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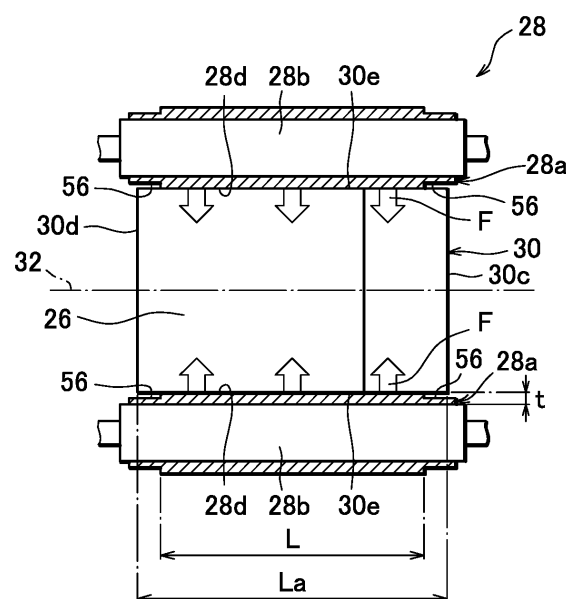
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(54) **PACKAGING MACHINE**

(57) A packaging machine (1) for forming a box (30) by folding a blank around the periphery of a plurality of smoking articles, including a conveyance path (26) for thereafter conveying the box (30) to a subsequent processing stage, wherein the box (30) includes a longitudinal axis (32), and a pair of side walls (30e) having inner and outer side wall parts (34a, 34b) which extend along the longitudinal axis (32) and are bonded to each other, and assumes a posture in which the pair of the side walls (30e) extend in a direction traversing the conveyance path (26) in the conveyance path (26); the conveyance path (26) has a pair of conveyance walls (28a) for holding therebetween the box (30) by the pair of side walls (30e), and includes a conveyor (28) for conveying the box (30) while holding the same between the conveyance walls (28a); the pair of conveyance walls (28a) respectively include pressing wall surfaces (28d) for substantially pressing the side walls (30e); and at least one of the pressing wall surfaces (28d) includes means (56, 58, 60) for reducing a total effective length (L) of the pressing wall surface (28d) along the longitudinal axis (32) to be less than an overall length (La) of the side wall (30e).

FIG. 5



Description

Technical Field

[0001] The present invention relates to a packaging machine, and particularly to a packaging machine for forming a box by folding a blank around the periphery of a plurality of smoking articles, the machine including a conveyance path for thereafter conveying the box to a subsequent processing stage.

Background Art

[0002] As the conveyance path of this kind of packaging machine, one which has a pair of conveyance walls and is provided with a conveyor for conveying the box while holding it between the conveyance walls is known. The box is conveyed, for example, while being held between the conveyance walls by a pair of side walls extending along its longitudinal axis, the pair of side walls having inner and outer side wall parts, which are bonded to each other, and while being positioned to extend in a direction in which the pair of side walls traverse the conveyance path in the conveyance path.

[0003] Meanwhile, Patent Document 1 discloses an apparatus including a conveyor for discharging cigarettes from a packaging machine. It is described that in this apparatus, to appropriately dry the box as a packet containing cigarettes without separating the bonded parts of the box, thereby obtaining a high quality final product, the pair of side walls of the box need to be held closely between a pair of belts forming a pair of conveyance walls of the conveyor.

[0004] Specifically, during the conveyance of a box in the conveyance path, the pair of side walls of the box are pressed by pressing wall surfaces of the belt forming a pair of the conveyance walls of the conveyor. As a result of this, those side wall parts are bonded to each other by the glue (adhesive) applied on a glue application region of the side wall parts constituting the pair of side walls.

Prior Art Document

Patent Document

[0005] Patent Document 1: National Publication of International Patent Application No. 2004-502608

Summary of the Invention

Problems to be solved by the Invention

[0006] However, when the side walls of the box are pressed by the pressing wall surfaces of the belt in the conveyance path, depending on the shape and type of the box, the shape of the contained object to be contained in the box, and the like, the pressing force acts intensively on an area in which the rigidity of the box is relatively

high and, on the other hand, in an area in which the rigidity of the box is low, the reaction force of the side wall against the pressing force is decreased, and thus caving is likely to occur during pressing.

[0007] In this way, when the pressing force applied from the pressing wall surfaces is concentrated into an unintended spot, or when release of the pressing force occurs due to caving, the pressing force to be primarily applied to the side walls may become too small or non-uniform in magnitude. In such cases, it is not possible to apply an appropriate magnitude of pressing force for suitably performing the bonding of side wall parts constituting the side walls, on the glue application region, thus causing risk of bonding defects of box, and, by extension, of defective shaping of the box due to peeling of the glue application region.

[0008] The present invention has been made in view of the above described problems, and has its object to provide a packaging machine which can suppress bonding defects and, by extension, defective shaping of the box, by surely applying appropriate pressing force to the glue application region of the side walls of the box depending on the shape and type of the box, the shape of the contained object to be contained in the box, and the like.

Means for Solving the Problems

[0009] In order to achieve the above object, an aspect of the present invention is directed to a packaging machine for forming a box by folding a blank around the periphery of a plurality of smoking articles, comprising a conveyance path for thereafter conveying the box to a subsequent processing stage, wherein the box includes a longitudinal axis and a pair of side walls having inner and outer side wall parts which extend along the longitudinal axis and are bonded to each other, and assumes a posture in which the pair of the side walls extend in a direction traversing the conveyance path in the conveyance path; the conveyance path has a pair of conveyance walls for holding therebetween the box by the pair of side walls, and includes a conveyor for conveying the box while holding the same between the conveyance walls; the pair of conveyance walls respectively include pressing wall surfaces for substantially pressing the side walls; and at least one of the pressing wall surfaces includes means for reducing a total effective length of the pressing wall surface along the longitudinal axis to be less than an overall length of the side wall.

Advantageous Effects of the Invention

[0010] According to the packaging machine of the present invention, it is possible to suppress bonding defects and, by extension, defective shaping of the box, by securely applying appropriate pressing force to the glue application region of the side walls of the box depending on the shape and type of the box, the shape of the con-

tained object to be contained in the box, and the like.

Brief Description of the Drawings

[0011]

FIG. 1 is a schematic view of a packaging machine according to one embodiment of the present invention.

FIG. 2 is a perspective view of a cigarette package (box) shaped by the packaging machine of FIG. 1.

FIG. 3 is a plan view seen from the back side of a main blank for forming the box of FIG. 2

FIG. 4 is a plan view seen from the back side of a sub blank for forming the box of FIG. 2.

FIG. 5 is a partial sectional view, seen from an arrow direction of the A-A section of FIG. 1, of a conveyor according to a first embodiment of the present invention.

FIG. 6 is a partial section view of the conveyor according to a second embodiment of the present invention.

FIG. 7 is a partial section view of the conveyor according to a third embodiment of the present invention.

FIG. 8 is a partial section view of the conveyor according to a fourth embodiment of the present invention.

FIG. 9 is a partial sectional view to show a case in which a long box is conveyed by the conveyor according to a fifth embodiment of the present invention.

FIG. 10 is a partial sectional view to show a case in which a short box is conveyed by the conveyor according to a fifth embodiment of the present invention.

Mode for Carrying out the Invention

[0012] Hereinafter, a packing machine according to an embodiment of the present invention will be described based on the drawings.

[0013] As shown in FIG. 1, a packing machine of the present embodiment includes a hopper apparatus 2. The hopper apparatus 2 includes three hoppers 2a, 2b, 2c and a large number of filter cigarettes are stored in those hoppers 2a to 2c. To lower parts of the hoppers 2a to 2c, a plurality of accumulation pockets 4 are successively transported. The hoppers 2a to 2c are disposed adjacent to each other in the transportation direction of the accumulation pocket 4.

[0014] Each accumulation pocket 4 receives a predetermined number of filter cigarettes from each hopper 2a to 2c when passing through the lower parts of the hoppers 2a to 2c. As a result, when the accumulation pocket 4 has passed all of the three hoppers 2a to 2c, a cigarette bundle assuming a block shape is contained in the accumulation pocket 4. The cigarette bundle includes 20

filter cigarettes, and the filter cigarettes are disposed in a stacked state of upper, middle, and lower levels in the accumulation pocket 4. For example, the upper and lower levels include 7 filter cigarettes, and the middle level includes 6 cigarettes.

[0015] Hereafter, the accumulation pocket 4 is transported along a transportation line to a first wheel 6 indicated by a one-point chain line. As it rotates, the first wheel 6 receives the cigarette bundle from the accumulation pocket 4, and transports the received cigarette bundle toward the second wheel 8 indicated by a one-point chain line. The first and second wheels 6, 8 are disposed in a vertical posture.

[0016] The second wheel 8 includes a plurality of folding pockets 10, and these folding pockets 10 are disposed at an equal spacing in the circumferential direction of the second wheel 8. As the second wheel 8 rotates, the folding pocket 10 receives a cigarette bundle from the first wheel 6 and also receives a sheet-like inner wrapper IW. The inner wrapper IW is supplied from an inner wrapper supply device 12 to between the first and second wheels 6, 8 to be pushed into the folding pocket 10 of the second wheel 8 along with the cigarette bundle. In this occasion, the inner wrapper IW is wound around the cigarette bundle in a U shape in the folding pocket 10.

[0017] As the second wheel 8 rotates, the cigarette bundle in the folding pocket 10 is transported in the circumferential direction of the second wheel 8. During this transportation process, the folding of an end flap for closing the end surface of the cigarette bundle and the folding of a side flap for closing both side surfaces of the cigarette bundle are carried out with respect to the inner wrapper IW wound around the cigarette bundle, resulting in formation of an inner pack IP.

[0018] A third wheel 14 is adjacent to the second wheel 8, and the third wheel 14 and the first wheel 6 are spaced apart from one another in a diametrical direction of the second wheel 8. The third wheel 14 has a plurality of transportation pockets, and each transportation pocket successively receives the inner pack IP from the second wheel 8 as the third wheel 14 rotates. Thereafter, the inner pack IP is transported in the circumferential direction of the third wheel 14 along with the transportation pocket.

[0019] Further, the fourth wheel 16 is adjacent to the third wheel 14, and the fourth wheel 16 is disposed in a horizontal posture as with the third wheel 14. The fourth wheel 16 has a plurality of transportation pockets, and is positioned below the third wheel 14, so that the circumferences of the third and fourth wheels 14, 16 are partly overlapped in the vertical direction. Arriving at the fourth wheel 16, the inner pack IP on the third wheel 14 transfers from the third wheel 14 into the transportation pocket of the fourth wheel 16, and thereafter, is transported in the circumferential direction of the fourth wheel 16 as it rotates.

[0020] On the other hand, the fourth wheel 16 is connected to a sub blank supply device 18, and the sub blank

supply device 18 supplies a sub blank SB to the transportation pocket of the fourth wheel 16 before it receives the inner pack IP. The sub blank supply device 18 includes a web roll RS, and the web roll RS feeds out a web WS along the supply path PSB.

[0021] In this supply path PSB, a notch/cutter roller, a feed unit, and a cutting unit are disposed successively from the roll RS side, although none of them is shown. The feed unit intermittently supplies the web WS, and in this supply process, the notch/cutter roller forms a pair of side folding lines, etc. on the web WS, and the cutting unit cuts the web WS into a predetermined length, thereby forming a sub blank SB.

[0022] When the transportation pocket of the fourth wheel 16 arrives at the third wheel 14 after receiving the sub blank SB, the inner pack IP of the third wheel 14 is packed into the relevant transportation pocket along with the sub blank SB. In this occasion, the sub blank SB is folded in from the side folding line to form an inner frame, and this inner frame is bonded to the inner pack IP. Thereafter, the inner pack IP with the inner frame is transported as the fourth wheel 16 rotates.

[0023] Further, the main blank supply device 20 is connected between the fourth wheel 16 and the fifth wheel 24, and this main blank supply device 20 supplies the main blank MB which is an outer wrapper to the inner pack IP on the fourth wheel 16. As shown in FIG. 1, the main blank supply device 20 includes a hopper 22 which stores the main blank MB. The main blank MB is transported one by one from the hopper 22 to the fourth wheel 16 along the supply path PMB, and is supplied to the inner pack IP positioned at a supply position of the fourth wheel 16. The main blank MB is placed on the inner pack IP in such a way to hold the inner pack IP between itself and the above described inner frame. At this moment, in the main blank MB, a glue has been applied in the glue application regions 48, 50, 51 to be described later by a glue application apparatus not shown.

[0024] Right above the supply position of the fourth wheel 16, the fifth wheel 24 is disposed in a vertical posture. The fifth wheel 24 has a plurality of folding pockets, and each folding pocket receives the inner pack IP with the inner frame and the main blank MB from the fourth wheel 16 as the fifth wheel 24 rotates. In this occasion, a pair of side flaps of the main blank MB are folded in.

[0025] Hereinafter, the received inner pack IP is transported in the circumferential direction of the fifth wheel 24, and in this transportation process, remaining folding process for the main blank MB is successively performed; as a result of this, a cigarette package SP is formed. The packaging machine 1 includes a conveyance path 26, and the conveyance path 26 conveys the formed cigarette package SP toward a film packaging section which is a subsequent processing stage. In the film packaging section, the cigarette package SP is packaged with film sheet, thereby forming a final product of the cigarette package SP.

[0026] Here, a conveyor 28 is provided in the convey-

ance path 26. The conveyor 28 includes a pair of endless belts (conveyance walls) 28a, and a plurality of rollers 28b around which a belt 28a is wound and which guides the belt 28a by rotation along the conveyance path 26.

By rotationally driving the rollers 28b, the conveyor 28 can successively convey a large number of cigarette packages SP to the film packaging section while holding the cigarette packages SP between the pair of belts 28a.

[0027] As shown in FIG. 2, the cigarette package SP before being packaged by film sheet is formed as a box 30 in which the main blank MB and the sub blank SB are folded in in the periphery of the cigarette bundle which is a plurality of smoking articles.

[0028] The box 30 assumes a cuboid shape and includes a front wall 30a, a rear wall 30b, a top wall 30c, a bottom wall 30d, and a pair of side walls 30e.

[0029] Each side wall 30e extends along the longitudinal axis 32 of the box 30, and is formed by bonding an inner side wall part 34a, which is obtained by folding in an inner side flap of the main blank MB, and an outer side wall part 34b, which is obtained by folding in an outer side flap of the main blank MB, to each other.

[0030] In the box 30 of the present embodiment, four round corners 36 which respectively connect the front wall 30a with the side wall 30e, and the rear wall 30b with the side wall 30e are formed.

[0031] The box 30 forms a cigarette package SP which is a so-called hinge-lid round corner box having an outer body 30A and a lid 30C connected to the outer body 30A via a hinge 30B. The above described inner side wall part 34a, outer side wall part 34b, and round corners 36 are formed in the lid 30C as well.

[0032] As shown in FIG. 3, the main blank MB includes a front panel 40a for forming the front wall 30a, a rear panel 40b for forming the rear wall 30b, a top panel 40c for forming the top wall 30c, a bottom panel 40d for forming the bottom wall 30d, inner and outer side flaps 40e, 40f for respectively forming inner and outer side wall parts 34a, 34b, and a lid front panel 40g, a lid flap 40h, and an outer side flap 40i for forming the lid 30C. An arcuate round part 42 is provided in each of the four corners of the top and bottom panels 40c, 40d, and the round part 42 is positioned along the round corner 36 when the box 30 is shaped.

[0033] In the order seen from the top in FIG. 3, the lid front panel 40g and the top panel 40c; the rear panel 40b and the top panel 40c; the rear panel 40b and the bottom panel 40d; and the front panel 40a and the bottom panel 40d are connected respectively via the folding lines 44 which are folded when the box 30 is shaped. Then, these folding lines 44 are reduced in length compared with a square box which has no round corner 36 due to slits associated with formation of the round parts 42.

[0034] Moreover, the round corner 36 is formed by slitting or pressing a plurality of linear folding lines 46 along the longitudinal axis 32 in the back side of the main blank MB.

[0035] In the back side of the outer side flap 40f of the

main blank MB, a glue application region 48 is formed in a region along the contour of the outer side flap 40f. In the glue application region 48, glue as an adhesive is applied in a linear shape or a dot pattern. When the box 30 is shaped, by bonding the inner and outer side flaps 40e, 40f with each other in the glue application region 48, a pair of side walls 30e in which the inner and outer side wall parts 34a, 34b are bonded together are formed.

[0036] Moreover, in an upper part when seen in FIG. 3 on the back side of the inner side flap 40e of the main blank MB, a glue application region 50 which is smaller than the glue application region 48 is formed. Moreover, a glue application region 51 is formed as well in the outer side flap 40i of the lid C.

[0037] As shown in FIG. 4, the sub blank SB includes a front panel 52a, and side flaps 52b located on both sides of the front panel 52a. In the back side of the sub blank SB, a plurality of folding lines 54 which are similar to the folding line 46 for forming a part of the round corner 36 are formed.

[0038] The frond side of the side flap 52b of the sub blank SB is bonded to the glue application region 50 in the back side of the inner side flap 40e when the box 30 is shaped, thus shaping an inner frame and, by extension, an inner pack IP including an inner frame and the main blank MB.

<First embodiment>

[0039] As shown in FIG. 5, the box 30 is disposed in the conveyance path 26 assuming a posture to extend in a direction (width direction of the belt 28a) in which a pair of side walls 30e traverse the conveyance path 26, and is held between the pair of side walls 30e between the belts 28a of the conveyor 28. Here, a guide not shown is provided between the fifth wheel 24 and the conveyor 28. This guide positions the longitudinal axis 32 of the box 30 in the width direction of the belt 28a when the box 30 is conveyed from the fifth wheel 24 to the conveyor 28.

[0040] Moreover, this guide is provided, for example, on the bottom wall 30d side of the box 30, and positions a conveyance reference position of the box 30 with respect to the belt 28a in the longitudinal axis 32 with reference to the bottom wall 30d. Note that two guides may be provided on both the bottom wall 30d side and the top wall 30c side of the box 30, and position the box 30 with respect to the belt 28a with reference to the bottom wall 30d and the top wall 30c.

[0041] The belt 28a is formed by such as laminating an outer base sheet not shown and an inner felt sheet, when seen from the conveyance path 26. A roller 28b is in abutment with a rubber sheet, so that for example, rotational driving force of the roller 28b is transferred to the belt 28a by friction. Note that the roller 28b of the present embodiment is a so-called flat roller which has substantially the same diameter over the longitudinal axis 32, and the middle of the longitudinal axis 32 of the roller main body is positioned substantially in the middle in the

width direction of the belt 28a.

[0042] In the pair of belts 28a facing each other in the conveyance path 26, pressing wall surfaces 28d for pressing the side walls 30e when the box 30 is conveyed are formed on the conveyance path 26 side (felt sheet side). When the roller 28b is rotationally driven to guide the belt 28a along the conveyance path 26, predetermined tension acts on the belt 28a. Owing to tension of the belt 28a and elastic force based on the rubber sheet, etc., a pair of pressing wall surfaces 28d facing each other in the conveyance path 26 substantially press the pair of side walls 30e respectively with predetermined pressing force F indicated by an arrow, thereby holding the box 30 therebetween while the box 30 is conveyed in the conveyance path 26.

[0043] Then, in the present embodiment, in an end part of the pressing wall surface 28d facing an end part of the side wall 30e, there is formed a notched part 56 which is in non-contact with the end part of the side wall 30e while the box 30 is conveyed in the conveyance path 26. The notched part 56 is formed by cutting the surface of the both ends of the pressing wall surface 28d reaching an end edge of the belt 28a, and is formed by being subjected to processing to scrape off a thickness t (for example 2 mm) of the belt 28a by a predetermined decrease of width (for example 1 mm). In this way, the notched part 56 decreases the total effective length L of the pressing wall surface 28d for substantially pressing the side wall 30e to be less than the overall length La of the side wall 30e (means).

[0044] As so far described, in the present embodiment, as a result of providing a notched part 56 at both end parts of the pressing wall surface 28d, the pressing wall surface 28d presses the side wall 30e while avoiding the vicinity of the top wall 30c and the bottom wall 30d of the box 30.

[0045] Here, conventionally, the top wall 30c and the bottom wall 30d of the box 30, which function as a support wall of the box 30 when the side wall 30e is pressed by the pressing wall surface 28d, are areas in which rigidity is relatively high in the box 30. For this reason, based on the law of action and reaction forces, pressing force F larger than the pressing force F which acts on the side wall 30e acts intensively on the top wall 30c and the bottom wall 30d.

[0046] On the other hand, as described above, the folding lines 44 to be formed respectively between the rear and top panels 40b, 40c and between the front and bottom panels 40a, 40d are shorter compared with a case of a square box due to slits associated with formation of the round parts 42. As a result of such shortening of the folding lines 44, the rigidity of both end parts of the pair of side walls 30e decreases, and reaction force against the pressing force F decreases so that caving becomes likely to occur when the side walls 30e are pressed by the pressing wall surfaces 28d.

[0047] In this way, conventionally, in the vicinity of both end parts of the side wall 30e, there existed both an area

on which pressing force F acts intensively and an area in which caving is likely to be caused by application of pressing force F . Because of this, it is not possible to apply an appropriate magnitude of pressing force F on a glue application region 48, 50 which is formed in the side wall 30e, and therefore there is risk of bonding defects of the box 30, and, by extension, of defective shaping of the box 30 associated with peeling of the glue application region 48, 50.

[0048] However, in the present embodiment, the pressing wall surface 28d presses the side wall 30e while avoiding the vicinity of the both end parts of the side wall 30e including the top wall 30c and the bottom wall 30d of the box 30. Since this makes it possible to securely apply an appropriate magnitude of pressing force F to the glue application region 48, 50, thereby forming a uniform pressing force distribution in the glue application region 48, 50, it is possible to effectively suppress bonding defects and, by extension, defective shaping of the box 30.

<Second embodiment>

[0049] Hereinafter, referring to FIG. 6, a conveyer 28 of the packaging machine 1 according to a second embodiment of the present invention will be described. Note that regarding the description of each embodiment below, contents thereof which are different from the first embodiment will be primarily described, and other contents may be omitted from description by giving the same reference symbols in the drawings, and so on.

[0050] As shown in FIG. 6, the pressing wall surface 28d of the present embodiment has a width W extending in a direction traversing the conveyance path 26. This width W is set to be shorter than the overall length L_a of the side wall 30e. As a result, the total effective length L of the pressing wall surface 28d which substantially presses the side wall 30e is necessarily decreased to be less than the overall length L_a of the side wall 30e (means). For this reason, as with the case of the first embodiment, it is possible that the pressing wall surface 28d presses the side wall 30e while avoiding the vicinity of both end parts of the side wall 30e. Therefore, in the present embodiment as well, it is possible to securely apply appropriate pressing force F on the glue application region 48, 50, thus effectively suppressing bonding defects and, by extension, defective shaping of the box 30.

<Third embodiment>

[0051] As shown in FIG. 7, the pressing wall surface 28d of the present embodiment has a concave part 58 which is in non-contact with the side wall 30e while the box 30 is conveyed in the conveyance path 26. The concave part 58, which is provided in both end parts of the pressing wall surface 28d, decreases the total effective length L of the pressing wall surface 28d which substantially presses the side wall 30e to be less than the overall

length L_a of the side wall 30e (means). As a result, as with the case of the first embodiment, the pressing wall surface 28d can press the side wall 30e while avoiding the vicinity of the both end parts of the side wall 30e.

Therefore, in the present embodiment as well, it is possible to securely apply appropriate pressing force F on the glue application region 48, 50, thereby effectively suppressing bonding defects and, by extension, defective shaping of the box 30.

<Fourth embodiment>

[0052] As shown in FIG. 8, a curved part 60 is formed at an end part of the pressing wall surface 28d of the present embodiment. This curved part 60, which assume an arcuate shape separated from the side wall 30e while the box 30 is conveyed in the conveyance path 26, decreases the total effective length L of the pressing wall surface 28d which substantially presses the side wall 30e to be less than the overall length L_a of the side wall 30e (means). For this reason, as with the case of the first embodiment, it is possible that the pressing wall surface 28d presses the side wall 30e while avoiding the vicinity of both end parts of the side wall 30e. Therefore, in the present embodiment as well, it is possible to securely apply appropriate pressing force F on the glue application region 48, 50, thus effectively suppressing bonding defects and, by extension, defective shaping of the box 30.

<Fifth embodiment>

[0053] As shown in FIG. 9, the conveyor 28 of the present embodiment uses a crown roller 62 in place of the roller 28b which is a flat roller. The crown roller 62, which is configured such that the diameter at the middle in the direction of the longitudinal axis 32 of the roller main body is larger than the diameters of the end parts, has a function of bringing the belt 28e into substantially uniform contact with the side wall 30e while suppressing deflection of the roller main body, and suppressing meandering of the belt 28a.

[0054] Moreover, the box 30L shown in FIG. 9 is a long box in which the length of the longitudinal axis 32 is longer compared with the box 30, in which the width W of the pressing wall surface 28d is set to be longer compared with the case of the first embodiment, corresponding to the box 30L. Moreover, a notched part 56 is formed at both end parts of the pressing wall surface 28d.

[0055] On the other hand, the box 30S shown in FIG. 10 is a short box in which the length of the longitudinal axis 32 is shorter compared with the box 30, and the width W of the pressing wall surface 28d is set to be the same width as in the case of FIG. 9. Moreover, a notched part 56 is formed in both end parts of the pressing wall surface 28d. However, the notched part 56 which is located on the top wall 30c side of the pressing wall surface 28d is formed over a longer range, compared with the case of FIG. 9, in the longitudinal axis 32 to an extent to

keep the end part of the side wall 30e of the box 30S in a non-contact state.

[0056] As so far described, in the present embodiment, as a result of using the crown roller 62 for the conveyor 28, it is possible to bring the belt 28a into substantially uniform contact with the side wall 30e, and suppress meandering of the belt 28a. Therefore, even when a box 30L of long size or a box 30S of short size is conveyed, as a result of the pressing wall surface 28d having the notched part 56, the total effective length L of the pressing wall surface 28d which substantially presses the side wall 30e is decreased to be less than the overall length La of the side wall 30e (means). Therefore, it is possible to press the side wall 30e while avoiding the vicinity of the both end parts of the side wall 30e, thus suppressing bonding defects and, by extension, defective shaping of the box 30L, 30S.

[0057] Further, even when the box 30L which is a long box and the box 30S which is a short box are conveyed, by pre-adjusting the position of the guide provided between the fifth wheel 24 and the conveyor 28, it is possible to effectively suppress bonding defects and, by extension, defective shaping of the box 30L, 30S by simple operation only to change the belt 28a to one in which the width W of the pressing wall surface 28d and the forming range of the notched part 56 are adjusted without changing conveyance reference position of the box 30L, 30S, and without replacing the crown roller 62.

[0058] While description on each embodiment of the present invention has been completed, the present invention will not be limited to those embodiments, and various modifications can be made within a range not departing from the spirit of the present invention.

[0059] For example, there may be a case in which, a space in which no contained object such as smoking articles is present, exists in the box 30, 30L, 30S (hereinafter, generally referred to as box 30). There may also be a case in which members such as a spacer for filling up the concerned space, or sectioning the contained object are contained in the box 30.

[0060] In such cases, when the side wall 30e is pressed by the pressing wall surface 28d, a spot on which the pressing force F intensively acts, and a spot in which caving is likely to occur by application of pressing force F are present in various ways, other than in the both end parts of the side wall 30e. Accordingly, in the present invention, the position of the above described each means, which keeps the end parts of the side wall 30e in a non-contact state while the box 30 is conveyed in the conveyance path 26, is not limited to the above described each embodiment. Besides, the present invention allows various means which can decrease the total effective length L of the pressing wall surface 28d for substantially pressing the side wall 30e to be less than the overall length La of the side wall 30e to securely apply an appropriate magnitude of pressing force F to the glue application region 48, 50 of the side wall 30e depending on the shape and type of the box 30, the shape of the

contained object to be contained in the box, and the like.

[0061] Specifically, in the above described each embodiment, each means, which brings the pressing wall surface 28d into non-contact with the end part of the side wall 30e while the box 30 is conveyed in the conveyance path 26, is provided in both of the pair of the pressing wall surfaces 28d. However, without being limited to these, the aforementioned means may be provided only in one of the pair of pressing wall surfaces 28d.

[0062] Further, in the above described each embodiment, the above described means are formed in both end parts of the pressing wall surface 28d facing the both end parts of the side wall 30e. However, the above described means may be provided spot by spot in an area other than the both end parts of the pressing wall surface 28d.

[0063] Moreover, the above described means may be provided not only in both end parts of the pressing wall surface 28d, but also in only one end part of the pressing wall surface 28d.

[0064] Furthermore, a convex part not shown which increases pressing force F against the side wall 30e while the box 30 is conveyed in the conveyance path 26 may be formed in at least one of the pair of pressing wall surfaces 28d. By forming the convex part of the pressing wall surface 28d at a position corresponding to a spot where peeling of the side wall 30e is likely to occur depending on the arrangement of the above described space and spacer, it is possible to suppress bonding defects and, by extension, defective shaping of boxes of various shapes and types.

[0065] Further, although the fifth embodiment has been described assuming the case of the first embodiment, it can be applied to the cases of the second to fourth embodiments.

[0066] Further, each embodiment has been described on the assumption that the box 30 is a cigarette package SP which provides a hinge-lid round corner box. However, without being limited thereto, the present invention can be applied to shaping of a square box having no round corner 36, cigarette packages SP other than the form of hinge-lid, and boxes 30 for uses other than cigarette package SP.

[0067] Here, when the box 30 is a round corner box, since it has folding lines 46 for forming the round corner 36, pre-folding of the inner and outer side flaps 40e, 40f is performed with less intensity compared with a case of a square box. For this reason, the restoring force against pre-folding of the inner and outer side flaps 40e, 40f tends to increase in the case of a round corner box compared with a square box. Therefore, when the box 30 is a round corner box, due to the concerned restoring force, bonding defects and, by extension, defective shaping of the box 30 is more likely to occur than in the case of a square box.

[0068] On the other hand, when the box 30 is a square box, since shortening of the folding line 44 associated with forming of round part 42 will not occur, the rigidity of at least both end parts of the side wall 30e will not decrease, and thus there is no area, in which caving is

likely to be caused by application of pressing force F, in the box 30. This point is also one of factors to make bonding defects and, by extension, defective shaping of the box 30 more likely to occur when the box 30 is a round corner box than in the case of a square box.

[0069] Thus, due to the above described structural difference between the round corner box and the square box, when the present invention is applied to the round corner box, it is possible to further effectively suppress bonding defects and, by extension, defective shaping of the box 30.

[0070] Moreover, the packaging machine 1 can assume various forms without being limited to the above described configurations, provided that it includes a conveyor 28 having the above described means. For example, a heater not shown may be provided in the conveyance path 26 to promote bonding of the box 30 through drying.

Explanation of Reference Signs

[0071]

1	Packaging machine
26	Conveyance path
38	Conveyor
28a	Belt (Conveyance wall)
28d	Pressing wall surface
30	Box (Cigarette pack)
30a	Front wall
30b	Rear wall
30c	Top wall
30d	Bottom wall
30e	Side wall
30A	Outer body
30B	Hinge
30C	Lid
30L	Box (Cigarette pack, long box)
30S	Box (Cigarette pack, short box)
32	Longitudinal axis
34a	Inner side wall part
34b	Outer side wall part
36	Round corner
56	Notched part (Means)
58	Concave part (Means)
60	Curved part (Means)
62	Crown roller
MB	Main blank (Blank)
SB	Sub blank (Blank)
F	Pressing force
W	Width

Claims

1. A packaging machine for forming a box by folding a blank around a periphery of a plurality of smoking articles, comprising a conveyance path for thereafter

conveying the box to a subsequent processing stage, wherein

the box includes a longitudinal axis and a pair of side walls having inner and outer side wall parts which extend along the longitudinal axis and are bonded to each other, and assumes a posture in which the pair of the side walls extend in a direction traversing the conveyance path in the conveyance path;

the conveyance path has a pair of conveyance walls for holding therebetween the box by the pair of side walls, and includes a conveyor for conveying the box while holding the same between the conveyance walls;

the pair of conveyance walls respectively include pressing wall surfaces for substantially pressing the side walls; and

at least one of the pressing wall surfaces includes means for reducing a total effective length of the pressing wall surface along the longitudinal axis to be less than an overall length of the side wall.

2. The packaging machine according to claim 1, wherein

the box assumes a cuboid shape, and further includes a front wall, a rear wall, a top wall, and a bottom wall, and

the means is formed in a portion of the pressing wall surface facing at least one end part of the side wall.

3. The packaging machine according to claim 2, wherein

the pressing wall surface has a notched part which is in non-contact with the end part of the side wall while the box is conveyed in the conveyance path, and

the notched part constitutes the means.

4. The packaging machine according to claim 2, wherein

the pressing wall surface has a width extending in a direction traversing the conveyance path, and the width is shorter than an overall length of the side wall to realize the means.

5. The packaging machine according to claim 1 or 2, wherein

the pressing wall surface has a concave part which is in non-contact with the side wall while the box is conveyed in the conveyance path, and the concave part constitutes the means.

6. The packaging machine according to claim 2, wherein

the means is formed as a curved part in the portion of the pressing wall surface, and

the curved part assumes an arcuate shape separated from the side wall while the box is conveyed in the conveyance path.

7. The packaging machine according to any one of claims 1 to 6, wherein the conveyor comprises:
- a pair of belts which form the pair of conveyance walls; and
 - a plurality of crown rollers which guide the belts along the conveyance path.
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8. The packaging machine according to any one of claims 1 to 7, wherein at least one of the pressing wall surfaces includes a convex part which increases pressing force against the side wall while the box is conveyed in the conveyance path.
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9. The packaging machine according to any one of claims 1 to 8, wherein the box has four round corners which connect the front wall with the side wall, and the rear wall with the side wall.
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10. The packaging machine according to any one of claims 1 to 9, wherein the box includes an outer body, and a lid which is connected to the outer body via a hinge.
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FIG. 1

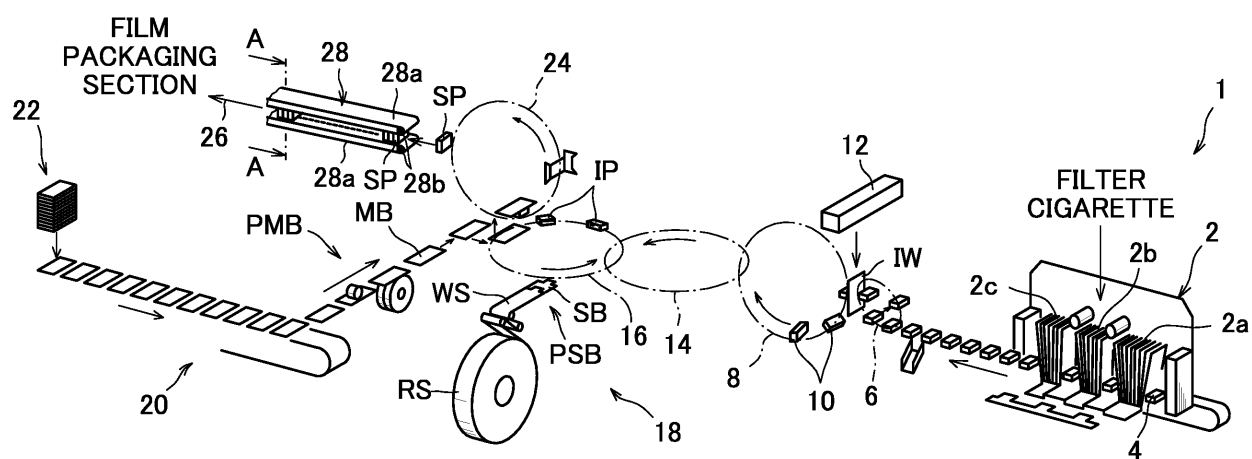


FIG. 2

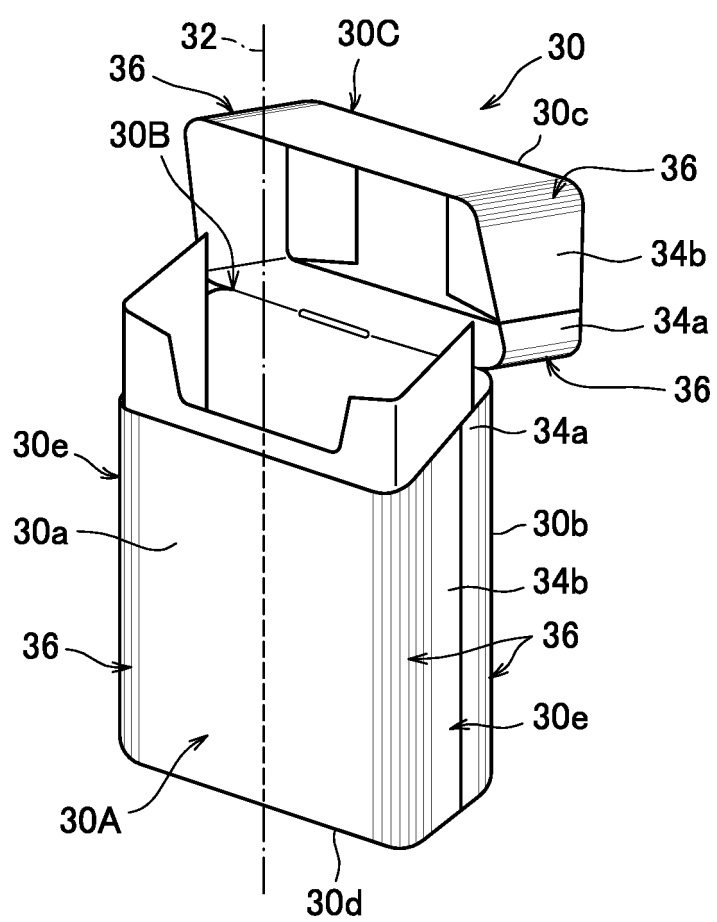


FIG. 3

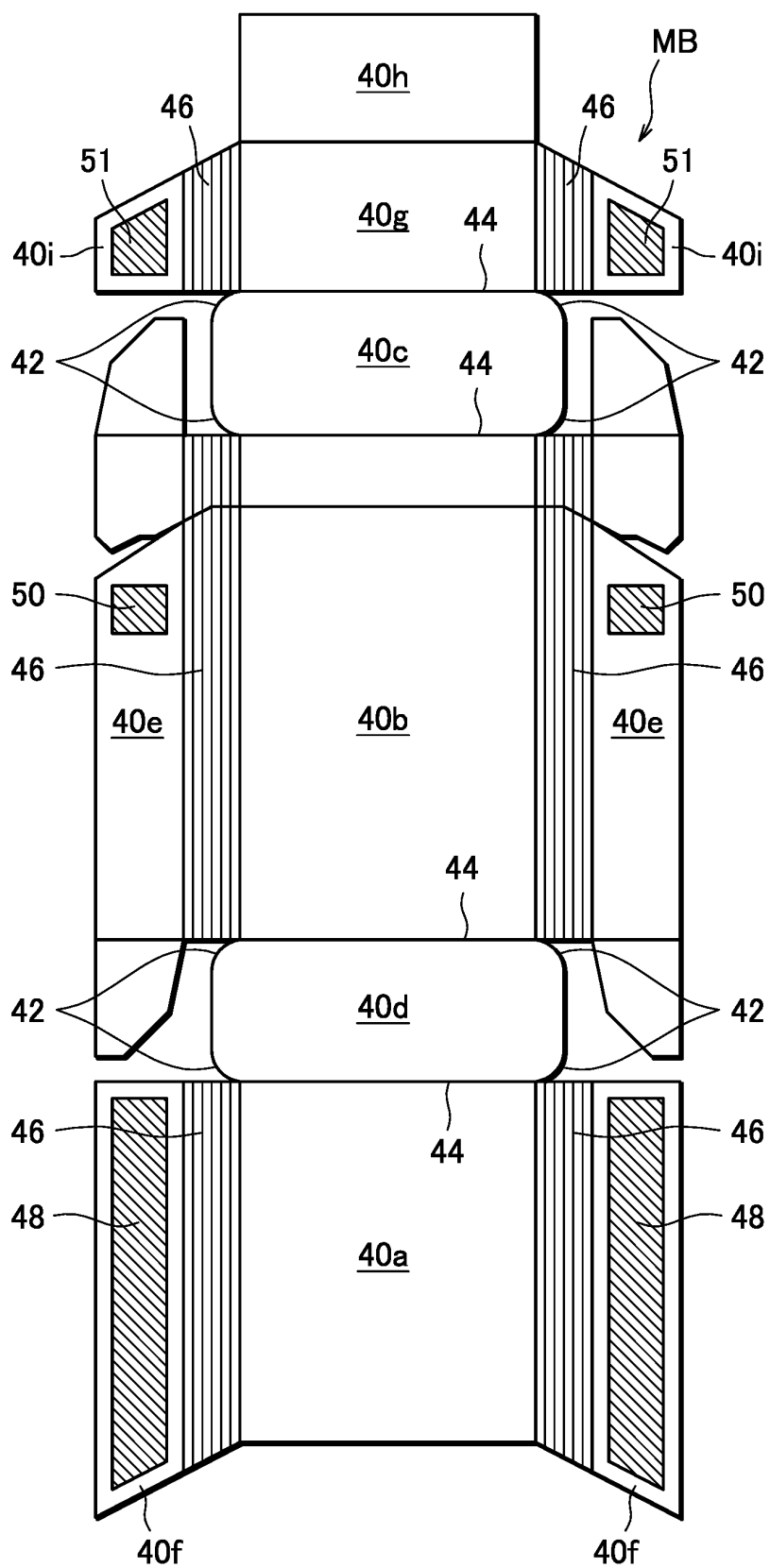


FIG. 4

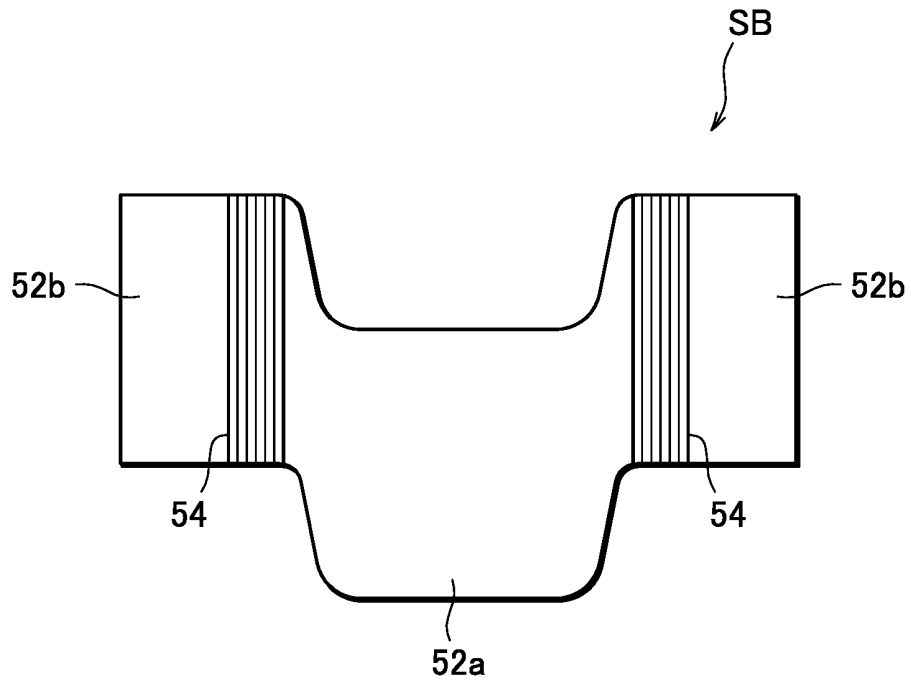


FIG. 5

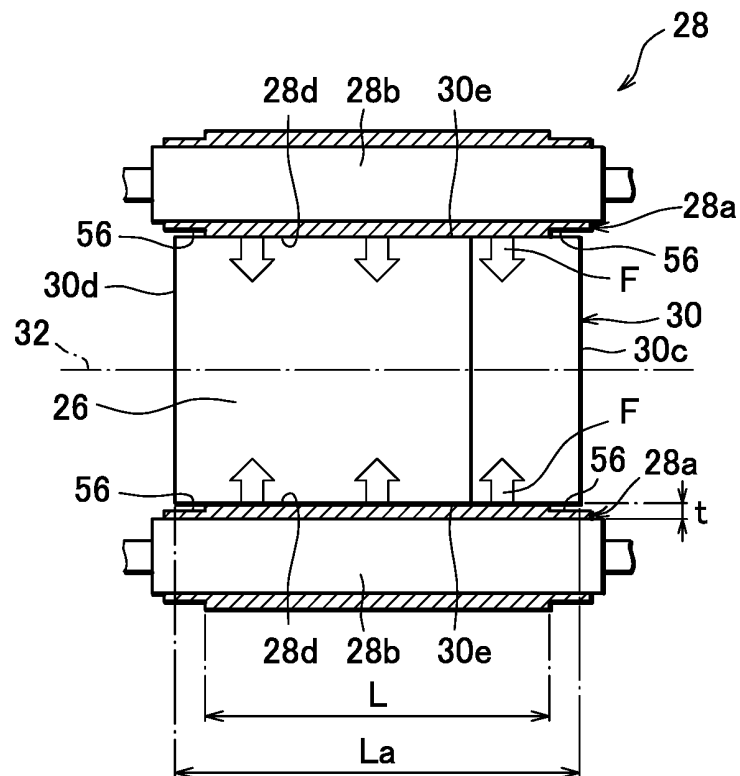


FIG. 6

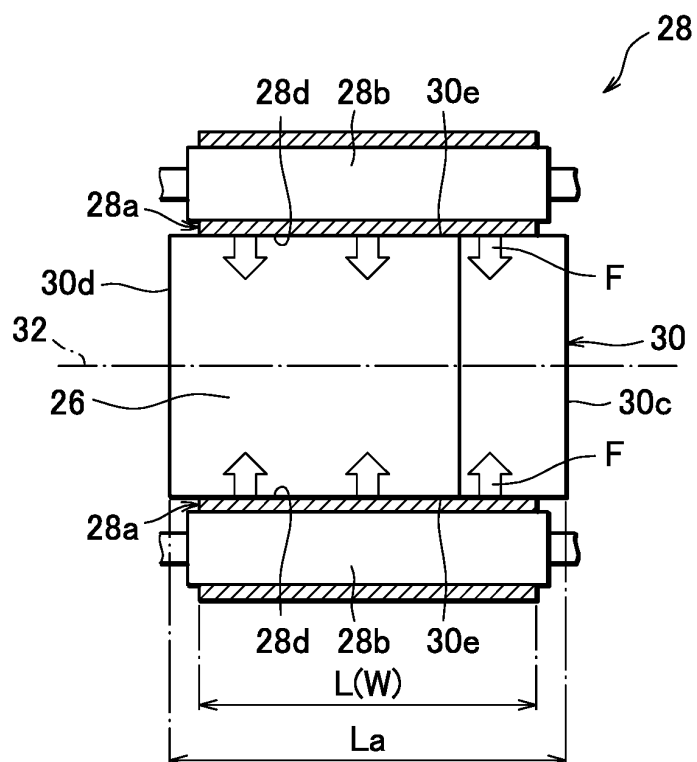


FIG. 7

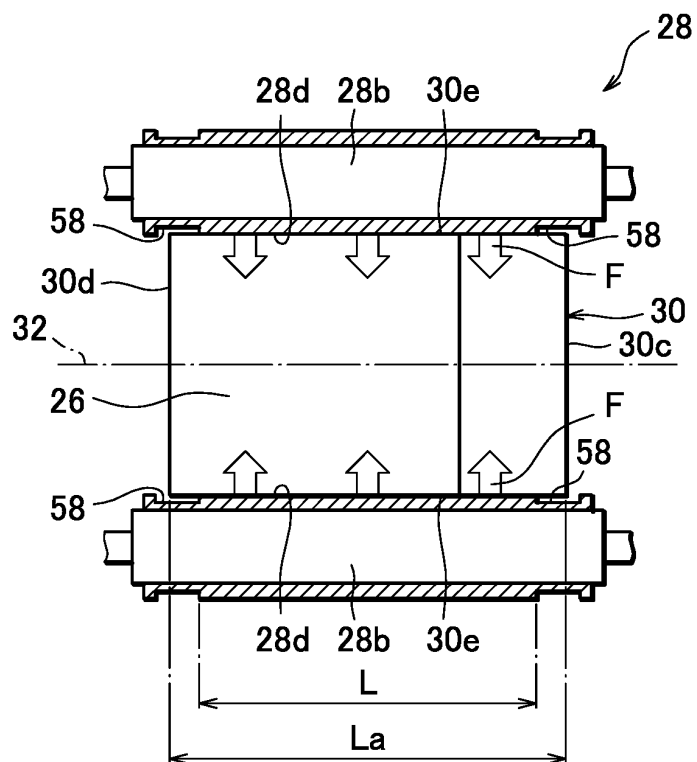


FIG. 8

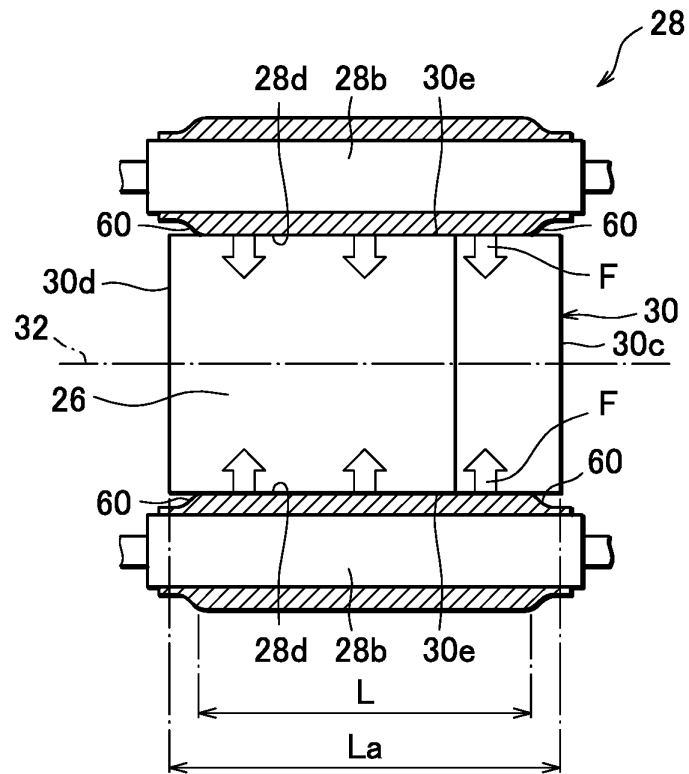


FIG. 9

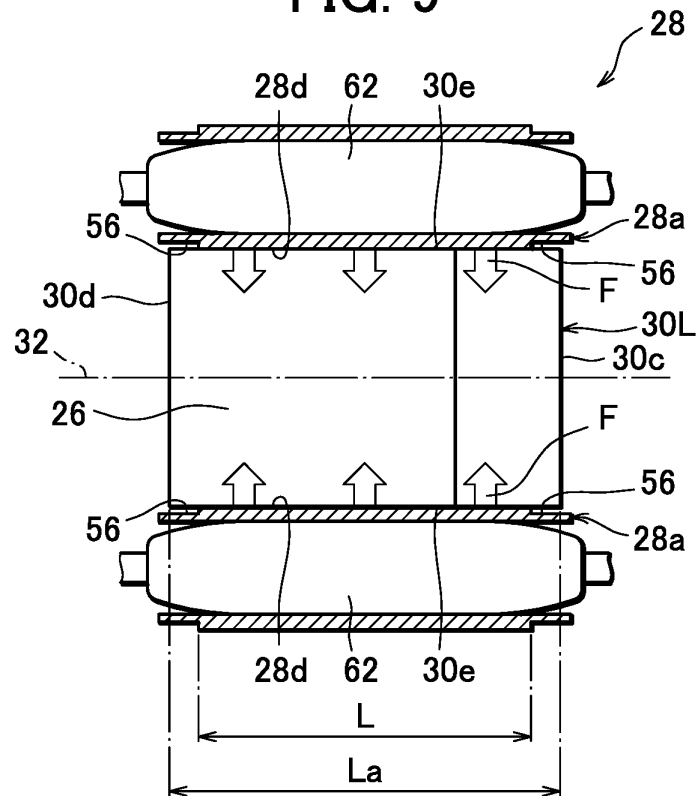
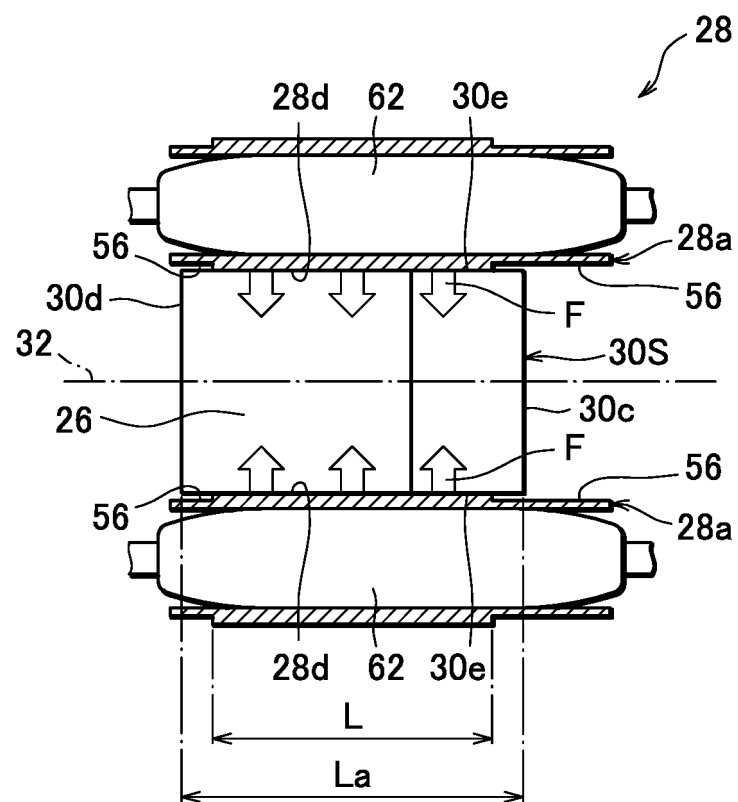


FIG. 10



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2016/076028

A. CLASSIFICATION OF SUBJECT MATTER

B31B1/62(2006.01)i, B65B19/02(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B31B1/62, B65B19/02

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

Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2016

Kokai Jitsuyo Shinan Koho 1971-2016 Toroku Jitsuyo Shinan Koho 1994-2016

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 50-140700 A (G.D S.p.A.), 11 November 1975 (11.11.1975), entire text; all drawings & US 4086744 A & GB 1489943 A & DE 2510094 A1 & FR 2267936 A1 & CH 590755 A5	1-10
A	JP 4-279440 A (G.D S.p.A.), 05 October 1992 (05.10.1992), entire text; all drawings & GB 2250730 A & DE 4139406 A1	1-10
A	US 2012/0031051 A1 (GIMA S.P.A.), 09 February 2012 (09.02.2012), entire text; all drawings & WO 2010/119472 A2 & CN 102448828 A	1-10

☒ Further documents are listed in the continuation of Box C.
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Date of the actual completion of the international search
13 October 2016 (13.10.16)Date of mailing of the international search report
01 November 2016 (01.11.16)Name and mailing address of the ISA/
Japan Patent Office
3-4-3, Kasumigaseki, Chiyoda-ku,
Tokyo 100-8915, Japan

Authorized officer

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2016/076028

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6098533 A (G.D S.p.A.), 08 August 2000 (08.08.2000), entire text; all drawings & GB 2337974 A & DE 19924449 A1	1-10

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Patent documents cited in the description

- WO 2004502608 A [0005]