig. 9 is a perspective view schematically showing a side rail forming section different from that shown in Fig. 8.

[0021] Preferred embodiments of a packaging method and apparatus will now be described with reference to the accompanying drawings.

[0022] Fig. 1 is a block diagram showing a general configuration of a packaging apparatus 10 according to an embodiment, and Fig. 2 is a perspective view schematically showing the sequence of packaging state. Reference numerals applied to arrow marks in Fig. 2 correspond to reference numerals applied to process sections in Fig. 1, and each of the arrow marks means that the working in the corresponding process section is performed.

[0023] The packaging apparatus 10 is an apparatus that packages a packaged article or a lithographic printing plate bundle 12 by folding a packaging material or a corrugated fiberboard sheet 14 shown in Fig. 2 to form a box-shaped packaging body 22.

[0024] As shown in Fig. 1, the packaging apparatus 10 includes a control section 20, a packaging material supplying section 30, a packaging material working section 40, a packaging body forming section 50, a finishing section 60, and a side rail section 70. Of these process sections, the packaging material supplying section 30, the packaging material working section 40, the packaging body forming section 50, and the finishing section 60 are arranged on one line.

[0025] The control section 20 is connected with a lithographic printing plate bundle manufacturing apparatus 100, and receives information about the lithographic printing plate bundle 12 from the manufacturing apparatus 100. The information about the lithographic printing

plate bundle 12 includes the size (planar dimensions and thickness) of the lithographic printing plate bundle 12, the kind of lithographic printing plates stacked in the lithographic printing plate bundle 12, and the like. On receipt of this information, the control section 20 determines a size necessary for packaging the lithographic printing plate bundle 12 (hereinafter referred to as a necessary minimum size). Further, the control section 20 selects a corrugated fiberboard sheet having a size not smaller than the necessary minimum size and closest to the necessary minimum size from a plurality of kinds of corrugated fiberboard sheets having been stocked. At the same time, the control section 20 determines the most suitable packaging pattern (the positions of later-described rib score lines L1, flap score lines L2, and slots 14C, the presence and size of a side rail 16, the number of folding operations for forming a rib part 14A, and the like) of the selected corrugated fiberboard sheet 14. At this time, when the size of the selected corrugated fiberboard sheet 14 is equal to the necessary minimum size, the control section 20 determines the packaging pattern as it is. When the size of the selected corrugated fiberboard sheet 14 is larger than the necessary minimum size, the control section 20 appropriately selects at least one method from three methods described below: (1) a method in which the blank sheet of the corrugated fiberboard sheet 14 is cut, (2) a method in which the number of folding operations or the folding area of the later-described rib part 14A is increased, and (3) a method in which the position and size of the side rail 16 are changed. Thus, the size and the packaging pattern of the corrugated fiberboard sheet 14 are determined.

[0026] The packaging material supplying section 30 includes a selecting section 32 and a cutting section 34. The selecting section 32 has a device for selecting and conveying the corrugated fiberboard sheet 14 that has the size determined by the control section 20 from the plurality of kinds of corrugated fiberboard sheets 14 having been stocked. The selecting section 32 is configured, for example, so that the blank sheets of the corrugated fiberboard sheets 14 stacked vertically are supplied one by one from the top of the stack onto the line by using a suction cup, etc. The corrugated fiberboard sheets 14 are stocked in such a manner as to include ones having different blank sheet sizes and ones having different kinds such as A flute, B flute, AB flute, BC flute, etc. The selecting section 32 selects one corrugated fiberboard sheet 14 from these stocked corrugated fiberboard sheets 14. It is also possible that the configuration is such that packaging materials (any materials capable of forming a packaging mode, for example, paper materials such as thick paper boards with cushioning material, coated boards and chip boards, plastic materials such as corrugated plastic boards and plastic sheets, wooden materials such as plywood, and metallic materials such as steel sheets) other than the corrugated fiberboard sheets 14 are stocked and one material is selected from these stocked materials. Also, the packaging materials are not

necessarily selected and conveyed automatically, but may be selected and conveyed manually. It is also possible that a pallet on which a bundle of blank sheets of the corrugated fiberboard sheets 14 is put is set in the supplying section. In the present embodiment, the plurality of kinds of packaging materials are stocked, and one material is selected from these stocked materials; however, it is also possible that packaging materials of only one kind are stocked, and the variations in size of the lithographic printing plate bundle 12 are accommodated by cutting the material, by increasing the number of folding operations and the area for forming the rib part, or by packing a cushioning material such as the side rail.

[0027] The corrugated fiberboard sheet 14 selected in the selecting section 32 is sent to the cutting section 34. The cutting section 34 has a device for cutting the corrugated fiberboard sheet 14 to the determined size as necessary (that is, when the control section 20 determines that the corrugated fiberboard sheet 14 must be cut). The cutting method is not subject to any special restriction, and it is possible to use, for example, a method in which the blank sheet of the corrugated fiberboard sheet 14 is cut in the conveyance direction by using rotary slitters while being conveyed, a method in which the sheet is shear cut in the direction perpendicular to the conveyance direction in a state in which the sheet is temporarily stopped, or a method in which the sheet is cut during running by rotary shearing without stopping the line. Moreover, the cutting method is not limited to the mechanical cutting method, and it is possible to perform sublimation cutting by a laser or collective punch cutting by a die cutter. In the case of the die cutting, although a die cutter having a necessary size should be prepared, it is possible to cut all sizes with a die cutter by making the positions of slit and cut variable.

[0028] To cut the corrugated fiberboard sheet 14, any of four-side cutting, three-side cutting, two-side cutting, and one-side cutting may be selected. That is to say, any of cutting positions shown in Figs. 3A to 3H may be selected. Fig. 3A shows an example in which four sides of the corrugated fiberboard sheet 14 are cut, Figs. 3B and 3C show examples in which three sides thereof are cut, Figs. 3D, 3E and 3F show examples in which two sides thereof are cut, and Figs. 3G and 3H show examples in which one side thereof is cut. In these drawings, alternate long and two short dashes lines L denote cutting positions, and reference numerals 14B denote portions that become scraps after cutting. It is preferable to select one of the cutting positions shown in Figs. 3A to 3H by choosing which type of the cutting operations is performed by the control section 20 for each of the lithographic printing plate bundles 12. At this time, it is preferable that the control section 20 determines the cutting position so that the scrap 14B separated by cutting in the cutting section 34 can be utilized as the side rail 16 in the side rail section 70, described later. In the case where the control section 20 judges that the cutting operation is unnecessary, the corrugated fiberboard sheet 14 is conveyed to the next

packaging material working section 40 without being cut in the cutting section 34.

[0029] The packaging material working section 40 includes a scoring section 42 and a slot forming section 44. Fig. 4 is a perspective view showing an embodiment of the scoring section 42 and the slot forming section 44.

[0030] The scoring section 42 is a process section in which score lines (bending lines) are formed on the corrugated fiberboard sheet 14. In this scoring section 42, for example, as shown in Fig. 4, the rib score lines L1 are formed by using pairs of rotary scoring blades 90 and receiving rollers 92. The rotary scoring blade 90 is constituted of a roller having a ridge part 91 on the outer peripheral surface thereof. By pressing the ridge part 91 against the corrugated fiberboard sheet 14 supported on the receiving roller 92, the rib score line L1 is formed along the conveyance direction of the corrugated fiberboard sheet 14. The rotary scoring blades 90 and the receiving rollers 92 are supported so as to be movable in the width direction of the corrugated fiberboard sheet 14, and the positions of the rotary scoring blades 90 and the receiving rollers 92 are adjusted in the width direction in accordance with the positions of the rib score lines L1 determined by the control section 20. The scoring section 42 shown in Fig. 4 has a press 94 and a receiving base 95. By using the press 94 and the receiving base 95, the flap score lines L2 in the direction perpendicular to the conveyance direction are formed. It is also possible that the flap score lines L2 are formed by using a running rotary press instead of the press 94.

[0031] The constructions of the rib score lines L1 and the flap score lines L2 are not subject to any special restriction as long as the corrugated fiberboard sheet 14 is easily bendable along the lines. For example, the constructions are such that the outermost layer of the corrugated fiberboard sheet 14 is cut linearly and continuously or intermittently, or the corrugated fiberboard sheet 14 is crushed linearly.

[0032] It is preferable that the scoring section 42 is capable of adjusting the depths and shapes of the rib score lines L1 and the flap score lines L2 by selecting the kind of the scoring blade according to the kind of the corrugated fiberboard sheet 14 and/or by adjusting the clearance between the scoring blade and the receiving side. It is also preferable that the scoring section 42 is capable of partially humidifying the corrugated fiberboard sheet 14 in order to prevent the corrugated fiberboard sheet from breaking and also to provide the accuracy of bending position.

[0033] The corrugated fiberboard sheet 14 on which the rib score lines L1 and the flap score lines L2 have been formed in the scoring section 42 is conveyed to the slot forming section 44, where slots 14C are formed. The configuration of the slot forming section 44 is not subject to any special restriction. For example, a method is used in which the slots 14C are punched by using die sets 96 each having punching blades on the upper and lower sides as shown in Fig. 4. In this case, the positions of the

slots 14C are adjusted by adjusting the positions of the die sets 96 in the width direction and the timing of cutting according to the packaging pattern determined by the control section 20. It is also possible that, the slots 14C are cut in the slot forming section 44 with a rotary cutter while the corrugated fiberboard sheet 14 is running. Chips 14D (see Fig. 2) separated by cutting the slots 14C in the slot forming section 44 are automatically discharged to the outside of the system by a conveying device (not shown) such as a belt conveyor or an air conveyor.

[0034] The above-described packaging material supplying section 30 and the packaging material working section 40 are preferably configured so that paper powder generated in these process sections is cleaned by a suction system or the like to prevent the paper powder from adhering to the corrugated fiberboard sheet 14.

[0035] The corrugated fiberboard sheet 14 on which the rib score lines L1, the flap score lines L2, and the slots 14C have been formed in the packaging material working section 40 is conveyed to the packaging body forming section 50 shown in Fig. 1.

[0036] The packaging body forming section 50 includes a rib part forming section 52, a side rail mounting section 54, a lithographic printing plate bundle setting section 56, and a folding section 58.

[0037] The rib part forming section 52 is a process section in which the rib parts 14A are formed by folding the widthwise end parts of the corrugated fiberboard sheet 14 along the rib score lines L1. As a method for folding the corrugated fiberboard sheet 14, it is possible to use a method in which the corrugated fiberboard sheet 14 is folded by stopping it at a folding station or a method in which the corrugated fiberboard sheet 14 is folded during the transfer by utilizing the movement thereof. It is preferable that the folded rib part 14A is fixed by using a hot-melt adhesive or an adhesive tape. Thereby, the rib part 14A as shown in Fig. 5A or 5B is formed. The size (the height h and the width W) of the rib part 14A is determined by the control section 20. More specifically, the control section 20 determines the height h of the rib part 14A according to the thickness of the lithographic printing plate bundle 12 and also determines the width W of the rib part 14A according to the size of the lithographic printing plate bundle 12, by which the rib part 14A having that shape is formed by adjusting the number of folding operations and the position of bending. At this time, the size and construction (for example, the selection of hollow construction) of the rib part 14A may be determined according to the kind (kind of surface coating, etc.) and weight of the lithographic printing plate bundle 12. Fig. 5A shows an embodiment in which the number of folding operation is one, and Fig. 5B shows an embodiment in which the number of folding operations is two. The number of folding operations is not limited to one or two, and may be three or more. The rib part 14A formed as described above prevents the lithographic printing plate bundle 12 from shifting in the packaging body 22 after

packaging, and also serves as cushioning material for the lithographic printing plate bundle 12 during the transportation of the packaging body 22. The corrugated fiberboard sheet 14 on which the rib parts 14A have been formed is conveyed to the side rail mounting section 54.

[0038] The side rail mounting section 54 is a process section in which the side rails 16 supplied from the side rail section 70, described later, are mounted on the corrugated fiberboard sheet 14. The side rails 16 usually have the same object as that of the rib parts 14A (preventing shift and serving as cushioning material), and are arranged on sides (a pair of sides along the width direction) other than the sides on which the rib parts 14A are arranged. In the side rail mounting section 54, the side rails 16 having been stocked in magazine sections 18 shown in Fig. 2 are taken out and arranged at predetermined positions, and are fixed with a hot-melt resin or an adhesive tape.

[0039] The corrugated fiberboard sheet 14 on which the side rails 16 have been arranged is conveyed to the setting section 56. In the case where the control section 20 judges that the side rails are unnecessary, the corrugated fiberboard sheet 14 is caused to pass through the side rail mounting section 54 without the functioning of that section, and is conveyed to the setting section 56.

[0040] The setting section 56 is a process section in which the lithographic printing plate bundles 12 are set one by one on the corrugated fiberboard sheets 14. The lithographic printing plate bundle 12 can be formed in various modes: for example, a mode in which a predetermined number of the lithographic printing plates are stacked and the stack of the lithographic printing plates is packaged by a general packaging material (for example, kraft paper) and taped; a mode in which a stack of the lithographic printing plates is shrink packaged; and a mode in which a stack of the lithographic printing plates is fixed on a backing with a band. The lithographic printing plate bundles 12 are supplied directly from the lithographic printing plate bundle manufacturing apparatus 100 (see Fig. 1). The packaging apparatus 10 is controlled to work in unison with the lithographic printing plate bundle manufacturing apparatus 100 by the control section 20 so that the corrugated fiberboard sheet 14 and the lithographic printing plate bundle 12 are conveyed and set at good timing in any case where the kinds of the lithographic printing plate bundles 12 are changed. The lithographic printing plate bundle 12 is supplied directly from the lithographic printing plate bundle manufacturing apparatus 100 in this embodiment; however, the configuration is not limited to this one. It is also possible that the lithographic printing plate bundles 12 that have been stocked are supplied to the setting section 56. In this case, a sensor for measuring the size of the lithographic printing plate bundle 12 is provided on the supply line for the lithographic printing plate bundle 12, the size measured with this sensor is inputted to the control section 20, and the process sections are controlled based on this information.

[0041] The configuration of the setting section 56 is not subject to any special restriction. For example, a configuration is adopted in which the lithographic printing plate bundle 12 is conveyed by a conveyor 55 and is set at a predetermined position (more specifically, between the rib parts 14A and between the side rails 16) on the corrugated fiberboard sheet 14 as shown in Fig. 6. As a method for conveying the lithographic printing plate bundle 12 onto the corrugated fiberboard sheet 14, for example, it is also possible to use a method in which the lithographic printing plate bundle 12 is held with a pick-and-place mechanism, or a method in which the lithographic printing plate bundle 12 is supported on a receiving sheet, which is drawn out afterward.

[0042] The corrugated fiberboard sheet 14 on which the lithographic printing plate bundle 12 has been set in the setting section 56 is conveyed to the folding section 58. The folding section 58 is a process section in which the corrugated fiberboard sheet 14 is folded along the flap score lines L2 in the width direction. As shown in Fig. 7A, the box-shaped packaging body 22 (see Fig. 2) is formed by folding flap doors 14E. In the folding section 58, the folded flap doors 14E are preferably glued simultaneously with the folding operation by supplying a hot-melt resin before folding. Alternatively, the folded flap doors 14E may be fixed with an adhesive tape after folding. Depending on the thickness of the corrugated fiberboard sheet 14, it is difficult to fold the flap doors 14E at a time, and a pre-folding operation is performed in this case. More specifically, it is possible that the configuration is such that the pre-folding operation in which the flap doors 14E are once folded to give a folding tendency and then returned to the original positions is provided before placing the lithographic printing plate bundle 12, and the flap doors 14E are folded again after placing the lithographic printing plate bundle 12, by which the packaging body 22 (see Fig. 2) is formed. Fig. 7A shows an embodiment in which the flap doors 14E have symmetrical shapes. It is also possible that the flap doors 14E have asymmetric shapes as shown in Fig. 7B. In this case, if the packaging body 22 after packaging is stored in a vertical posture such that the larger flap door 14E is located on the downside, the work for taking out the lithographic printing plate bundle 12 can be performed easily. The packaging body 22 formed as described above is conveyed to the finishing section 60.

[0043] The finishing section 60 includes a taping section 62, a labeling section 64, and a piling-up section 66. The taping section 62 is a process section in which a tape 24 is affixed to a joint portion of the flap doors 14E (see Figs. 7A and 7B) by using a tape dispenser to reinforce the seal portion. The labeling section 64 is a process section in which a label 26 (see Fig. 2) for identifying the product is affixed to the top surface or the side surface of the packaging body 22. As the label 26, a label printed at the site, an IC tag embedded with an IC chip, or the like can be used. It is also possible that letters, a bar code, etc. are printed directly on the surface of the pack-

aging body 22 by ink-jet printing or the like, in addition to or instead of the labeling.

[0044] The piling-up section 66 is a process section in which the packaging bodies 22 are piled up. In the piling-up section 66, the packaging bodies 22 are automatically palletized in a predetermined loading mode on a pallet 28 (see Fig. 2), which has been automatically selected according to the size of the packaging bodies 22. At this time, by using a robot, all sizes of the packaging bodies 22 can be piled up in various modes. While the packaging bodies 22 are piled up in the piling-up section 66, a defective product (for example, the packaging body 22 that has experienced an equipment trouble or a product trouble) is sent out to the outside of the system. This operation can be performed by detecting important items in terms of control and by tracking the detection results.

[0045] Next, the side rail section 70 shown in Fig. 1 is explained. The scraps 14B (see Fig. 2) separated by cutting in the cutting section 34 are supplied to the side rail section 70 by a conveying device such as a belt conveyor or an air conveyor. The side rail section 70 includes a side rail forming section 72 and a side rail storing section 74. The scrap 14B is cut to a necessary size in the side rail forming section 72. For example, as shown in Fig. 8, the scrap 14B is cut in the lengthwise direction by using a cutting roller 75, and also is cut in the width direction by using a shear cutter 76 having upper and lower blades. Thereby, the side rail 16 having a desired size can be formed. The forming operation of the side rail 16 may be performed simultaneously with the cutting operation of the corrugated fiberboard sheet 14 in the cutting section 34 in Fig. 1. The size of the side rail 16 is not limited to one kind. The side rails 16 having a plurality of sizes may always be stocked in the side rail storing section 74. The side rail storing section 74 includes the magazine sections 18 shown in Fig. 2, and the side rails 16 are stocked in the magazine sections 18. The stocked side rails 16 are supplied to the side rail mounting section 54 of the packaging body forming section 50. At this time, the side rails 16 having a proper size determined by the control section 20 are selected and supplied. The side rails 16 are formed by utilizing the scraps 14B in the above-described embodiment; however, the configuration is not limited to this one. For example, as shown in Fig. 9, it is also possible that the configuration is such that a long hoop material 78 for side rail is cut to a desired size in a feed cut section 79 while being reeled out, by which the side rail 16 is formed.

[0046] The above-described control section 20 is connected to all of the packaging material supplying section 30, the packaging material working section 40, the packaging body forming section 50, the finishing section 60, the side rail section 70, and the lithographic printing plate bundle manufacturing apparatus 100 through a network etc., and is configured so as to be capable of controlling all of these process sections. The control section 20 is configured so that when the kinds of the lithographic printing plate bundles 12 are changed, control is carried out

considering a change in conveyance time. That is to say, the control section 20 carries out control so that even when the kinds of the lithographic printing plate bundles 12 are changed, the packaging operation is performed continuously without stopping the line, and also the lithographic printing plate bundles 12 of which kinds have been changed are set on the corrugated fiberboard sheets 14 corresponding to the change of kinds at good timing.

[0047] In the above-described embodiment, the sequence of work may be changed within each of the process sections 40, 50 and 60. For example, the sequence of the side rail mounting section 54 and the setting section 56 may be reversed, or the sequence of the taping section 62 and the labeling section 64 may be reversed.

[0048] Next, the operation of the packaging apparatus 10 configured as described above is explained.

[0049] Since the lithographic printing plate bundle 12 contains the lithographic printing plates each having photosensitive layers or thermosensitive layers thereon, the lithographic printing plate bundle 12 after being packaged is required not to move within the packaging body 22. Therefore, it is necessary that the corrugated fiberboard sheet 14 is formed with the rib score lines L1, the flap score lines L2, and the slots 14C and is folded so as to match the size of the lithographic printing plate bundle 12. Moreover, the rib part 14A of the corrugated fiberboard sheet 14 must take a shape suitable as a cushioning material for each of the lithographic printing plate bundles 12, and the width W and the height h (or the number of folding operations) of the rib part 14A must be determined according to the planar size and thickness of the lithographic printing plate bundle 12. There hence arises a problem in that the proper sizes and packaging patterns of the corrugated fiberboard sheets 14 are different for the kinds of the lithographic printing plate bundles 12.

[0050] Furthermore, for each of the lithographic printing plate bundles 12, a necessary number of lithographic printing plates having a necessary planar size are stacked and packaged for each shipping destination, which presents a problem of widely varied sizes. Therefore, if the corrugated fiberboard sheets 14 are prepared for every kind of the lithographic printing plate bundle 12, the kinds of the corrugated fiberboard sheets 14 increase, which presents a problem of difficulty in stocking. In the case where the lithographic printing plate bundles 12 are each packaged in the common corrugated fiberboard sheets 14 and the side rails 16 are packed therein, the packaging bodies 22 increase in size wastefully, which presents a problem in that the conveyance cost increases and the disposal cost of the corrugated fiberboard sheets 14 after conveyance increases.

[0051] In contrast, for the packaging apparatus 10 of the present embodiment, the information about the lithographic printing plate bundle 12 is inputted, and based on this information, the size of the corrugated fiberboard sheet 14 is selected, and further the proper packaging pattern is formed on the corrugated fiberboard sheet 14

on the line. Therefore, the waste of the corrugated fiberboard sheet 14 can be kept at a minimum, and also the proper packaging body 22 can be formed for each of the lithographic printing plate bundles 12, whereby the conveyance efficiency of the packaging body 22 can be improved.

[0052] Also, in the present embodiment, since the rib parts 14A of the corrugated fiberboard sheet 14 are formed and the side rails 16 are prepared in accordance with the information about the lithographic printing plate bundle 12, a cushioning function can be set for each of the lithographic printing plate bundles 12. Therefore, when the packaging body 22 is transported, the damage to the lithographic printing plate bundle 12 can be prevented more surely.

[0053] In the present embodiment, it is preferable that the control section 20 automatically changes, in accordance with the information about the lithographic printing plate bundle 12, all of the items that are changed for the kinds of the lithographic printing plate bundles 12. The items that are automatically changed by the control section 20 include, for example, the kind of the tape 24, the kind and content of the label 26, and the palletization pattern at the time of piling-up on the pallet 28.

Claims

1. A method of packaging a lithographic printing plate bundle (12), formed of stacked lithographic printing plates, by folding a sheet-shaped packaging material (14), comprising:

- a determining step of determining a size of the packaging material (14) and a packaging pattern of the packaging material (14) in accordance with information about the lithographic printing plates inputted from a manufacturing apparatus (100);
- a packaging material supplying step of performing cutting operations on the packaging material (14) so as to match the size determined in the determining step and to separate scrap (14B) from the packaging material (14), and then supplying the packaging material (14);
- a packaging material working step of forming a score line (L1, L2) and a slot (14C) on the packaging material (14) supplied in the packaging material supplying step in accordance with the packaging pattern determined in the determining step; and
- a packaging body forming step of conveying and placing the lithographic printing plate bundle (12) onto a predetermined position of the packaging material (14) on which the score line (L1, L2) and the slot (14C) have been formed in the packaging material working step, and then folding the packaging material (14) along the score

line (L1, L2) to form a box-shaped packaging body (22), wherein includes a side rail member placing step of placing a side rail member (16) at a side of the predetermined position where the lithographic printing plate bundle (12) is placed in the packaging body forming step, the packaging body forming step the separated scrap (14B) being utilized as side rail member (16) for packaging the lithographic printing plate bundle (12).

2. A method according to claim 1, wherein the packaging material is a corrugated fiberboard sheet (14).
3. A method according to claim 2, wherein in the packaging material supplying step, before the cutting operation, one corrugated fiberboard sheet (14) is selected from stocked corrugated fiberboard sheets (14).
4. A method according to claim 1 or 2, wherein the packaging body forming step includes a rib part forming step of folding the packaging material (14) to form a rib part (14A) at a side of the predetermined position where the lithographic printing plate bundle (12) is placed in the packaging body forming step.
5. A packaging apparatus (10) for packaging a lithographic printing plate bundle (12) formed of stacked lithographic printing plates, by folding a sheet-shaped packaging material (14), the packaging apparatus (10) comprising:
 - an input device (20) through which information about the lithographic printing plates inputted from a manufacturing apparatus (100) which manufactures the lithographic printing plates is inputted;
 - a control device (20) which determines a size of the packaging material (14) and a packaging pattern of the packaging material (14) in accordance with the information about the lithographic printing plates inputted through the input device (20);
 - a packaging material supplying device (30) which performs cutting operations on the packaging material (14) so as to match the size determined by the control device (20) and to separate scrap (14B) from the packaging material (14), and then supplies the packaging material (14);
 - a packaging material working device (40) which forms a score line (L1, L2) and a slot (14C) on the packaging material (14) supplied from the packaging material supplying device (30) in accordance with the packaging pattern determined by the control device (20); and
 - a packaging body forming device (50) which

conveys and places the lithographic printing plate bundle (12) onto a predetermined position of the packaging material (14) on which the score line (L1,L2) and the slot (14C) have been formed by the packaging material working device (40), and then folds the packaging material (14) along the score line (L1,L2) to form a box-shaped packaging body (22), wherein a side rail forming section (72) is provided which cuts the separated scrap (14B) to a side rail member (16) and places the side rail member at a side of the predetermined position for packaging the lithographic printing plate bundle (12).

Patentansprüche

1. Verfahren zum Verpacken einer lithografischen Druckplattenmenge (12), gebildet aus gestapelten lithografischen Druckplatten, durch Falten eines blattförmigen Verpackungsmaterials (14), aufweisend:

- einen Festlegungsschritt zum Festlegen eines Formats des Verpackungsmaterials (14) und eines Verpackungsmusters des Verpackungsmaterials (14) in Übereinstimmung mit einer Information über die lithografischen Druckplatten, eingegeben von einer Herstellungsvorrichtung (100);
- einen Verpackungsmaterial-Zuführungsschritt zum Ausführen von Schneidevorgängen an dem Verpackungsmaterial (14), um das Format, festgelegt in dem Festlegungsschritt, übereinzustimmen, und um ein Reststück (14B) von dem Verpackungsmaterial (14) zu separieren und dann das Verpackungsmaterial (14) zuzuführen;
- einen Verpackungsmaterial-Bearbeitungsschritt zum Bilden einer Rillenlinie (L1, L2) und eines Schlitzes (14C) in dem Verpackungsmaterial (14), zugeführt in dem Verpackungsmaterial-Zuführungsschritt in Übereinstimmung mit dem Verpackungsmuster, festgelegt in dem Festlegungsschritt; und
- einen Verpackungskörper-Bildungsschritt zum Befördern und Platzieren der lithografischen Druckplattenmenge (12) auf einer vorbestimmten Position des Verpackungsmaterials (14), an dem die Rillenlinie (L1, L2) und der Schlitz (14C) in dem Verpackungsmaterial-Bearbeitungsschritt gebildet worden sind, und dann Falten des Verpackungsmaterials (14) entlang der Rillenlinie (L1, L2), um einen kastenförmigen Verpackungskörper (22) zu bilden, wobei der Verpackungskörper-Bildungsschritt einen Seitenschienenteil-Platzierungsschritt zum Platzieren eines Seitenschienenteils (16) auf ei-

ner Seite der vorbestimmten Position enthält, wo die lithografische Druckplattenmenge (12) in dem Verpackungskörper-Bildungsschritt platziert wird, wobei die abgetrennten Reststücke (14B) als Seitenschienenteil (16) zum Verpacken der lithografischen Druckplattenmenge (12) verwendet werden.

2. Verfahren nach Anspruch 1, wobei das Verpackungsmaterial ein gewelltes Faserplattenblatt (14) ist.
3. Verfahren nach Anspruch 2, wobei in dem Verpackungsmaterial-Zuführungsschritt vor dem Schneidevorgang ein gewelltes Faserplattenblatt (14) aus gelagerten gewellten Faserplattenblättern (14) ausgewählt wird.
4. Verfahren nach Anspruch 1 oder 2, wobei der Verpackungskörper-Bildungsschritt einen Rippenteil-Bildungsschritt zum Falten des Verpackungsmaterials (14) enthält, um ein Rippenteil (14A) auf einer Seite der vorbestimmten Position zu bilden, wo die lithografische Druckplattenmenge (12) in dem Verpackungskörper-Bildungsschritt platziert ist.
5. Verpackungsvorrichtung (10) zum Verpacken einer lithografischen Druckplattenmenge (12), gebildet aus gestapelten lithografischen Druckplatten, durch Falten eines blattförmigen Verpackungsmaterials (14), wobei die Verpackungsvorrichtung (10) aufweist:
 - eine Eingabevorrichtung (20), durch die eine Information über die lithografischen Druckplatten, eingegeben von einer Herstellungsvorrichtung (100), die die lithografischen Druckplatten herstellt, eingegeben wird;
 - eine Steuerungsvorrichtung (20), die ein Format des Verpackungsmaterials (14) und ein Verpackungsmuster des Verpackungsmaterials (14) in Übereinstimmung mit der Information über die lithografischen Druckplatten, eingegeben durch die Eingabevorrichtung (20), festlegt;
 - eine Verpackungsmaterial-Zuführungsvorrichtung (30), die Schneidevorgänge an dem Verpackungsmaterial (14) ausführt, um das Format, festgelegt durch die Steuerungsvorrichtung (20), übereinzustimmen, und um das Reststück (14B) von dem Verpackungsmaterial (14) zu separieren und dann das Verpackungsmaterial (14) zuzuführt;
 - eine Verpackungsmaterial-Bearbeitungsvorrichtung (40), die eine Rillenlinie (L1, L2) und einen Schlitz (14C) an dem Verpackungsmaterial (14), zugeführt von der Verpackungsmaterial-Zuführungsvorrichtung (30), in Übereinstimmung mit dem Verpackungsmuster, festge-

legt durch die Steuerungsvorrichtung (20), bildet; und

- eine Verpackungskörper-Bildungsvorrichtung (50), die die lithografische Druckplattenmenge (12) an einer vorbestimmten Position des Verpackungsmaterials (14), an der die Rillenlinie (L1, L2) und der Schlitz (14C) durch die Verpackungsmaterial-Bearbeitungsvorrichtung (40) gebildet worden sind, fördert und platziert und dann das Verpackungsmaterial (14) entlang der Rillenlinie (L1, L2) faltet, um einen kastenförmigen Verpackungskörper (22) zu bilden, wobei ein Seitenschienen-Bildungsabschnitt (72) vorgesehen ist, der das abgetrennte Reststück (14B) zu einem Seitenschienenteil (16) schneidet und das Seitenschienenteil auf einer Seite der vorbestimmten Position zum Verpacken der lithografischen Druckplattenmenge (12) platziert.

Revendications

1. Procédé d'emballage d'un paquet de plaque d'impression lithographique (12), constitué de plaques d'impression lithographique empilées, en pliant une matière d'emballage en forme de feuille (14), comportant :

- une étape de détermination destinée à déterminer une taille de la matière d'emballage (14) et un modèle d'emballage de la matière d'emballage (14) suivant une information sur les plaques d'impression lithographique entrées à partir d'un appareil de fabrication (100) ;

- une étape d'alimentation en matière d'emballage destinée à réaliser des opérations de coupe sur la matière d'emballage (14) de façon à correspondre à la taille déterminée dans l'étape de détermination et à séparer une chute (14B) de la matière d'emballage (14), et à délivrer ensuite la matière d'emballage (14) ;

- une étape de travail de matière d'emballage destinée à former une ligne de pointillés (L1, L2) et une fente (14c) sur la matière d'emballage (14) délivrée à l'étape d'alimentation en matière d'emballage suivant le modèle d'emballage déterminé à l'étape de détermination ; et

- une étape de formation de corps d'emballage destinée à transporter et à placer le paquet de plaque d'impression lithographique (12) sur une position prédéterminée de la matière d'emballage (14) sur laquelle la ligne de pointillés (L1, L2) et la fente (14c) ont été formées dans l'étape de travail de matière d'emballage, et à plier ensuite la matière d'emballage (14) suivant la ligne de pointillés (L1, L2) afin de former un corps d'emballage en forme de boîte (22), selon lequel

l'étape de formation de corps d'emballage comprend une étape de mise en place d'élément de rail latéral destinée à mettre en place un élément de rail latéral (16) sur un côté de la position prédéterminée où le paquet de plaque d'impression lithographique (12) est placé dans l'étape de formation de corps d'emballage, la chute séparée (14B) étant utilisée comme élément de rail latéral (16) afin d'emballer le paquet de plaque d'impression lithographique (12).

2. Procédé selon la revendication 1, selon lequel la matière d'emballage est une feuille de panneau de fibres ondulée (14).

3. Procédé selon la revendication 2, selon lequel, dans l'étape d'alimentation en matière d'emballage, avant l'opération de coupe, une feuille de panneau de fibres ondulée (14) est choisie parmi les feuilles de panneau de fibres ondulées stockées (14).

4. Procédé selon la revendication 1 ou 2, selon lequel l'étape de formation de corps d'emballage comprend une étape de formation de partie de nervure destinée à plier la matière d'emballage (14) afin de former une partie de nervure (14A) sur un côté de la position prédéterminée où le paquet de plaque d'impression lithographique (12) est placé dans l'étape de formation de corps d'emballage.

5. Appareil d'emballage (10) destinée à emballer un paquet de plaque d'impression lithographique (12) constitué de plaques d'impression lithographique empilées, en pliant une matière d'emballage en forme de feuille (14), l'appareil d'emballage (10) comportant :

- un dispositif d'entrée (20) par l'intermédiaire duquel une information sur les plaques d'impression lithographique entrées à partir d'un appareil de fabrication (100) qui fabrique les plaques d'impression lithographique est entrée ;

- un dispositif de commande (20) qui détermine une taille de la matière d'emballage (14) et un modèle d'emballage de la matière d'emballage (14) en fonction de l'information sur les plaques d'impression lithographique entrée par l'intermédiaire du dispositif d'entrée (20) ;

- un dispositif d'alimentation en matière d'emballage (30) qui réalise des opérations de coupe sur la matière d'emballage (14) de façon à correspondre à la taille déterminée par le dispositif de commande (20) et à séparer une chute (14B) de la matière d'emballage (14), et délivre ensuite la matière d'emballage (14) ;

- un dispositif de travail de matière d'emballage (40) qui forme une ligne de pointillés (L1, L2) et une fente (14c) sur la matière d'emballage (14)

délivrée à partir du dispositif d'alimentation en matière d'emballage (30) suivant le modèle d'emballage déterminé par le dispositif de commande (20) ; et

- un dispositif de formation de corps d'emballage (50) qui transporte et place le paquet de plaque d'impression lithographique (12) sur une position prédéterminée de la matière d'emballage (14) sur laquelle la ligne de pointillés (L1, L2) et la fente (14c) ont été formées par le dispositif de travail de matière d'emballage (40), et plie ensuite la matière d'emballage (14) suivant la ligne de pointillés (L1, L2) afin de former un corps d'emballage en forme de boîte (22), dans lequel est prévue une section de formation de rail latéral (72) qui coupe la chute séparée (14B) en un élément de rail latéral (16) et place l'élément de rail latéral sur un côté de la position prédéterminée afin d'emballer le paquet de plaque d'impression lithographique (12).

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FIG.1

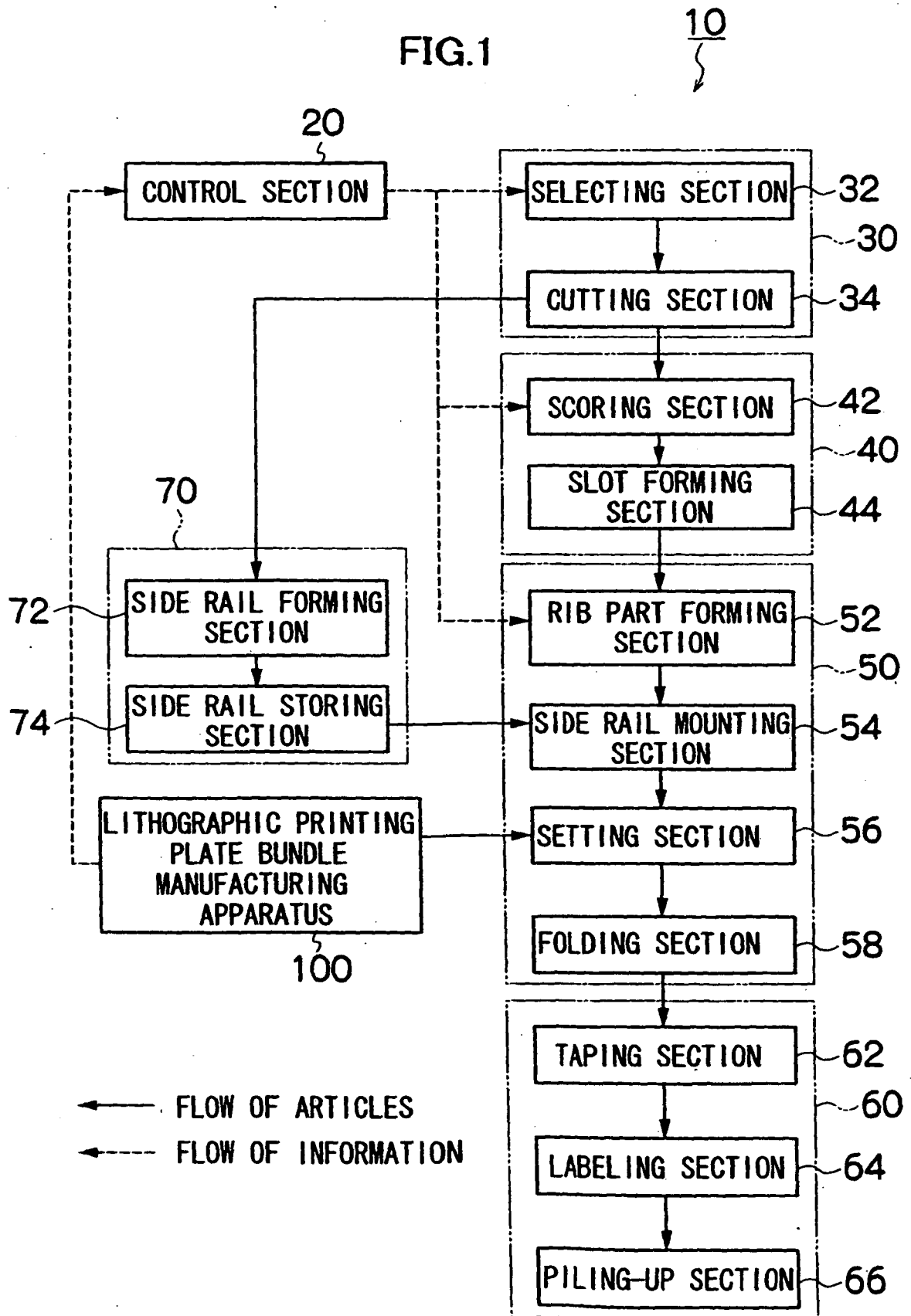


FIG. 2

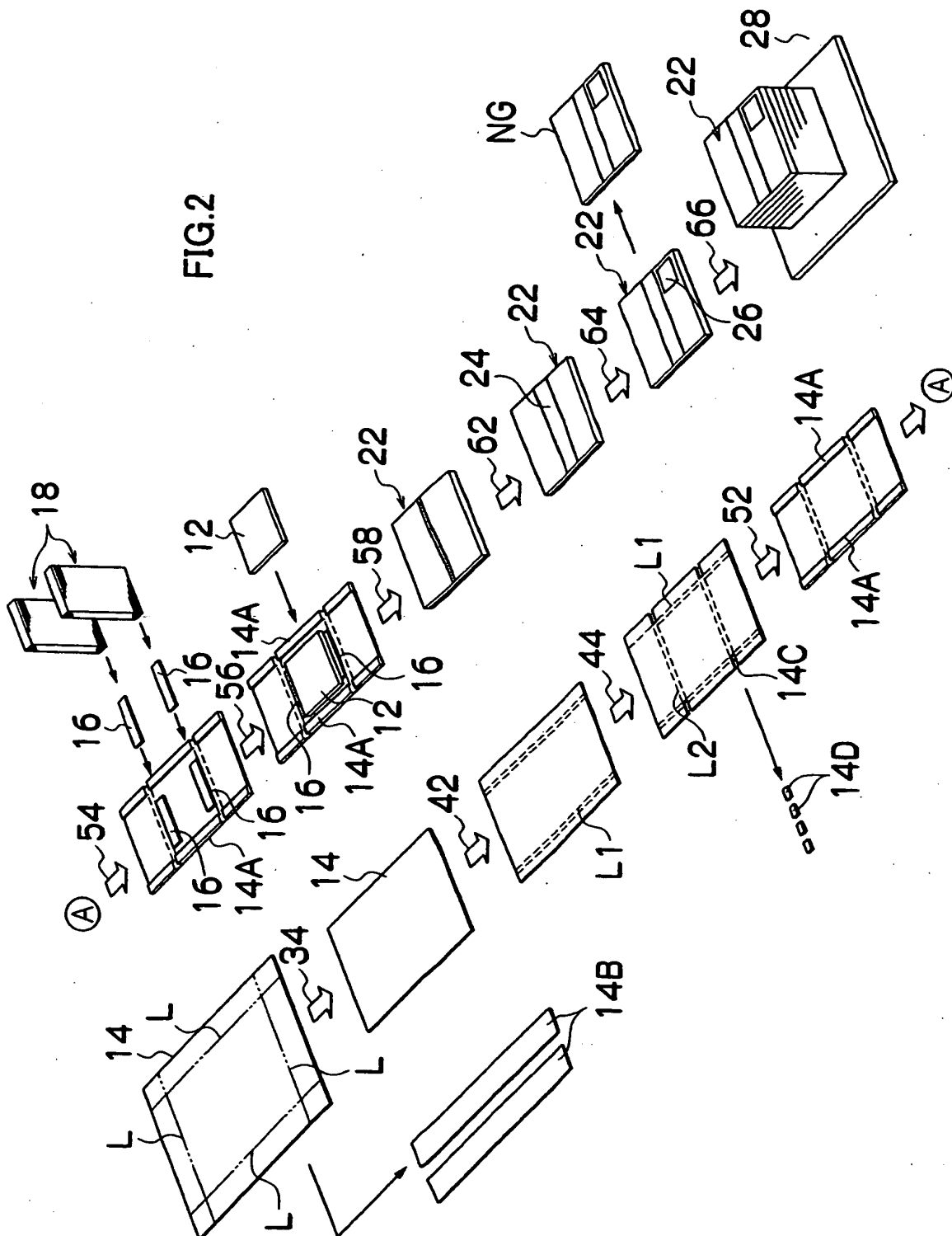


FIG.3A

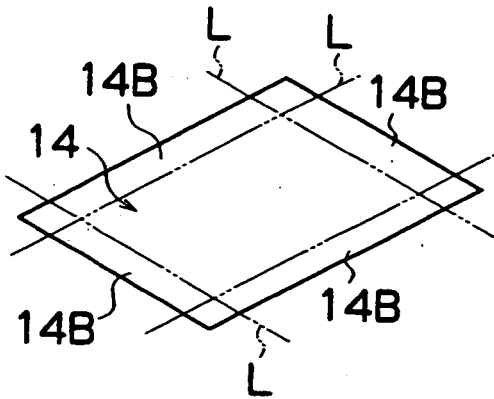


FIG.3B

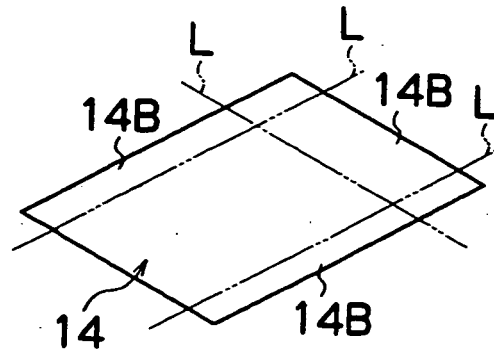


FIG.3C

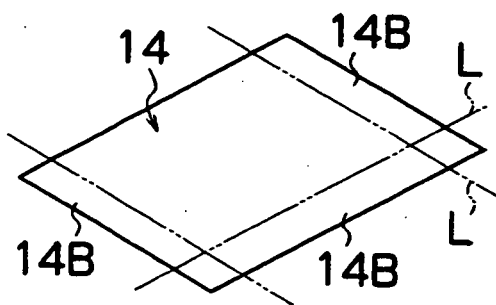


FIG.3D

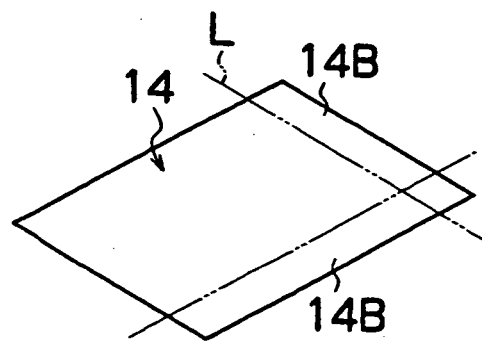


FIG.3E

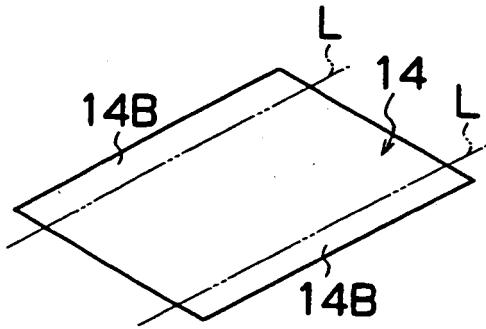


FIG.3F

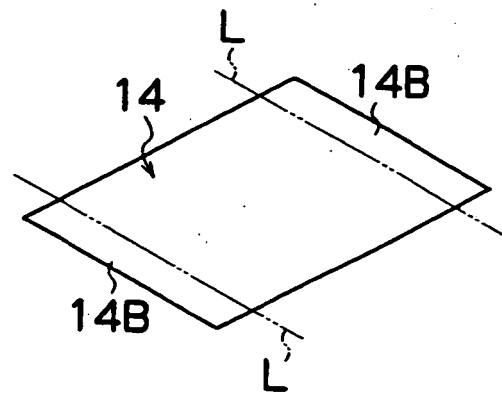


FIG.3G

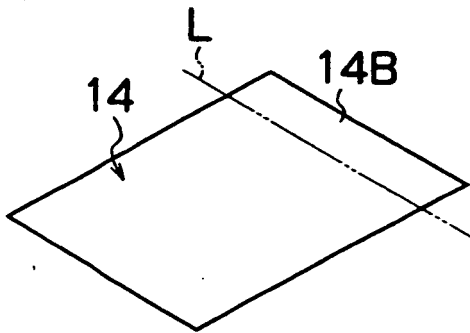
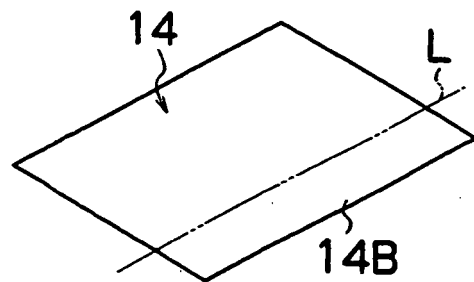


FIG.3H



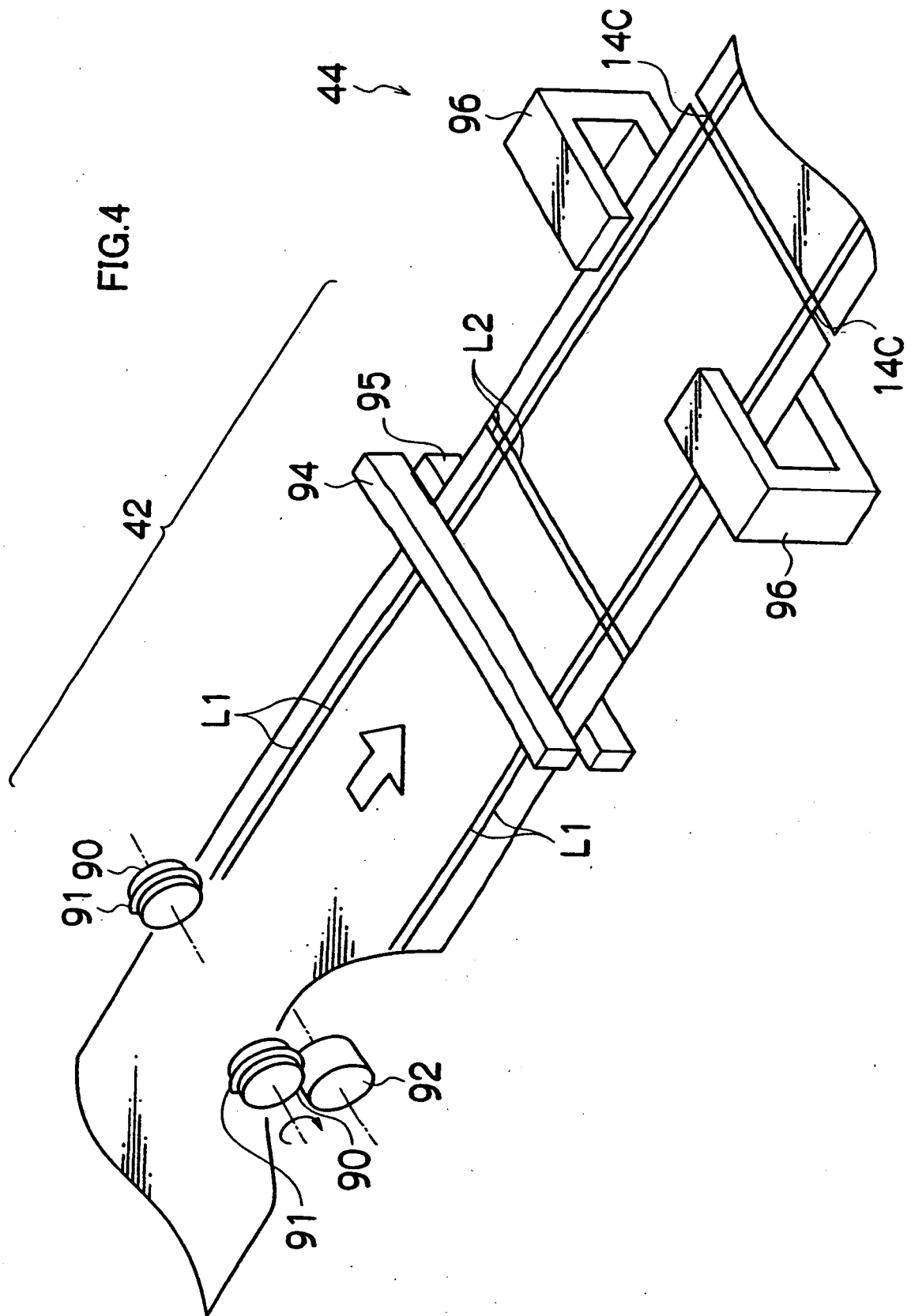


FIG.5A

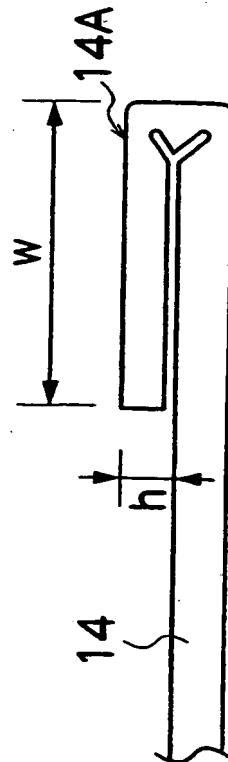
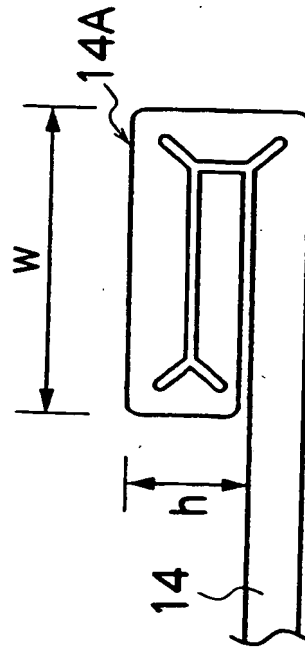


FIG.5B



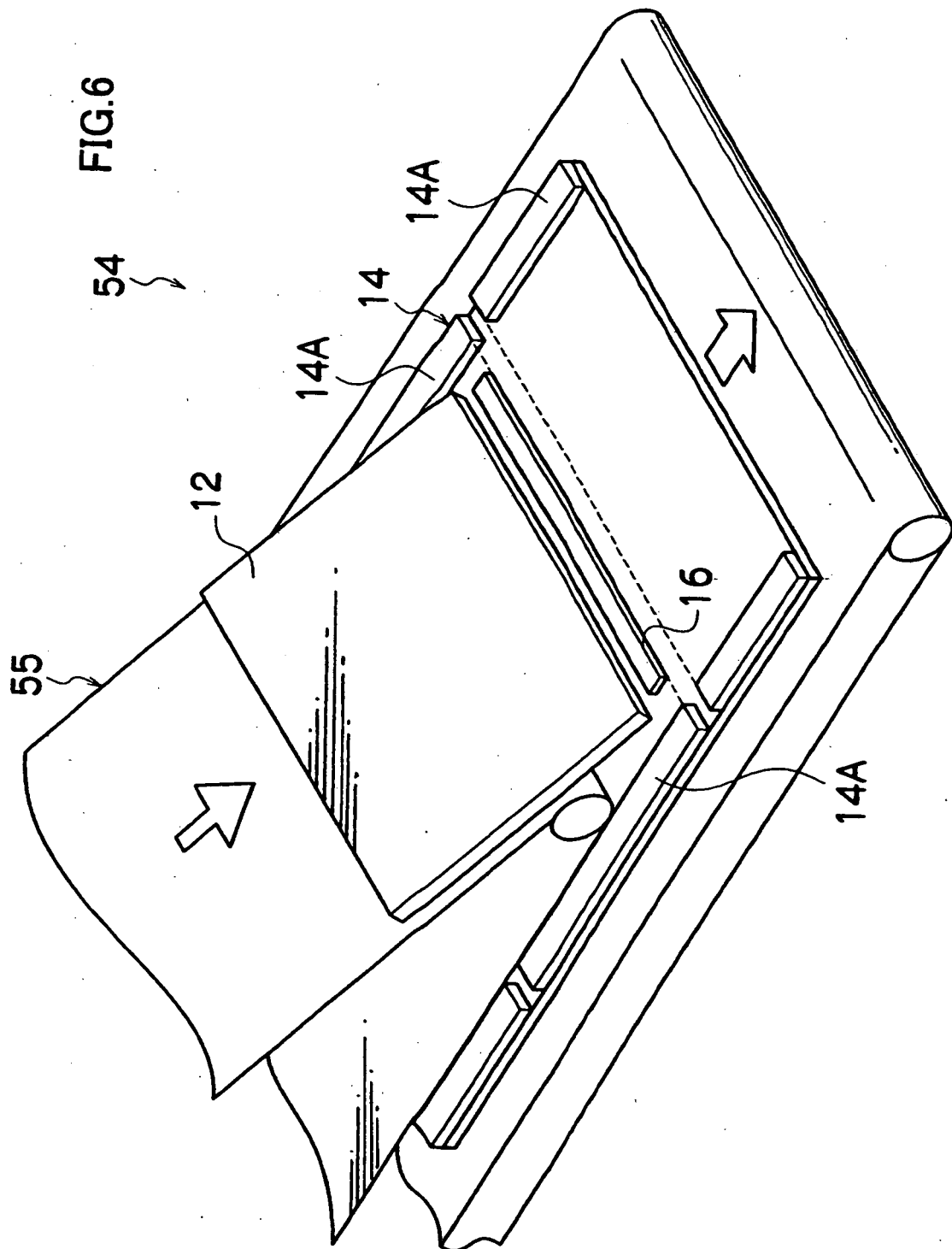


FIG.7B

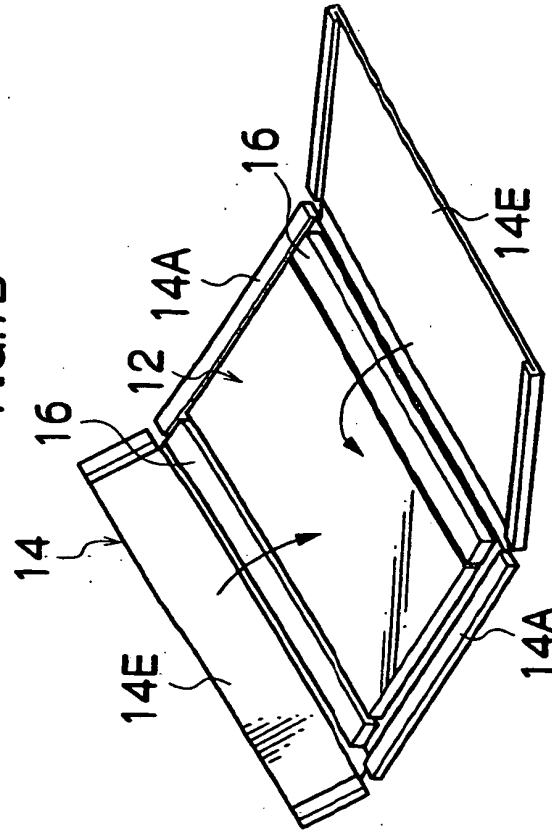


FIG.7A

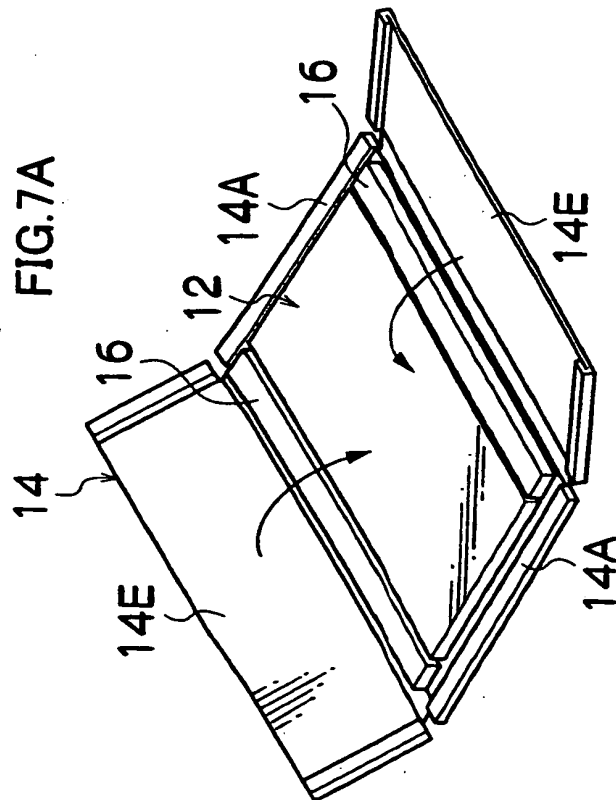


FIG.8

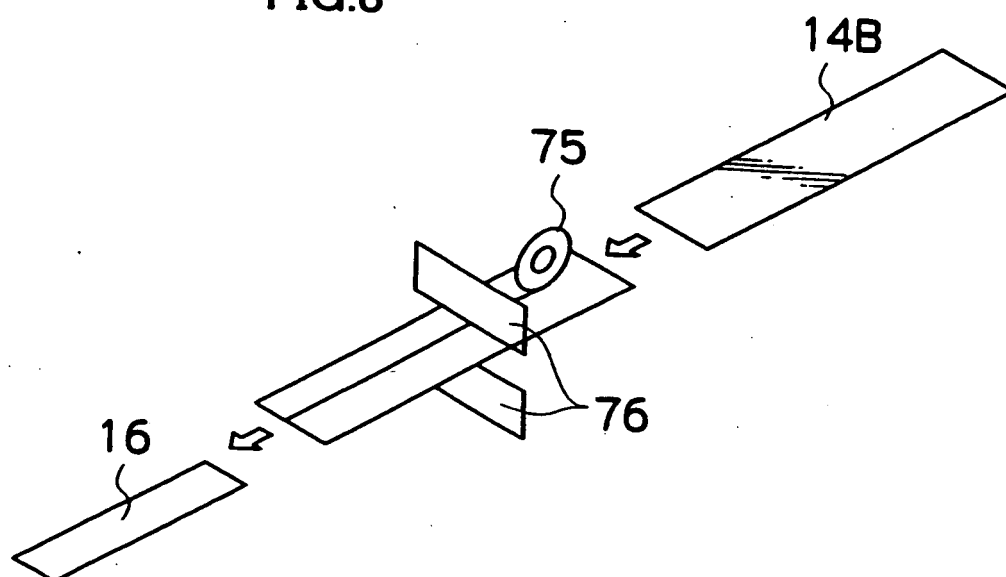
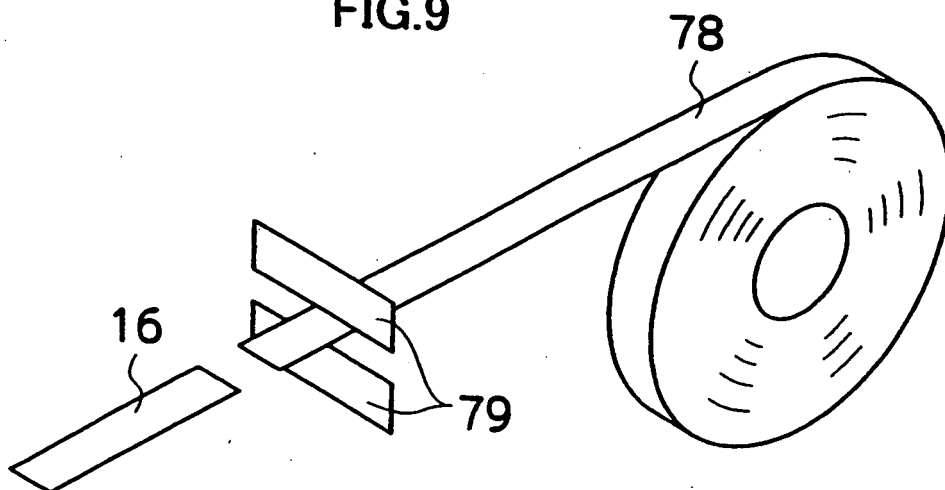


FIG.9



REFERENCES CITED IN THE DESCRIPTION

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