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(54) PACKAGING APPARATUS

(57) Providing a packaging apparatus in which a film for packaging is easily cut even when the blade edge of a cutting blade that cuts the film is dull. A packaging apparatus includes a conveyer (300) that sandwiches between upper and lower belts a film F paid out from a film roll and conveys the film to a packaging position, a cutter (200), and a moving mechanism. The cutter has a cutting blade (210) that cuts the film, and the cutter is disposed upstream of the position where the film is sandwiched between the upper and lower belts in a conveyance direction (D) in which the conveyer conveys the film. The moving mechanism moves the cutting blade between a standby position and a cutting completion position (P2) that is positioned downstream of the standby position in the conveyance direction (D) and is a position at which the cutting blade goes through the film and is closer to the belts than it is in the standby position. The moving mechanism moves the cutting blade so that, in the cutting completion position, an angle A formed by the cutting blade and the film that is downstream of the cutting blade is smaller than an angle B formed by the cutting blade and the film that is upstream of the cutting blade.

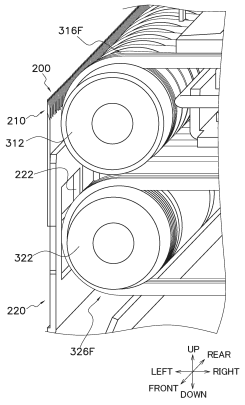

FIG. 9

EP 4 566 777 A1

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Description

BACKGROUND

Technical Field

[0001] The present invention relates to a packaging apparatus.

Related Art

[0002] Conventionally, packaging apparatus have been known which, as disclosed in Patent Document 1 (JP-A No. 2011-20700), cut in a predetermined length a film for packaging paid out from a film roll and package articles in the film that has been cut out.

SUMMARY

Technical Problem

[0003] In such packaging apparatus, if the blade edge of the cutting blade that cuts the film becomes dull, it may become difficult for the film to be cut. A packaging apparatus that can reduce the occurrence of such a problem is required.

Solution to Problem

[0004] A packaging apparatus pertaining to a first aspect of the present invention includes a conveyer, a cutter, and a moving mechanism for the cutter. The conveyer is configured to sandwich between upper and lower belts a film paid out from a film roll and drive at least one of the upper and lower belts to convey the film to a packaging position. The cutter has a cutting blade configured to cut the film and a support unit supporting the cutting blade. The cutter is disposed upstream of a position where the film is sandwiched between the upper and lower belts in a conveyance direction in which the conveyer conveys the film. The moving mechanism moves the cutting blade between a standby position and a cutting completion position. The standby position is a position away from the upper and lower belts. The cutting completion position is positioned downstream of the standby position in the conveyance direction and is a position at which the cutting blade goes through the film and is closer to the belts than it is in the standby position. The moving mechanism is configured to move the cutting blade so that, in the cutting completion position, an angle A formed by the cutting blade and the film that is downstream of the cutting blade is smaller than an angle B formed by the cutting blade and the film that is upstream of the cutting blade.

[0005] In the packaging apparatus of the first aspect, the moving mechanism moves the cutting blade so that, in the cutting completion position, the angle A is smaller than the angle B. Thus, as the cutting blade moves to the cutting completion position, the cutting blade does not pull the upstream film downstream but pulls the downstream film held by the upper and lower belts of the conveyer, and thus the cutting blade deeply sticks into the film. For that reason, even when the blade edge of the cutting blade is dull, it is relatively easy for the cutting blade to cleanly cut the tensely held film.

[0006] A packaging apparatus pertaining to a second aspect of the present invention is the packaging apparatus of the first aspect, wherein in the support unit is formed an opening that a part of the upper belt or the lower belt goes into when the cutting blade is disposed in the cutting completion position.

[0007] In the packaging apparatus of the second aspect, since the belt goes into the opening in the support unit, the cutting blade can be bitten into the film in a state in which the cutting blade has been brought close to the belts in the conveyance direction of the film. As a result, in the packaging apparatus of the second aspect, the angle A formed with the film during cutting can be made particularly small, and it is easy for the film to be relatively cleanly cut even when the cutting blade is dull.

[0008] A packaging apparatus pertaining to a third aspect of the present invention is the packaging apparatus of the first aspect or the second aspect, wherein the moving mechanism for the cutter is configured to stick the cutting blade into the film and further causes the cutting blade to bite into and cut the film.

[0009] In the packaging apparatus of the third aspect, it is easy for the film to be cleanly cut by the cutting blade.

[0010] A packaging apparatus pertaining to a fourth aspect of the present invention is the packaging apparatus of any of the first aspect to the third aspect, wherein the moving mechanism is configured to move the cutting blade between the standby position and the cutting completion position while maintaining, in an erect attitude in the vertical direction, the support unit which is plate-like and has the cutting blade attached to an end portion thereof.

[0011] If the cutting blade is brought close to the belts while the support unit is circularly moved, as described further below, depending on the attitude of the support unit the angle formed by the cutting blade and the film that is downstream of the cutting blade may become a relatively large value and the film may not be able to be cleanly cut, even if the degree to which the cutting blade bites into the film is large.

[0012] In contrast to this, in the packaging apparatus of the fourth aspect, the cutting blade is brought into contact with the film in a state in which the support unit to which the cutting blade is attached is in an erect attitude in the vertical direction, and while that attitude is maintained the cutting blade is brought close to the belts and is caused to bite into the film. Thus, as the cutting blade moves to the cutting completion position, the angle formed by the cutting blade and the film that is downstream of the cutting blade is gradually reduced and the cutting blade can cleanly cut the film.

[0013] A packaging apparatus pertaining to a fifth aspect of the present invention is the packaging apparatus of any of the first aspect to the fourth aspect, wherein the film roll is supported such that the film roll is freely rotatable.

[0014] The packaging apparatus of the fifth aspect has a configuration that supports the film roll such that it is freely rotatable, so the support structure for the film roll can be simplified, and it is also easy for the work of attaching the film roll to be simplified. However, when the film roll freely rotates, depending on the film cutting conditions, the film that is upstream of the cutting blade may just be pulled out from the film roll by the motion of the cutting blade without the film being cut by the cutting blade.

[0015] In contrast to this, since this packaging apparatus has a configuration where the cutting blade moves so that the angle A is smaller than the angle B in the cutting completion position and pulls the downstream film that is restrained, such a situation is unlikely to occur.

[0016] A packaging apparatus pertaining to a sixth aspect of the present invention is the packaging apparatus of any of the first aspect to the fifth aspect, further comprising a control unit configured to control operations of the conveyer and the moving mechanism. The control unit is configured to cause the moving mechanism to move the cutting blade from the standby position to the cutting completion position after or while the control unit controlling the conveyer to convey the film in the conveyance direction to reduce slack in the film between the film roll and the conveyer.

[0017] If the cutting blade of the cutter contacts the film in a state in which there is slack in the film between the film roll and the conveyer, the film may just be pushed by the cutter so as to eliminate the slack in the film but without the film being cut by the cutter. In contrast to this, in the packaging apparatus of the sixth aspect, the occurrence of such a situation can be reduced by the process to reduce slack in the film.

Advantageous Effects of Invention

[0018] In the packaging apparatus of the present invention, even when the blade edge of the cutting blade is dull, it is relatively easy to cleanly cut the film.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019]

FIG. 1 is a schematic front elevation view of a packaging apparatus pertaining to an embodiment of the present invention;
FIG. 2 is a right side view depicting schematic configurations inside the packaging apparatus of FIG. 1;
FIG. 3 is a schematic front elevation view depicting configurations in the area of a front conveyer of the packaging apparatus of FIG. 1;
FIG. 4 is a schematic rear elevation view depicting configurations in the area of a rear conveyer of the packaging apparatus of FIG. 1;
FIG. 5 is a block configuration diagram of the packaging apparatus of FIG. 1;
FIG. 6 is a left side view of an upper belt and a lower belt of the front conveyer of the packaging apparatus of FIG. 1 as viewed from the left side;
FIG. 7 is an enlarged schematic front elevation view of the area around a supply unit and a cutter of FIG. 3;
FIG. 8 is a schematic top view depicting a state in which a clamp unit is holding a film;
FIG. 9 is a schematic perspective view of the area around the cutter of the packaging apparatus of FIG. 1;
FIG. 10 is a front elevation view of the area around the cutter of the packaging apparatus of FIG. 1, for mainly describing the motion of the cutter in the packaging apparatus, with (a) depicting a state in which a cutting blade is disposed in a standby position and (b) depicting a state in which the cutting blade is disposed in a cutting completion position;
FIG. 11 is a drawing schematically depicting the way in which the film is cut in the packaging apparatus of FIG. 1, and depicts the cutter in a cross-sectional view;
FIG. 12 is an example of a flowchart of a film cutting process in the packaging apparatus of FIG. 1; and
FIG. 13 is a drawing schematically depicting the way in which the film is cut in a conventional packaging apparatus.

DETAILED DESCRIPTION

[0020] A pasckaging apparatus pertaining to an embodiment of the present invention will be described below with reference to the drawings. It will be noted that the embodiment described below is merely illustrative and that the present invention is not intended to be limited to the following embodiment. Many changes may be made without departing from the spirit of the present invention.

[0021] In the following description and in the drawings, for convenience of description, expressions such as "front (front elevation)," "rear (rear elevation)," "left," "right," "upper," and "lower" may be used to describe directions and dispositions utilizing the directions of the arrows shown in the drawings. Unless otherwise specified, these expressions are not intended to limit the invention.

(1) Overview

[0022] A packaging apparatus 100 pertaining to an embodiment of the present invention is an apparatus that lifts for example trays on which a perishable food or the like has been placed (hereinafter called goods G), though this is not intended to limit the packaging items, and pushes them against a stretch film (hereinafter simply

called a film F) to thereby package the goods G in the film F. The packaging apparatus 100 specifically weighs the goods G that have been input from an input space Si, moves the goods G rearward after the weighing, thereafter lifts the goods G toward the film F which is disposed in an upper packaging position PP, folds under the bottoms of the goods G the peripheral edge portions of the film F against which the goods G are pushed to thereby package the goods G in the film F, and discharges the goods G to a discharge space Sd. It will be noted that in the packaging apparatus 100 of the present embodiment, as shown in FIG. 2, the input space Si is disposed in the lower portion of the front surface of the packaging apparatus 100 and the discharge space Sd is disposed in the upper portion of the front surface of the packaging apparatus 100.

[0023] The packaging apparatus 100 mainly has a weighing/infeed device 10, a lifter 20, a supply unit 30, a cutter 200, a moving mechanism 250, a conveyer 300, a clamp unit 400, a folding mechanism 40, a discharge pusher 50, a removal table 70, and a control unit 80 (see FIG. 1 to FIG. 5).

[0024] The weighing/infeed device 10 is provided in the lower portion of the center of the front surface of the packaging apparatus 100. The weighing/infeed device 10 includes a weigh scale 12 (see FIG. 2). The weigh scale 12 measures the weights of the perishable food or the like put in the trays of the goods G input to the input space Si. After measuring the weights, the weighing/infeed device 10 pushes the goods G rearward with an infeed member (not shown in the drawings) driven by a drive unit such as a motor (not shown in the drawings) to thereby move the goods G onto a movable placement table 22 of the lifter 20.

[0025] The lifter 20 is disposed in back of the weighing/infeed device 10. The lifter 20 includes the movable placement table 22 (see FIG. 2). When receiving the goods G from the weighing/infeed device 10, the upper surface of the movable placement table 22 is disposed in the same position as, or a slightly lower position than, a conveyance surface on which the weighing/infeed device 10 conveys the goods G. The lifter 20 uses a drive unit such as a motor (not shown in the drawings) to drive the movable placement table 22 on which the goods G have been placed to thereby move the movable placement table 22 to an upper packaging area PA and so move the goods G on the movable placement table 22 upward. Specifically, the lifter 20 moves the goods G to the upper packaging area PA and pushes the goods G against the film F, which is held in a stretched state in the packaging position PP in the central upper portion of the packaging apparatus 100. When the lifter 20 lifts the goods G from the underside of the film F, the upper surfaces of the goods G become covered by the film F. Folding members 46, 48, which are indicated by long dashed double-short dashed lines and had been retracted, move under the bottoms of the goods G from left and right directions and fold under the bottoms of the goods G the peripheral edge portions of the film F sticking out from the peripheries of the goods G. Next, a rear folding member 44 and the discharge pusher 50, which are standing by in back, move forward and discharge forward the goods G covered by the film F. The lifter 20 returns the movable placement table 22 to its lower position, where it receives the goods G from the weighing/infeed device 10.

[0026] The supply unit 30 of the film F is disposed in the upper left portion of the packaging apparatus 100 (see FIG. 1). As shown in FIG. 3 and FIG. 4, the supply unit 30 includes a pair of support rollers 32, which hold a film roll R in which the film F is wound, and a guide mechanism 34, which is disposed under the position in which the film roll F is held.

[0027] The pair of support rollers 32 both extend in the front and rear direction and are disposed next to each other in the left and right direction. The film roll R is placed on the pair of support rollers 32. The support rollers 32 are free rollers (rollers that do not require a drive source) that are rotatable in one direction. The pair of support rollers 32 support the film roll R such that it freely rotates in the direction in which the film F is paid out.

[0028] The guide mechanism 34 is a mechanism that guides the film F paid out from the film roll R between upper belts and lower belts of the conveyer 300 (between an upper belt 316F and a lower belt 326F of a front conveyer 300F and between an upper belt 316R and a lower belt 326R of a rear conveyer 300R described further below).

[0029] The cutter 200 cuts the film F after the film F paid out from the film roll R has been conveyed by the conveyer 300 to the packaging position PP. The cutter 200 (a cutting blade 210 of the cutter 200) is moved by the moving mechanism 250. Details about the cutter 200 and how the moving mechanism 250 moves the cutter 200 will be described further below.

[0030] The conveyer 300 conveys the film F rightward so that the film F paid out from the film roll R is disposed in the packaging position PP (above the movable placement table 22 of the lifter 20). Specifically, the conveyer 300 sandwiches between the upper and lower belts the film F paid out from the film roll R and drives at least one of the upper and lower belts to convey the film F to the packaging position PP. It will be noted that the conveyance direction of the film F conveyed by the conveyer 300 will hereinafter be called a conveyance direction D (see FIG. 3 and FIG. 4). Details about the conveyer 300 will be described further below.

[0031] The clamp unit 400 holds in a stretched state the film F that has been conveyed by the conveyer 300 to the packaging position PP and has been cut away by the cutter 200 from the film extending from the film roll R. Details about the clamp unit 400 will be described further below.

[0032] The folding mechanism 40 folds under the bottoms of the goods G (the bottoms of the trays of the goods G) the peripheral edge portions of the film F covering the upper sides of the goods G that are packaging items in the

packaging area PA.

[0033] The folding mechanism 40 includes a front folding member 42 disposed in front of the packaging area PA where the goods G are packaged by the film F, a rear folding member 44 disposed in back of the packaging area PA, a right folding member 46 disposed to the right of the packaging area PA, and a left folding member 48 disposed to the left of the packaging area PA. The front folding member 42 is an immovable rod-shaped member extending in the left and right direction, and the rear folding member 44, the right folding member 46, and the left folding member 48 are all movable plate-shaped members. After the lifter 20 pushes the goods G against the film F being held in the packaging position PP, drive units such as motors (not shown in the drawings) drive the rear folding member 44 to move forward, the right folding member 46 to move leftward, and the left folding member 48 to move rightward to thereby fold under the bottoms of the goods G the film F disposed on the rear side, the right side, and the left side of the goods G. When the discharge pusher 50 moves forward the goods G whose tops are covered by the film F and have the film F on the rear, right, and left sides thereof folded under the bottoms of the trays, the front folding member 42 contacts from in front, and folds under the bottoms of the goods G, the film disposed on the front sides of the goods G. In this way, the goods G are covered by the film F by the folding mechanism 40.

[0034] The discharge pusher 50 pushes out toward the discharge space Sd the goods G that have been covered by the film F. Specifically, the discharge pusher 50 uses a pusher member 52 driven by a drive unit such as a motor (not shown in the drawings) to push forward the back portions of the goods G and to push out to the discharge space Sd the goods G that have been covered by the film F. When the discharge pusher 50 pushes out the goods G to the discharge space Sd, a restraining member (not shown in the drawings) contacts the goods G (restrains the goods G) from above to inhibit the goods G from turnover. The restraining member moves forward and backward together with the pusher member 52 of the discharge pusher 50 when the pusher member 52 moves forward and backward.

[0035] The removal table 70 is provided in the discharge space Sd and is a table to which the goods G covered by the film F are conveyed by the discharge pusher 50. The removal table 70 mainly has a placement plate 72 and a heater 74. The goods G discharged by the discharge pusher 50 to the discharge space Sd move on the placement plate 72. The heater 74 heat-seals the film F folded under the bottoms of the goods G when the goods G are moved by the discharge pusher 50.

[0036] The control unit 80 is a device that controls the operations of each part of the packaging apparatus 100. The control unit 80 is, as shown in FIG. 5, electrically connected to the weighing/infeed device 10, the lifter 20, the moving mechanism 250, the conveyer 300, the clamp unit 400, the folding mechanism 40, the discharge pusher 50, and the heater 74. The control unit 80 includes an arithmetic processing device such as a CPU and a storage device such as a ROM and a RAM and controls the operations of the various devices 10, 20, 250, 300, 400, 40, 50, 74 by executing programs stored in the storage device.

[0037] The packaging apparatus 100 has a label issuing device 92, a display 94, and an input unit 96 in addition to the above configurations. The label issuing device 92 generates labels for being adhered to the film F and on which are printed the names, weights, and prices of the goods G. The display 94 displays various types of information. The control unit 80 is electrically connected to the label issuing device 92, the display 94, and the input unit 96. The control unit 80 controls the operations of the label issuing device 92 and the display 94 and receives operations and information input by the input unit 96.

(2) Detailed Configurations

[0038] Details about the conveyer 300, the clamp unit 400, the cutter 200, and the moving mechanism 250 among the configurations of the packaging apparatus 100 will now be described.

(2-1) Conveyer

[0039] The conveyer 300 includes a front conveyer 300F, which holds the front end portion of the film F and conveys the film F rightward, and a rear conveyer 300R, which holds the rear end portion of the film F and conveys the film F rightward. The front conveyer 300F includes an upper belt 316F and a lower belt 326F (see FIG. 3). The rear conveyer 300R includes an upper belt 316R and a lower belt 326R (see FIG. 4). Furthermore, as shown in FIG. 3 and FIG. 4, the conveyer 300 includes pulleys 312, 314, 322, 324 that extend in the front and rear direction and are common to the front conveyer 300F and the rear conveyer 300R. As shown in FIG. 3 and FIG. 4, the pulley 312 and the pulley 322 are disposed next to each other in the up and down direction, and the pulley 314 and the pulley 324 are disposed next to each other in the up and down direction. Gears that mesh with each other are attached to rotating shafts of the pulley 312 and the pulley 322 and are configured such that when the one pulley 312 is driven to rotate, the other pulley 322 is also driven to rotate. Furthermore, the upper belt 316F and the upper belt 316R are trained around the pulley 312 and the pulley 314. The lower belt 326F and the lower belt 326R are trained around the pulley 322 and the pulley 324. Of the four pulleys, the pulley 312 is driven to rotate by a conveyance drive unit 350 such as a motor. However, the pulley that is directly driven to rotate by the conveyance drive unit 350 may also be the other pulley 322.

[0040] FIG. 6 is a side view showing the upper belt 316F trained around the pulley 312 and the lower belt 326F trained around the pulley 322 as viewed from the left side. As depicted in FIG. 6, the upper belt 316F

includes a plurality of round belts 317, and the lower belt 326F includes a plurality of round belts 327. The round belts 317, 327 are cord-like belts with round cross-sections. It will be noted that although in FIG. 6 the number of the round belts 317 and the number of the round belts 327 are both three, this number is merely illustrative and is not intended to limit the present disclosure. The plural round belts 317 are spaced apart from each other in the front and rear direction and trained around the pulleys 312, 314, and the plural round belts 327 are spaced apart from each other and trained around the pulleys 322, 324. The round belts 317 and the round belts 327 that are each spaced apart from each other in the front and rear direction are, as shown in FIG. 6, disposed alternately and adjacent to each other.

[0041] Although illustration and detailed description are omitted, the upper belt 316R trained around the pulley 312 includes a plurality of round belts 317, the lower belt 326R trained around the pulley 322 includes a plurality of round belts 327, and the rear conveyer 300R has the same configuration as the front conveyer 300F.

[0042] In the conveyer 300, when the pulley 312 is driven to rotate by the conveyance drive unit 350, the upper belt 316F and the upper belt 316R trained around the pulley 312 travel in the conveyance direction D, and the pulley 314 concomitantly rotates. Furthermore, when the pulley 312 rotates, the pulley 322 rotates via the gears not shown in the drawings, the lower belt 326F and the lower belt 326R concomitantly travel in the conveyance direction D, and the pulley 324 concomitantly rotates.

[0043] As shown in FIG. 7, the supply unit 30 guides with the guide mechanism 34 the film F to the belts of the conveyer 300 and supplies the film F from the left side between the upper belt 316F and the lower belt 326F of the front conveyer 300F and between the upper belt 316R and the lower belt 326R of the rear conveyer 300R. When the pulley 312 is driven to rotate by the conveyance drive unit 350, this causes the upper belts 316F, 316R and the lower belts 326F, 326R to rotate as described above, whereby the conveyer 300 sandwiches the film F paid out from the film roll R of the supply unit 30 between the upper belt 316F and the lower belt 326F, also sandwiches the film F between the upper belt 316R and the lower belt 326R, and conveys the film F in the conveyance direction D to the packaging position PP.

[0044] It will be noted that instead of the pluralities of round belts 317, 327, the conveyer 300 may also have a single flat belt. However, when the plural round belts 317 and the plural round belts 327 are alternately disposed and sandwich the film F as described above, the conveyer 300 can firmly sandwich, hold, and convey the film F because, as in FIG. 6, the film F is held by the round belts 317 and the round belts 327 in a state in which it snakes in an S-like shape as viewed in a side view.

(2-2) Clamp Unit

[0045] The clamp unit 400 includes a front clamp unit 400F, which holds the front end portion of the film F disposed in the packaging position PP, and a rear clamp unit 400R, which holds the rear end portion of the film F disposed in the packaging position PP. The front clamp unit 400F, as shown in FIG. 3 and FIG. 8, includes a fixed member 410F and a plurality of movable members 420F that are disposed next to each other in the left and right direction. The rear clamp unit 400R, as shown in FIG. 4 and FIG. 8, includes a fixed member 410R and a plurality of movable members 420R that are disposed next to each other in the left and right direction. It will be noted that the numbers of the fixed members 410F, 410R and the movable members 420F, 420R shown in FIG. 3, FIG. 4, and FIG. 8 are merely illustrative, are not intended to be limited to the numbers shown in the drawings, and may be appropriately decided.

[0046] As shown in FIG. 3, the fixed member 410F is disposed above the parts of the upper belt 316F and the lower belt 326F that sandwich the film F and adjacent to the upper side of the upper belt 316F. The movable members 420F are disposed below the parts of the upper belt 316F and the lower belt 326F that sandwich the film F and below the lower belt 326F. The movable members 420F are disposed in positions in which they oppose the fixed member 410F so that the parts of the upper belt 316F and the lower belt 326F that sandwich the film F are disposed between the movable members 420F and the fixed member 410F.

[0047] The movable members 420F are driven by a clamp drive unit 450 such as an electromagnetic solenoid and are moveable between a lower position and an upper position. The movable members 420F are disposed in the lower position away from the lower belt 326F when the film F is conveyed by the conveyer 300. When the conveyer 300 conveys the film F to the packaging position PP, the movable members 420F of the clamp unit 400 are moved to the upper position by the clamp drive unit 450 and hold, between themselves and the immovable fixed member 410F, the upper belt 316F and the lower belt 326F and the front end portion of the film F that the upper belt 316F and the lower belt 326F are sandwiching and holding between them.

[0048] The configuration of the rear clamp unit 400R that holds the rear end portion of the film F disposed in the packaging position PP is the same as the configuration of the front clamp unit 400F that holds the front end portion of the film F disposed in the packaging position PP, so description thereof will be omitted here.

(2-3) Cutter and Moving Mechanism

[0049] The cutter 200 is disposed upstream of a position Pc where the film F is sandwiched between the upper and lower belts of the conveyer 300 in the conveyance direction D in which the conveyer 300 conveys the film F (see FIG. 7). Using FIG. 7 to describe this, the cutter 200 is disposed on the left side of the position Pc.

[0050] The moving mechanism 250 includes a rotating

arm 270, which is moved up and down by an electromagnetic solenoid or the like, and a parallel link mechanism 260. The rotating arm 270 and the parallel link mechanism 260 are coupled to each other, and when the rotating arm 270 moves up and down, the parallel link mechanism 260 is flipped up about a rotating shaft RS 1. This causes the cutter 200 (particularly a cutting blade 210 described below) to translationally move in the up and down direction.

[0051] The cutter 200 has a cutting blade 210 that cuts the film F and a support unit 220 that supports the cutting blade 210. The support unit 220 is a plate-like member extending such that its lengthwise direction coincides with the front and rear direction. The cutting blade 210 is attached to the end portion (in the present embodiment, the upper end portion) of the upper and lower end portions of the support unit 220 that opposes the film F. The cutting blade 210 preferably is a serrated blade (a saw-blade-like blade) such as shown in FIG. 9. The support unit 220 and the cutting blade 210 may be separate members or integrally formed. Preferably, the support unit 220 is attached to the parallel link mechanism 260 such that the blade edge of the cutting blade 210 faces vertically upward. The cutting blade 210 of the cutter 200 translationally moves between a standby position P1 and a cutting completion position P2. The standby position P1 is (compared with the cutting completion position P2) a position away from the upper belts 316F, 316R and the lower belts 326F, 326R of the conveyer 300 ((a) in FIG. 10). The cutting completion position P2 is positioned downstream of the standby position P1 in the conveyance direction D of the conveyer 300 and is a position at which the cutting blade 210 (eventually) goes through the film F and is closer to the belts 316F, 316R, 326F, 326R than it is in the standby position P1 ((b) in FIG. 10). In the present embodiment, the cutting completion position P2 is higher than the standby position P1.

[0052] The moving mechanism 250 of the present disclosure moves the cutting blade so that, when the film F is viewed along the lengthwise direction of the cutting blade 210 in which the serrations of the cutting blade 210 form a line, in the cutting completion position P2, an angle A formed by the cutting blade 210 and the film F that is downstream of the cutting blade 210 is smaller than an angle B formed by the cutting blade 210 and the film F that is upstream of the cutting blade 210 assuming a state where the film F is not cut(see FIG. 11).

[0053] Advantageous effects obtained by configuring the packaging apparatus 100 to satisfy the relationship of angle A < angle B will now be described.

[0054] First, a cutter in a conventional packaging apparatus is, for example, attached so as to circularly move about the rotating shaft RS1 of FIG. 10. For that reason, the cutter moves in such a way as to satisfy the relationship of angle A ≥ angle B in the position corresponding to the cutting completion position of the present disclosure (see the moving trajectory of the cutting blade depicted by the long dashed double-short dashed lines in FIG. 13). It has been thought that giving the cutter such a configuration would allow the cutter to easily cut the film F because the belts of the conveyer 300 restrain the film F. Additionally, even with such a configuration, it is possible for the cutting blade to cut the film F if the cutting blade is a serrated blade.

[0055] However, when the angle A and the angle B have the relationship of angle A ≥ angle B, the component of the force with which the cutter pulls the film F that is upstream of the cutting blade tends to increase. Thus, for example, if the blade edge of the cutting blade becomes dull and/or there is slack in the film F that is upstream of the cutting blade, the cutting blade does not sufficiently stick into the film F, so the film F is not cut or is unable to be cleanly cut.

[0056] In contrast to this, in this packaging apparatus 100, the cutting blade 210 approaches the restrained film and moves to push up the film F so as to satisfy the relationship of angle A < angle B in the cutting completion position P2. Therefore, even if the blade edge of the cutting blade 210 becomes dull, as the cutting blade 210 moves to the cutting completion position P2, the cutting blade 210 can deeply stick into the film F sandwiched between the upper and lower belts. Particularly when the cutting blade 210 is a serrated blade, perforated cuts are formed in the places of the film F contacted by the cutting blade 210, and eventually the perforated cuts form a continuous cut surface and the film F is cut.

[0057] Moreover, in order make it easier for the film F to be cut by reducing the angle A, it is preferred that the cutting blade 210 come as close as possible to the belts 316F, 316R, 326F, 326R of the conveyer 300 in the left and right direction. However, when the cutter 200 is moved in this way, the support unit 220 might contact the belts 316F, 316R, 326F, 326R of the conveyer 300. For that reason, it is preferred that, as depicted in the perspective view of FIG. 9 and the cross-sectional view of the cutter 200 in FIG. 11, in the support unit 220 there be formed openings 222 that parts of the belts 316F, 316R, 326F, 326R (in the example of FIG. 9 and FIG. 11, parts of the belts 326F, 326R) go into when the cutting blade 210 is disposed in the cutting completion position P2.

(3) Film Cutting Process

[0058] Operations of the packaging apparatus 100 when cutting the film F used for packaging will now be described.

[0059] When the conveyer 300 completes to convey the film F to the packaging position PP, the control unit 80 controls the operation of the conveyer 300 to stop conveyance of the film F (step S1). The control unit 80 uses a drive unit such as a motor or an electromagnetic solenoid (not shown in the drawings) to cause the guide mechanism 34 of the supply unit 30 that had been near the pulley 312 in order to supply the film F to the conveyer 300 (see FIG. 7) to move to a position away from the pulley 312 (see FIG. 10).

[0060] Next, the conveyer 300 executes a process (called a slack reduction process) to reduce slack in the film F between the film roll R and the conveyer 300 (step S2). The reason the conveyer 300 performs the slack reduction process is that the film F may become slack when the position of the guide mechanism 34 is changed, or even when the conveyer 300 is stopped the film roll F may not soon stop so that the film F becomes slack as a result of the film F being excessively paid out from the film roll F, and slack in the film F may adversely affect the cutting of the film F as described above.

[0061] The control unit 80 reduces slack in the film F between the film roll R and the conveyer 300 by, for example, controlling the conveyer 300 to convey the film F just a small amount in the conveyance direction D. Preferably, the control unit 80 controls the conveyer 300 to convey the film F at a lower speed than normal (compared with what the speed is when conveying the film F to the packaging position PP).

[0062] It will be noted that although in the flowchart of FIG. 12 the moving mechanism 250 moves the cutting blade 210 from the standby position P1 to the cutting completion position P2 after the execution of the slack reduction process, the control unit 80 may control the operation of the moving mechanism 250 to move the cutting blade 210 from the standby position P1 to the cutting completion position P2 during the execution of the slack reduction process.

[0063] In step S3 the control unit 80 activates the rotating arm 270 to move the cutting blade 210 from the standby position P1 to the cutting completion position P2. The cutting blade 210 contacts the film F before reaching the cutting completion position P2, the blade edge (serrations) of the cutting blade 210 sticks into the film F (step S4), and furthermore the cutting blade 210 bites into the film F1, whereby the film F is cut and is cut away from the film F connected to the film roll R.

[0064] After the cutting blade 210 reaches the cutting completion position P2 (step S5), the control unit 80 returns the rotating arm 270 to its initial position, and the cutting blade 210 also concomitantly moves to the standby position P1 (step S6).

(4) Characteristics

[0065] (4-1)

The packaging apparatus 100 includes the conveyer 300, the cutter 200, and the moving mechanism 250 for the cutter 200. The conveyer 300 sandwiches between the upper belts 316F, 316R and the lower belts 326F, 326R the film F paid out from the film roll R and drives at least one of the upper and lower belts (hereinafter, reference signs for the belts are omitted) of the conveyer 300 to convey the film F to the packaging position PP. The cutter 200 has the cutting blade 210 that cuts the film F and the support unit 220 that supports the cutting blade 210. The cutter 200 is disposed upstream of the position Pc where the film F is sandwiched between the upper and lower belts of the conveyer 300 in the conveyance direction D in which the conveyer 300 conveys the film F. The moving mechanism 250 moves the cutting blade 210 between the standby position P1 and the cutting completion position P2. The standby position P1 is a position away from the upper and lower belts of the conveyer 300. The cutting completion position P2 is positioned downstream of the standby position P1 in the conveyance direction D and is a position at which the cutting blade 210 goes through the film F and is closer to the belts of the conveyer 300 than it is in the standby position P1. The moving mechanism 250 moves the cutting blade 210 so that, in the cutting completion position P2, the angle A formed by the cutting blade 210 and the film F that is downstream of the cutting blade 210 is smaller than the angle B formed by the cutting blade 210 and the film F that is upstream of the cutting blade 210.

[0066] In this packaging apparatus 100, as the cutting blade 210 moves to the cutting completion position P2, the cutting blade 210 does not pull the upstream film F downstream but sticks deeply into the film F held by the upper and lower belts of the conveyer 300 and the cutting blade 210. For that reason, even when the blade edge of the cutting blade 210 is dull, it is relatively easy for the cutting blade 210 to cleanly cut the film F.

[0067] (4-2)

In the support unit 220 are preferably formed the openings 222 that parts of the belts of the conveyer 300 go into when the cutting blade 210 is disposed in the cutting completion position P2.

[0068] In this packaging apparatus 100, since the belts go into the openings 222 in the support unit 220, the cutting blade 210 can be bitten into the film F in a state in which the cutter 200 has been brought close to the belts of the conveyer 300 in the conveyance direction D. As a result, in this packaging apparatus 100, the angle A formed with the film F during cutting can be made particularly small, and it is easy for the film F to be relatively cleanly cut even when the cutting blade 210 is dull.

[0069] (4-3)

The moving mechanism 250 moves the cutting blade 210 between the standby position P1 and the cutting completion position P2 while maintaining, in an erect attitude in the vertical direction, the support unit 220 which is plate-like and has the cutting blade 210 attached to an end portion thereof (in the present embodiment, the end portion on the upper side).

[0070] In this packaging apparatus 200, the cutting blade 21 is brought into contact with the film F in a state in which the support unit 220 to which the cutting blade 210 is attached is in an erect attitude in the vertical direction, and while that attitude is maintained the cutting blade 210 is caused to bite into the film. Thus, as the cutting blade 210 moves to the cutting completion position P2, the angle formed by the cutting blade 210 and the film F that is downstream of the cutting blade 210 is gradually reduced and the cutting blade 210 can cleanly

cut the film F.

[0071] (4-4)

The packaging apparatus 100 includes the control unit 80 that controls the operations of the conveyer 300 and the moving mechanism 250. The control unit 80 preferably causes the moving mechanism 250 to move the cutting blade 210 from the standby position P1 to the cutting completion position P2 after or while the control unit 80 executes the process (the slack reduction process) in which the control unit 80 controls the conveyer 300 to convey the film F in the conveyance direction D and thereby reduce slack in the film F between the film roll R and the conveyer 300.

[0072] If the cutting blade 210 of the cutter 200 contacts the film F in a state in which there is slack in the film F between the film roll R and the conveyer 300, the film may just be pushed by the cutter 200 so as to eliminate the slack in the film F but without the film F being cut by the cutting blade 210. In contrast to this, in this packaging apparatus 100, the occurrence of such a situation can be reduced by the process to reduce slack in the film F.

(5) Example Modifications

[0073] Example modifications of the above embodiment will be described below. It will be noted that any aspect described in the above embodiment may be combined with the following example modifications to the extent that they are not mutually contradictory. Furthermore, the following example modifications may be combined with each other as appropriate to the extent that they are not mutually contradictory.

(5-1) Example Modification A

[0074] In the above embodiment, the cutting blade 210 is attached to the upper end portion of the support unit 220, the cutting completion position P2 is positioned higher than the standby position P1, and the cutting blade 210 moves from a lower position to a higher position when it cuts the film F.

[0075] However, the structure of the cutter 200 and the operation of the cutting blade 210 are not limited to such a configuration. For example, the cutting blade 210 may be attached to the lower end portion of the support unit 220 such that its blade edge faces downward, and the cutting completion position may be lower than the standby position. Additionally, when cutting the film F, the moving mechanism 250 may move the cutting blade 210 that is disposed in the upper standby position to the lower cutting completion position (bring the cutting blade 210 into contact with the film F from above) to cut the film F.

(5-2) Example Modification B

[0076] In the above embodiment, the moving mechanism 250 moves the cutting blade 210 between the standby position P1 and the cutting completion position P2 while maintaining, in an erect attitude in the vertical direction, the support unit 220 which is plate-like and has the cutting blade 210 attached to an end portion thereof.

[0077] However, the way in which the cutting blade 210 moves is not limited to such a configuration, and if the above relationship of angle A < angle B can be satisfied in the cutting completion position P2, the moving mechanism 250 may also move the cutting blade 210 between the standby position P1 and the cutting completion position P2 while changing the attitude of the support unit 220 or while maintaining the support unit 220 in an attitude other than one in which it is erect in the vertical direction.

Reference Signs List

[0078]

80 Control Unit
200 Cutter
210 Cutting Blade
220 Support Unit
222 Opening
250 Moving Mechanism
300 Conveyer
316F, 316R Upper Belts (Belts)
326F, 326R Lower Belts (Belts)
D Conveyance Direction
F Film
P1 Standby Position
P2 Cutting Completion Position
PP Packaging Position
R Film Roll

Citation List

Patent Literature

[0079] Patent Document 1: JP-ANo. 2011-20700

Claims

1. A packaging apparatus comprising:

a conveyer configured to sandwich between upper and lower belts a film unwound from a film roll and drive at least one of the upper and lower belts to convey the film to a packaging position;
a cutter having a cutting blade configured to cut the film and a support supporting the cutting blade, the cutter being disposed upstream of a position where the film is sandwiched between the upper and lower belts in a conveyance direction in which the conveyer conveys the film; and
a moving mechanism for the cutter configured to move the cutting blade between a standby posi-

tion that is away from the upper and lower belts and a cutting completion position that is positioned downstream of the standby position in the conveyance direction and at which the cutting blade goes through the film and is closer to the belts than it is in the standby position,
wherein the moving mechanism is configured to move the cutting blade so that, in the cutting completion position, an angle A formed by the cutting blade and the film downstream of the cutting blade is smaller than an angle B formed by the cutting blade and the film upstream of the cutting blade.

2. The packaging apparatus according to claim 1, wherein an opening is formed in the support unit such that a part of the upper belt or the lower belt goes into the opening when the cutting blade is disposed in the cutting completion position.

3. The packaging apparatus according to claim 1 or 2, wherein the moving mechanism is configured to stick the cutting blade into the film and further cause the cutting blade to bite into and cut the film.

4. The packaging apparatus according to any one of claims 1 to 3, wherein the moving mechanism is configured to move the cutting blade between the standby position and the cutting completion position while maintaining, in an erect attitude in the vertical direction, the support unit which is plate-like and has the cutting blade attached to an end portion thereof.

5. The packaging apparatus according to any one of claims 1 to 4, wherein the film roll is supported such that the film roll is freely rotatable.

6. The packaging apparatus according to any one of claims 1 to 5, further comprising a control unit configured to control operations of the conveyer and the moving mechanism, wherein the control unit is configured to cause the moving mechanism to move the cutting blade from the standby position to the cutting completion position after or while the control unit controls the conveyer to convey the film in the conveyance direction so as to reduce slack in the film between the film roll and the conveyer.

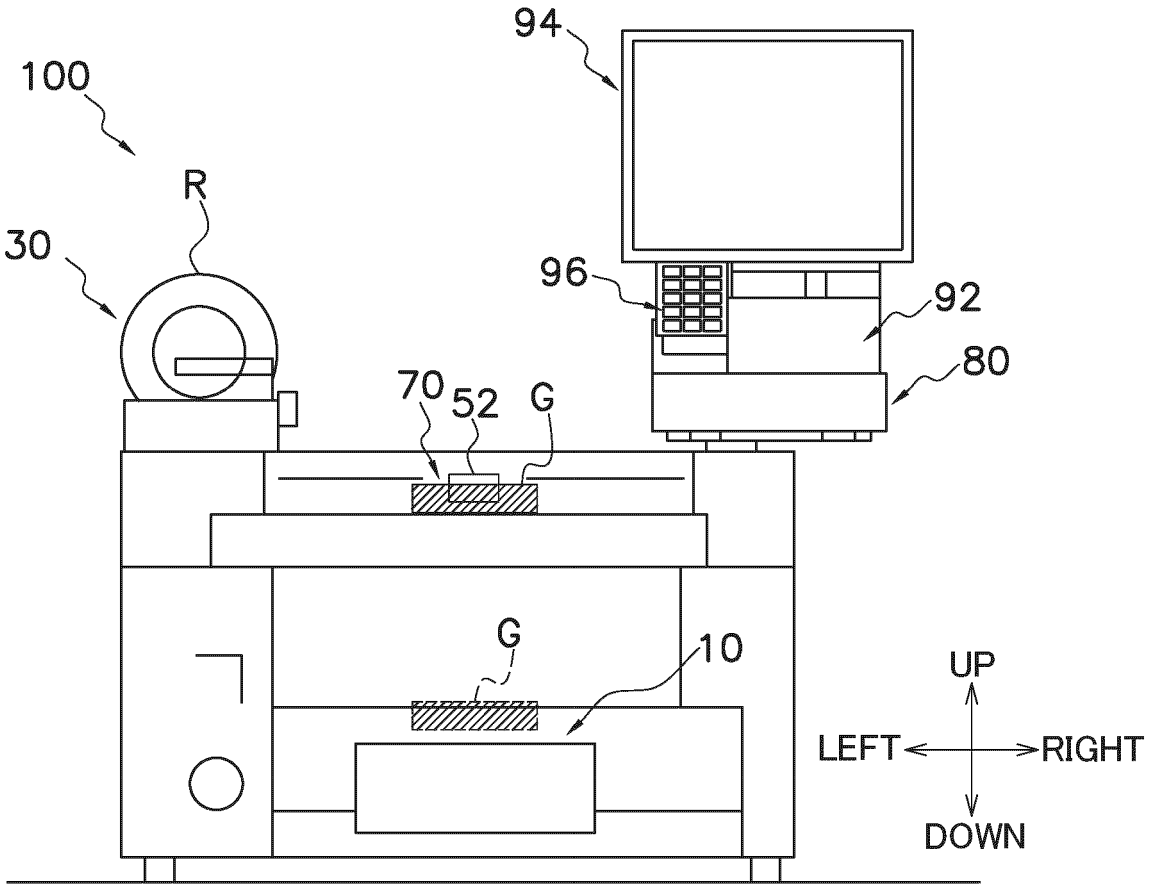

FIG. 1

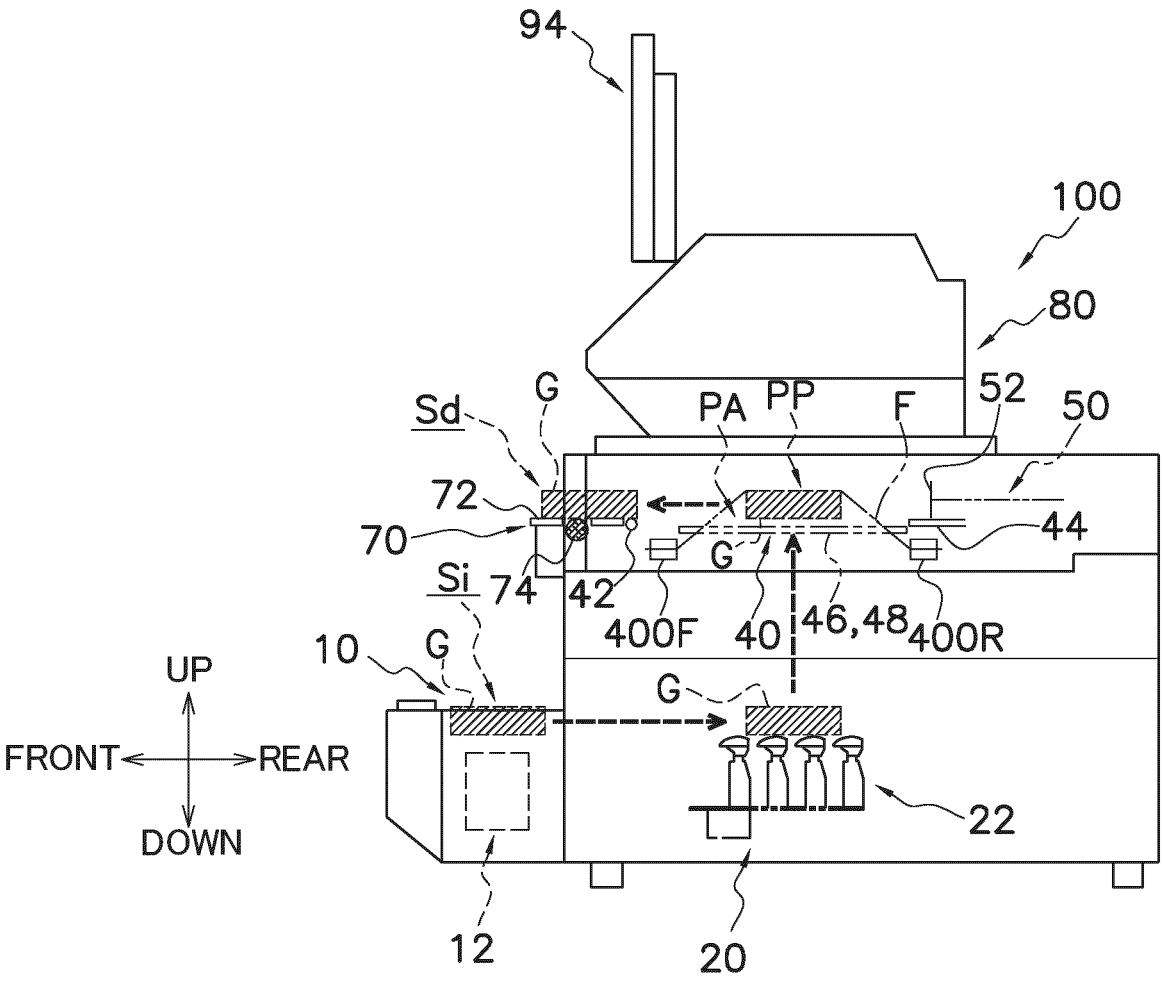
94
100
80
G
Sd
PA
PP
F
52
50
72
70
Si
74
42
G
44
400F
40
46,48
400R
10
G
G
UP
FRONT
REAR
DOWN
22
12
20

FIG. 2

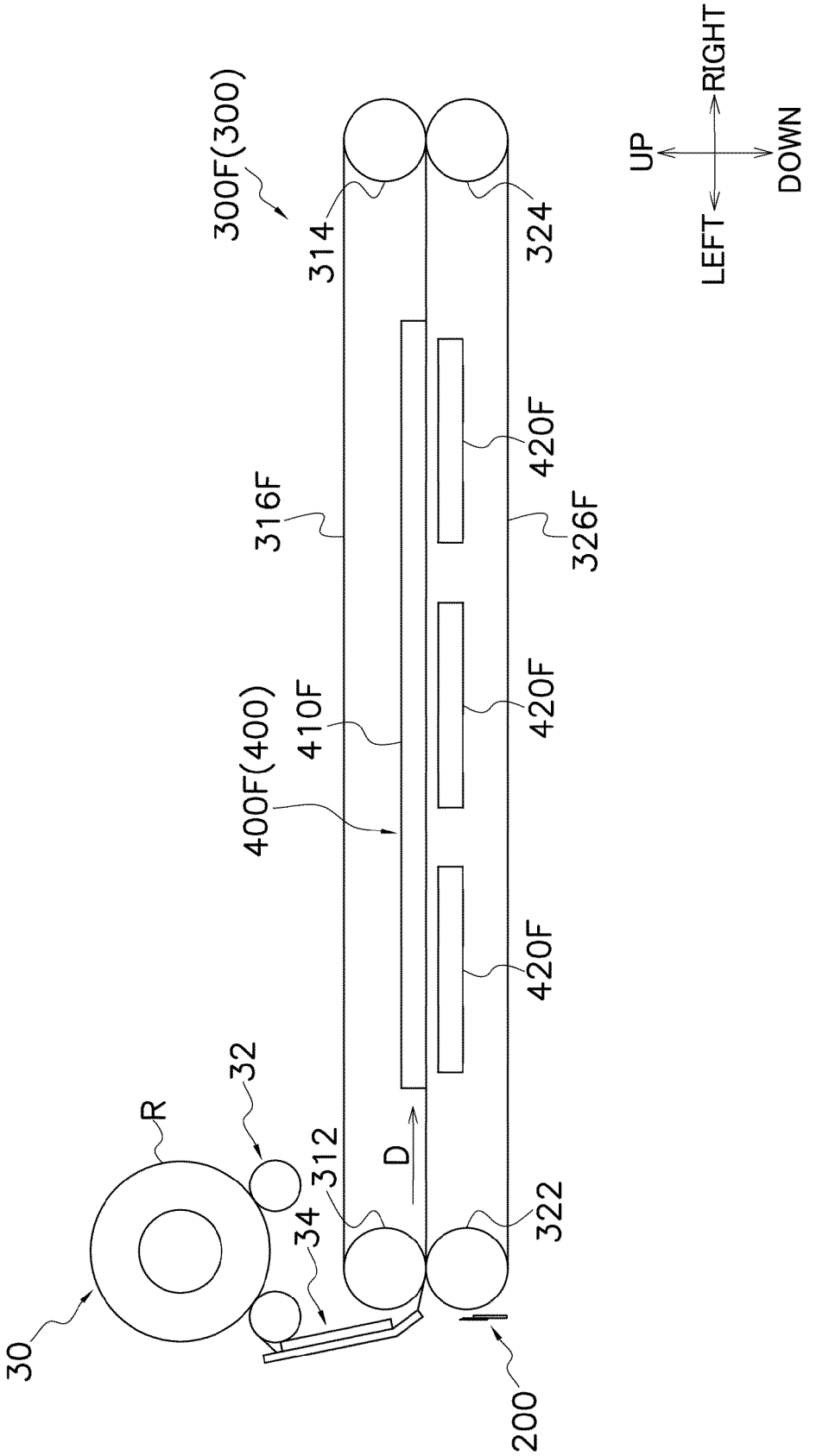
300F(300)
314
324
UP
RIGHT
LEFT
DOWN
316F
420F
326F
400F(400)
410F
420F
420F
R
32
312
D
34
322
30
200

FIG. 3

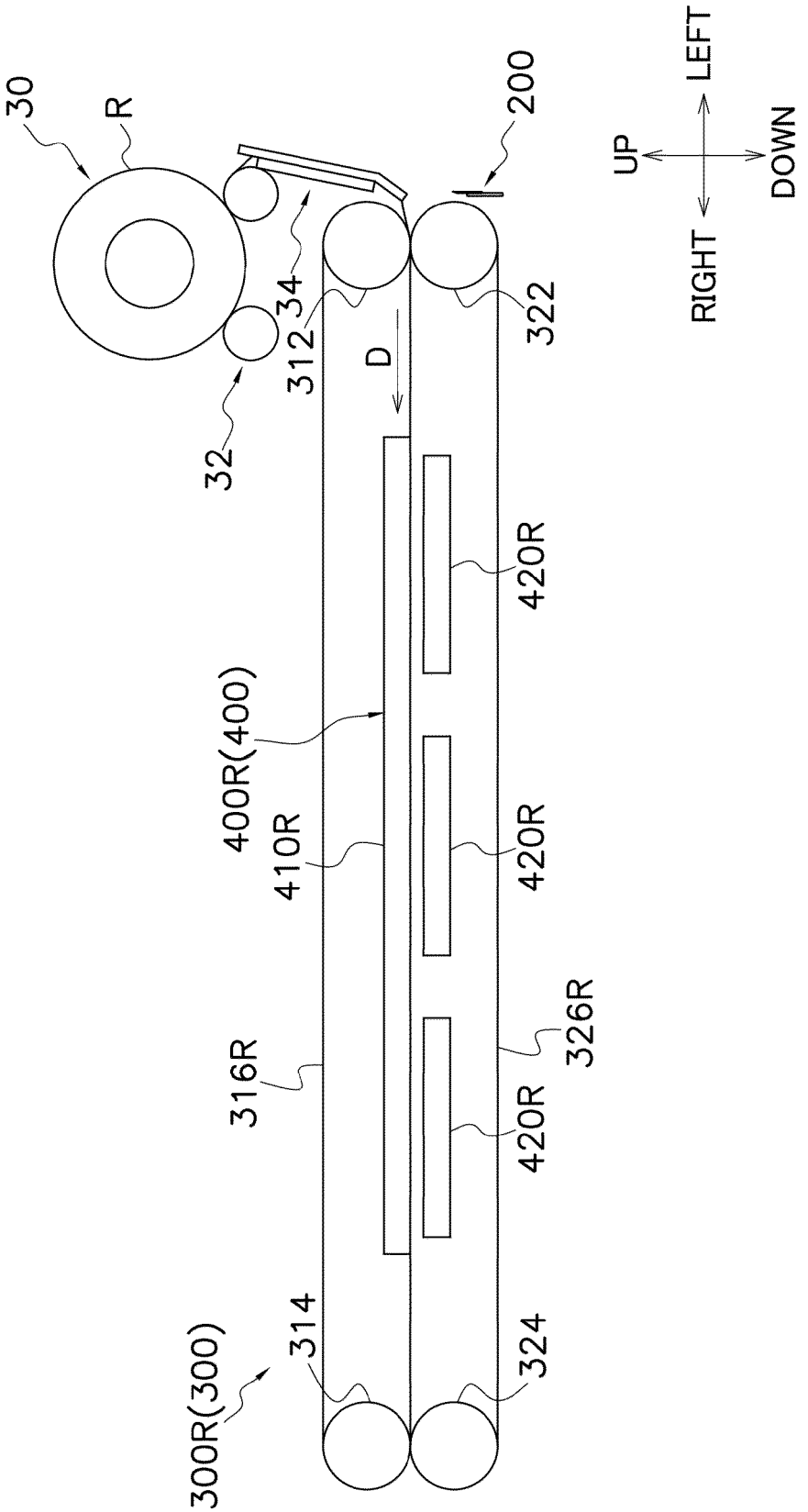
30
R
200
UP
LEFT
DOWN
RIGHT
34
312
322
D
32
420R
400R(400)
410R
420R
316R
326R
420R
314
324
300R(300)

FIG. 4

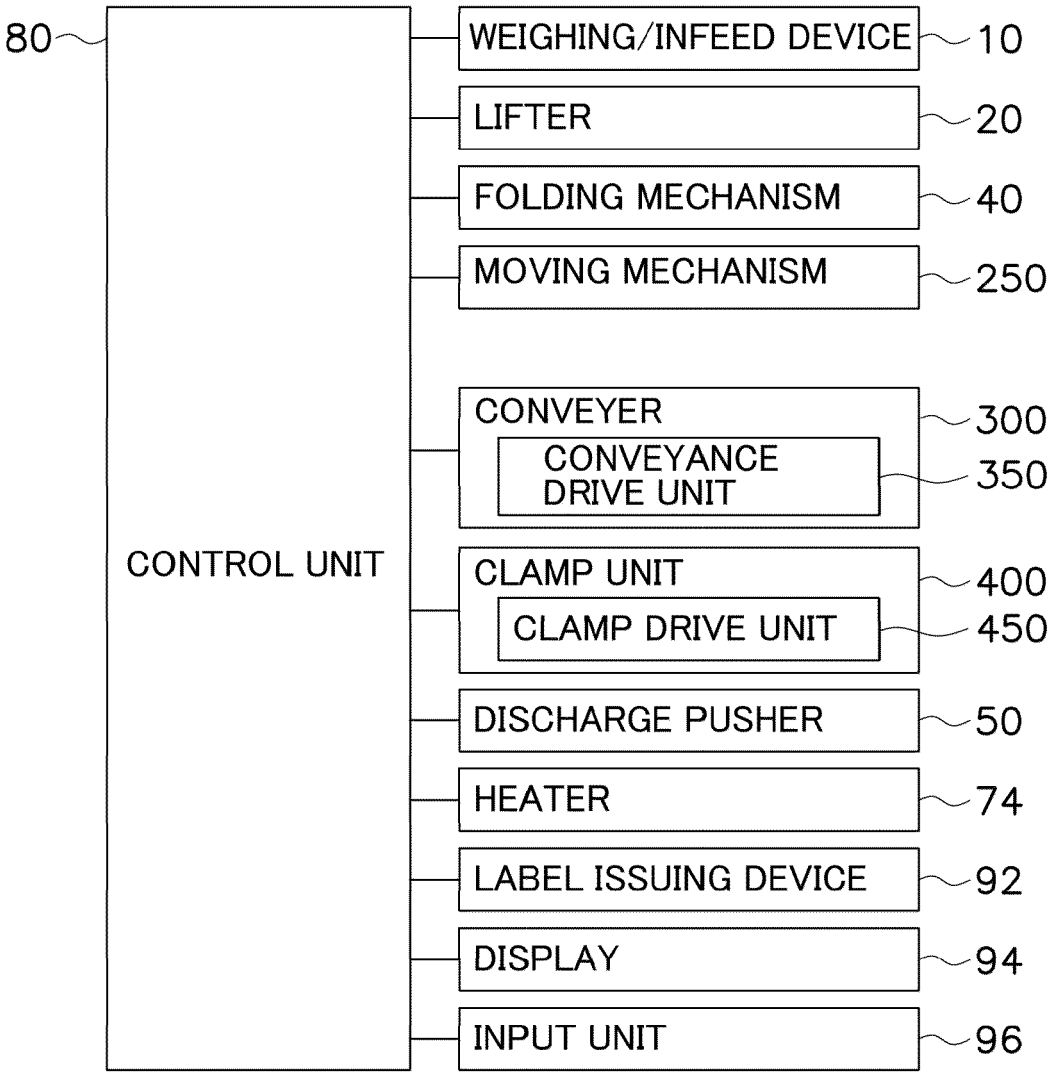
80
CONTROL UNIT
WEIGHING/INFEED DEVICE
10
LIFTER
20
FOLDING MECHANISM
40
MOVING MECHANISM
250
CONVEYER
300
CONVEYANCE DRIVE UNIT
350
CLAMP UNIT
400
CLAMP DRIVE UNIT
450
DISCHARGE PUSHER
50
HEATER
74
LABEL ISSUING DEVICE
92
DISPLAY
94
INPUT UNIT
96

FIG. 5

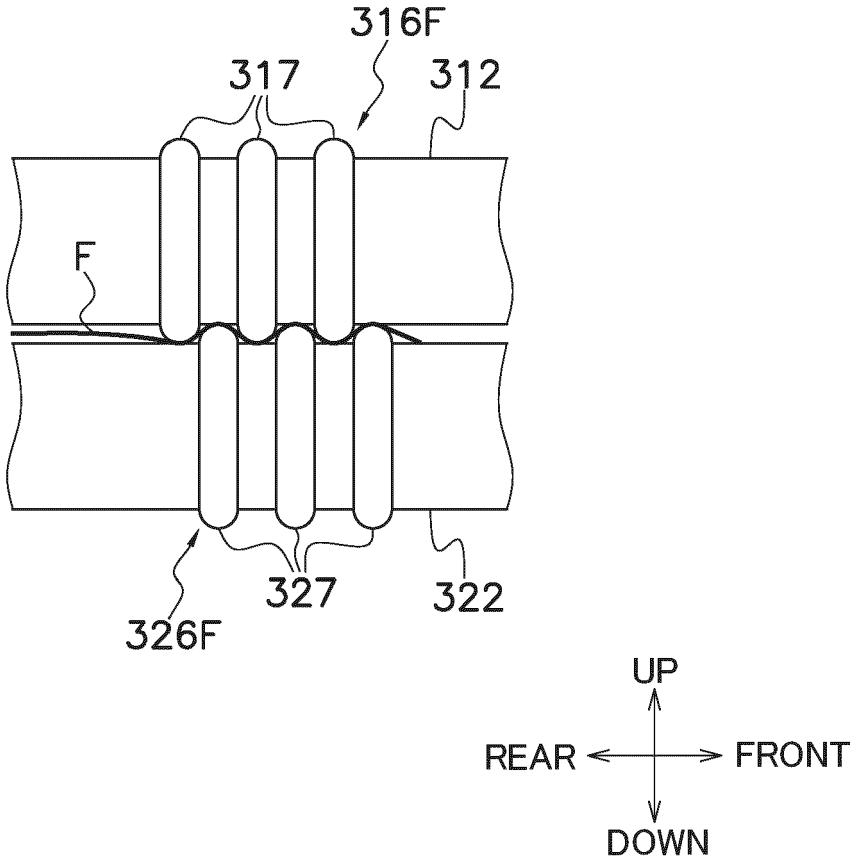

FIG. 6

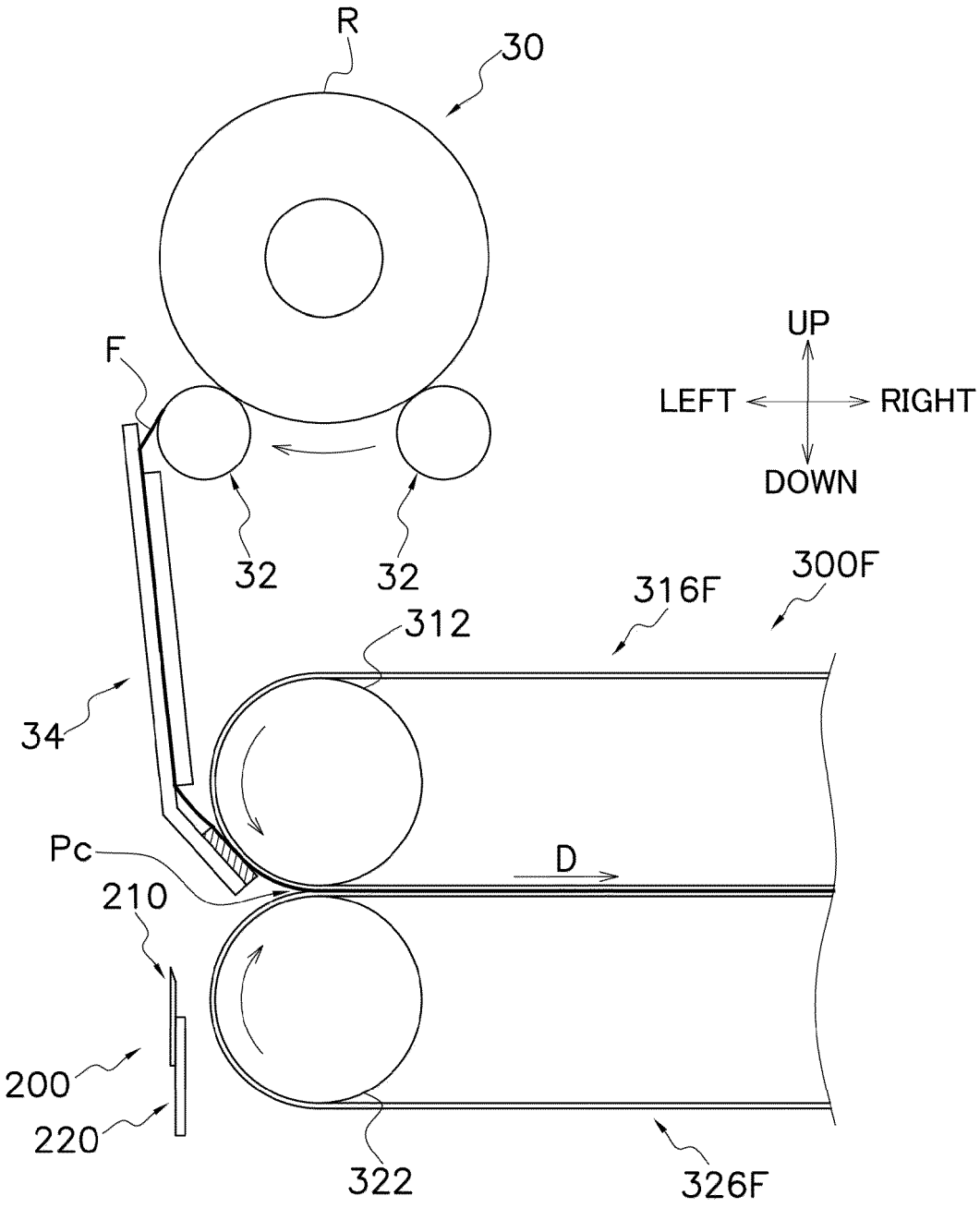
R
30
F
UP
LEFT
RIGHT
DOWN
32
32
316F
300F
312
34
Pc
D
210
200
220
322
326F

FIG. 7

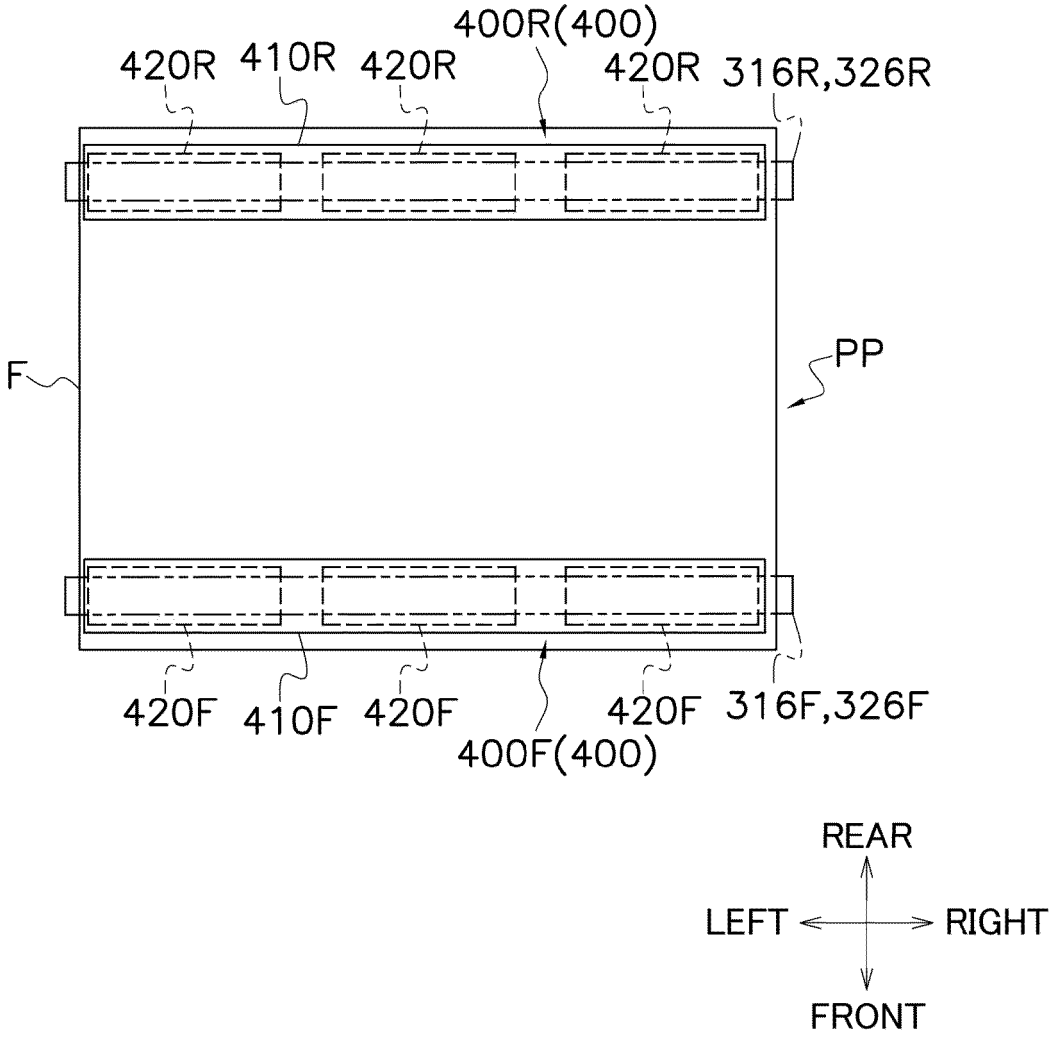
400R(400)
420R
410R
420R
420R
316R,326R
F
PP
420F
410F
420F
420F
316F,326F
400F(400)
REAR
LEFT
RIGHT
FRONT

FIG. 8

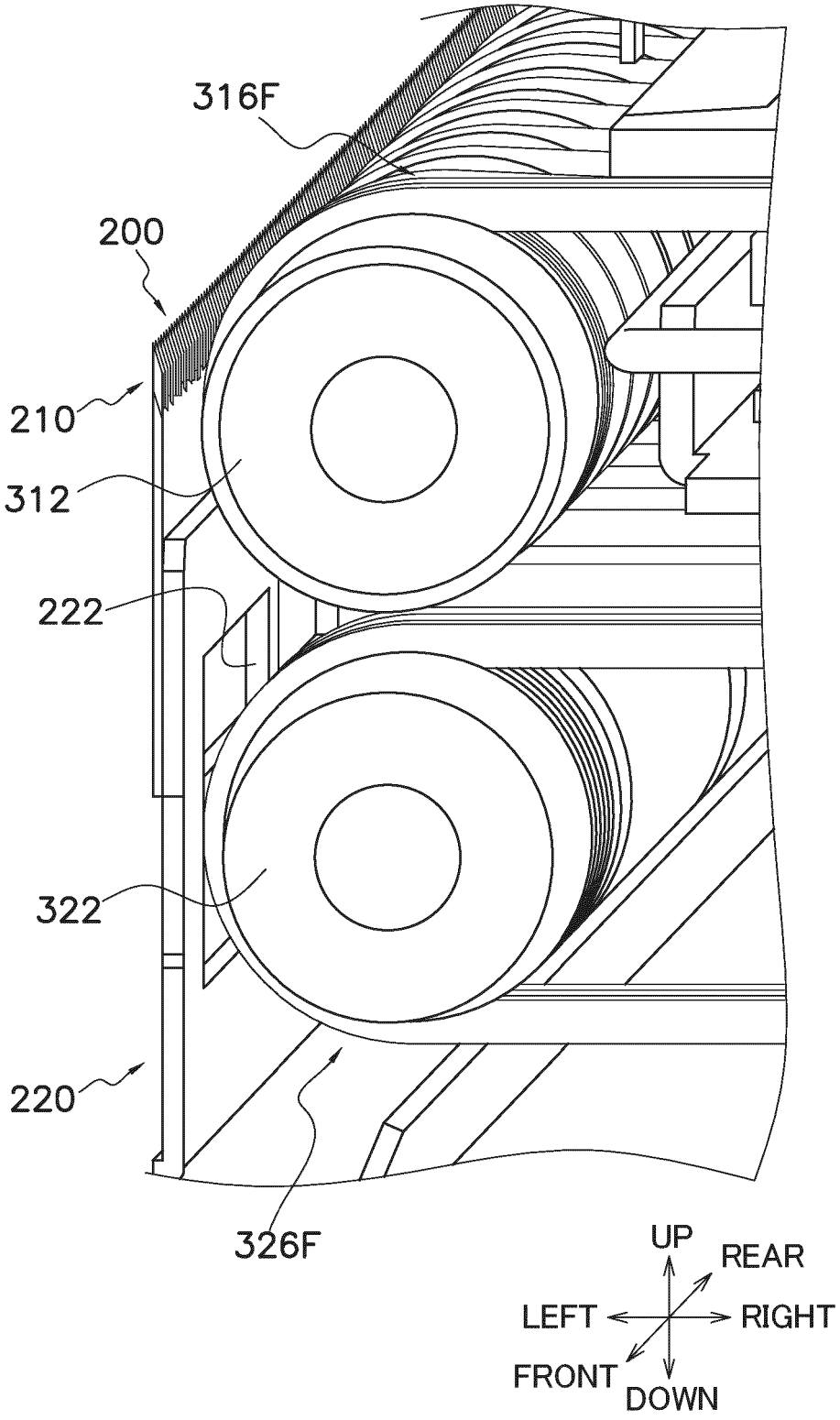
316F
200
210
312
222
322
220
326F
UP
REAR
LEFT
RIGHT
FRONT
DOWN

FIG. 9

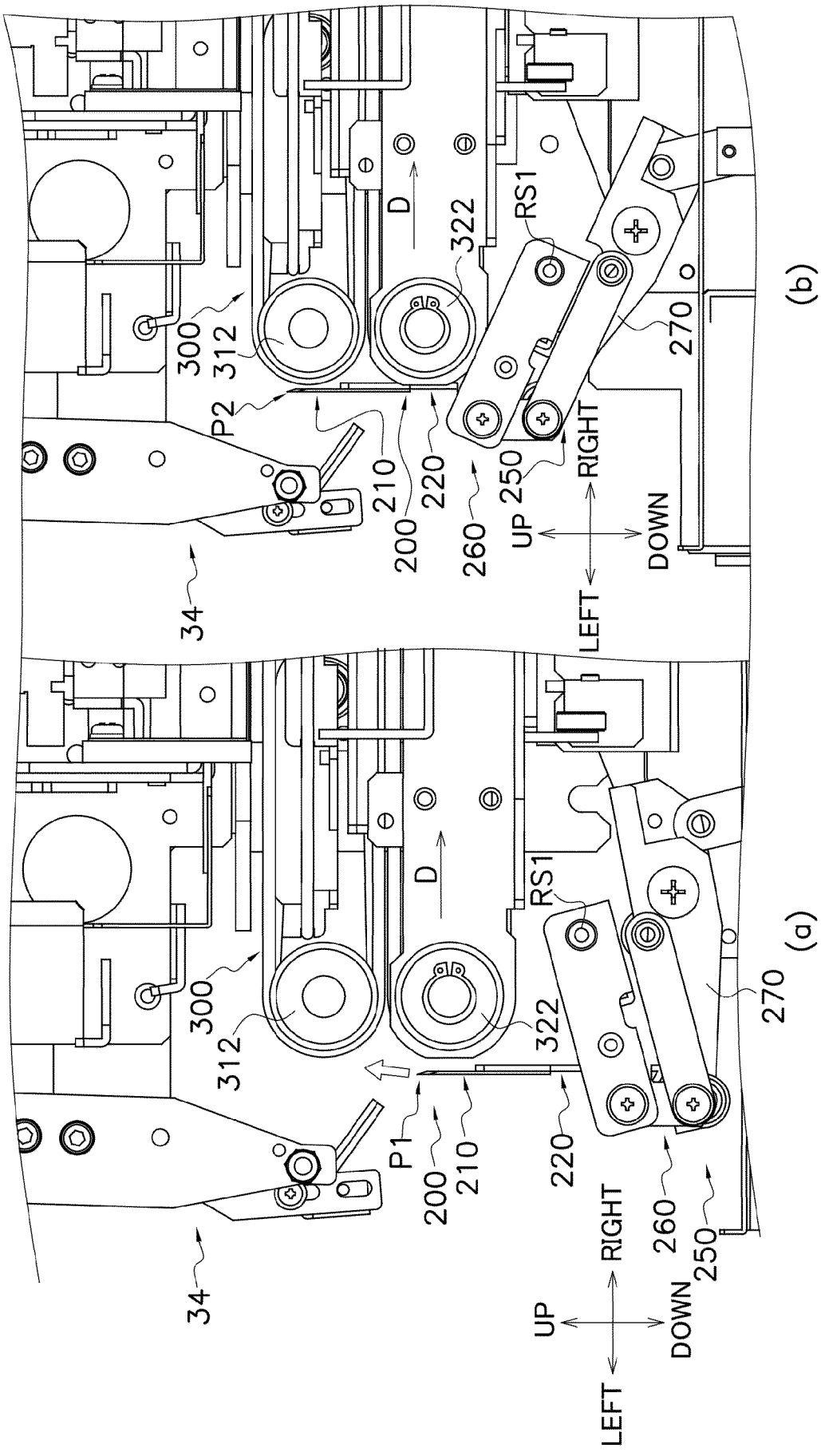
(a)
(b)
34
300
312
P1
P2
200
210
220
260
250
270
322
RS1
D
UP
DOWN
LEFT
RIGHT

FIG. 10

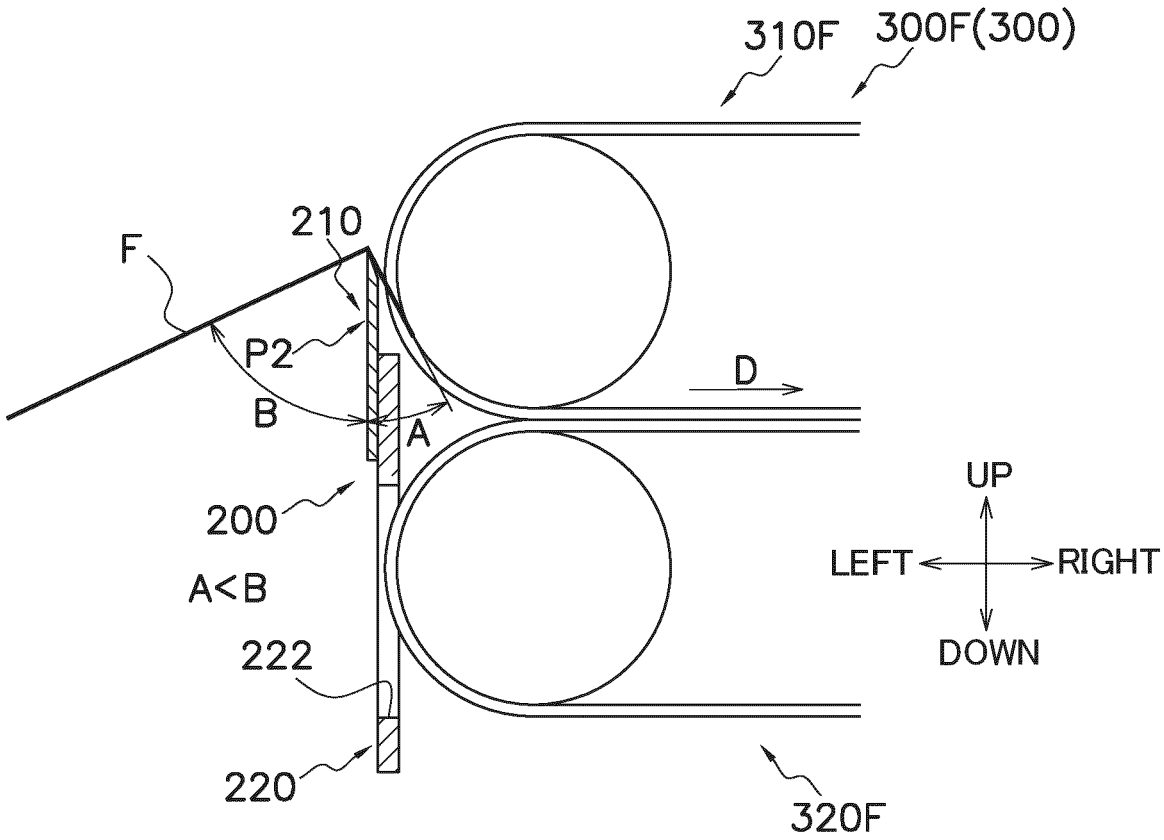
310F
300F(300)
210
F
P2
B
A
D
200
A<B
222
220
320F
UP
LEFT
RIGHT
DOWN

FIG. 11

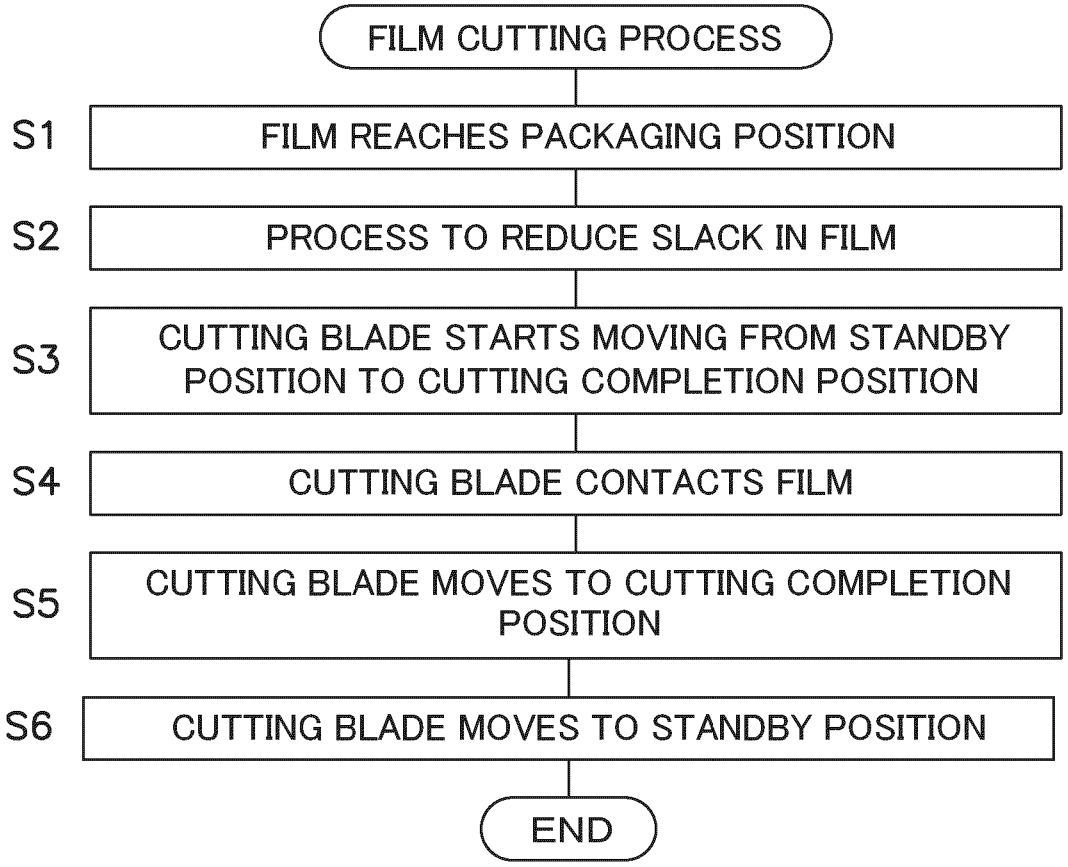
FILM CUTTING PROCESS
S1
FILM REACHES PACKAGING POSITION
S2
PROCESS TO REDUCE SLACK IN FILM
S3
CUTTING BLADE STARTS MOVING FROM STANDBY POSITION TO CUTTING COMPLETION POSITION
S4
CUTTING BLADE CONTACTS FILM
S5
CUTTING BLADE MOVES TO CUTTING COMPLETION POSITION
S6
CUTTING BLADE MOVES TO STANDBY POSITION
END

FIG. 12

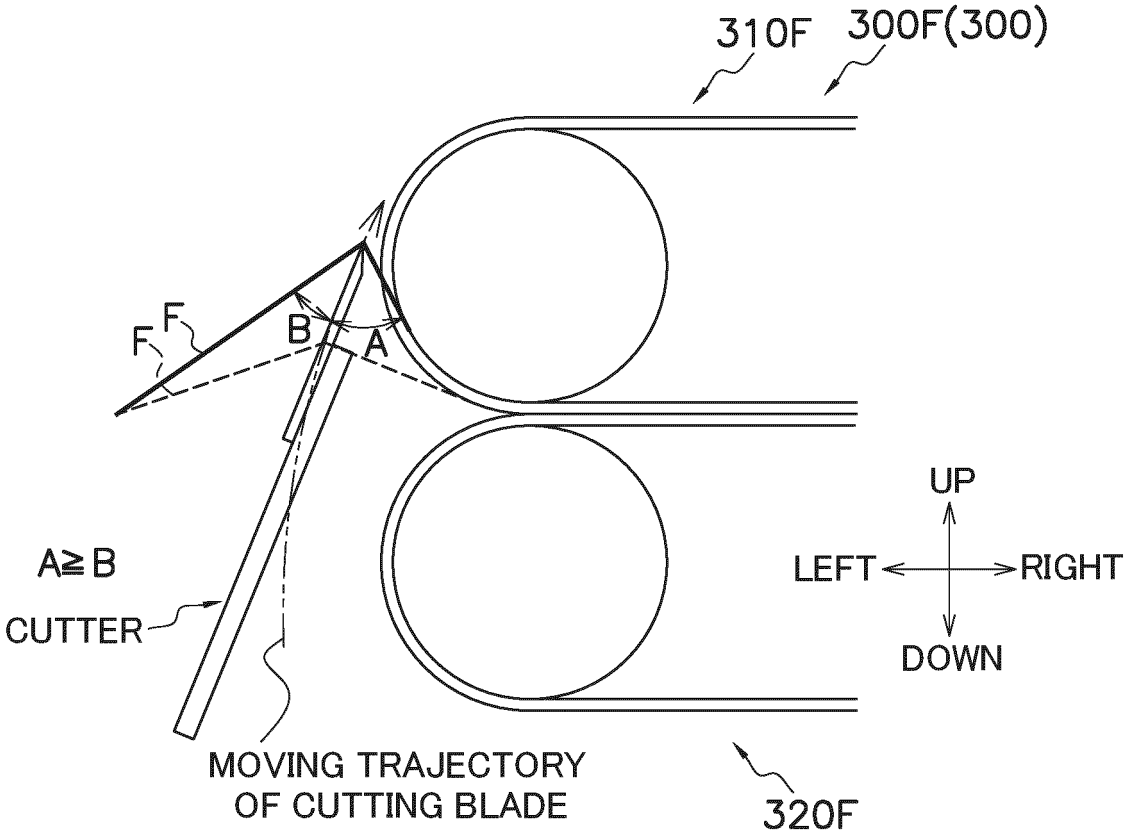
310F
300F(300)
F
F
B
A
A≧B
CUTTER
MOVING TRAJECTORY
OF CUTTING BLADE
320F
UP
LEFT
RIGHT
DOWN

FIG. 13

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EUROPEAN SEARCH REPORT

Application Number
EP 24 21 7634

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	* paragraph [0018]; claim 1; figures 1-3 * * paragraph [0028] *	4	B26D7/00 B26D7/14 B26F3/00
X	EP 0 211 478 A2 (TERAOKA SEIKO KK [JP]) 25 February 1987 (1987-02-25)	1-6	B65B61/04
	* page 5, left-hand column, line 9 - line 18; claims 1,10; figure 5 *		ADD. B26D1/00 B26D5/00
A	EP 0 284 538 A1 (ULMA S COOP [ES]) 28 September 1988 (1988-09-28)	1-6	B26D5/08 B26D5/18 B26D5/20 B26D7/01
	* figures 1-3 *		
A	JP 2011 020700 A (ISHIDA SEISAKUSHO) 3 February 2011 (2011-02-03)	1-6	B26D7/27 B26D7/30 B26D7/08 B65B11/06
	* claim 1; figures 9-15 *		

TECHNICAL FIELDS SEARCHED (IPC)
B26D
B65B
B65H
B26F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	3 April 2025	Orozco Gijon, G

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L : document cited for other reasons

& : member of the same patent family, corresponding document

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EUROPEAN SEARCH REPORT

Application Number
EP 24 21 7634

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
			B65B11/18 B65B11/54 B65B61/06 B65H35/04
			TECHNICAL FIELDS SEARCHED (IPC)

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	3 April 2025	Orozco Gijon, G

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03-04-2025

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		JP 2011020700 A	03-02-2011

EPO FORM P0459

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Patent documents cited in the description

- JP 2011020700 A **[0002] [0079]**