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(54) **STRETCH WRAPPING MACHINE**

(57) Provided is a stretch wrapping machine that can stably convey film even in a case where, for the purpose of wrapping, a holding component that holds the film is provided separately from belts for conveyance. The stretch wrapping machine is equipped with conveyance devices (22) having belt conveyance units and belt pressing mechanisms, a clamp device (23), a wrapping station, and a control device (9). At the wrapping station, product is pushed against film held by the clamp device (23), and the product is wrapped by the film. The belt conveyance units have upper belts and lower belts that sandwich end portions of the film. Pressing members (221e) of the belt pressing mechanisms apply force to the upper belts so that the force with which the upper belts and the lower belts sandwich the film increases. Additionally, the control device (9) controls the belt pressing mechanisms so that during conveyance of the film the force resulting from the pressing members (221e) acts on the upper belts and so that after conveyance of the film the force resulting from the pressing members (221e) that had acted on the upper belts is cancelled.

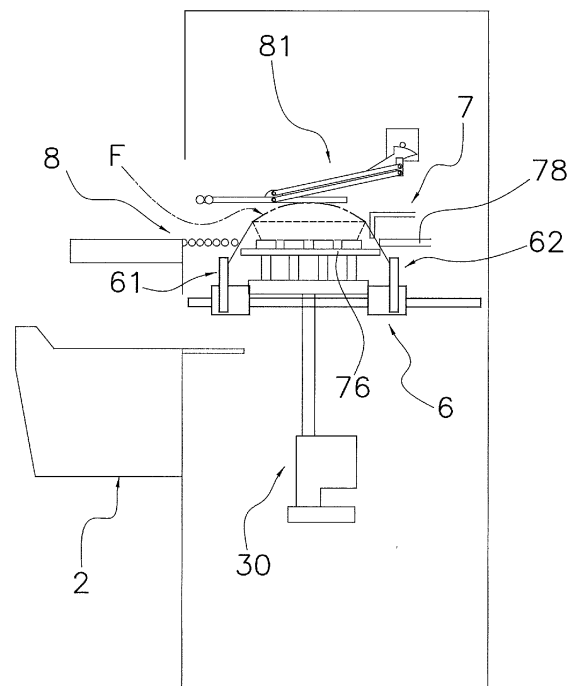


FIG. 15

Description

TECHNICAL FIELD

[0001] The present invention relates to a stretch wrapping machine.

BACKGROUND ART

[0002] Stretch wrapping machines are known as machines that wrap a wrapping item such as perishable food. As described in patent document 1 (JP-A No. 2006-327670) for example, a stretch wrapping machine pushes up the wrapping item against stretched film and in that state tucks the film under the wrapping item. In the stretch wrapping machine disclosed in this document, the film paid out from a film roll is conveyed by pairs of upper and lower conveyor belts.

DISCLOSURE OF INVENTION

<Technical Problem>

[0003] In the stretch wrapping machine described above, a clamp device is provided separately from the pairs of upper and lower conveyor belts that sandwich the film during conveyance, and the clamp device (a holding component) clamps both side end portions of the film after the film is conveyed by the conveyor belts. Then, the wrapping item is pushed up against the film held by clamp device, and wrapping is started.

[0004] Additionally, the clamp device is disposed so as to hold the film on the inner side of the conveyor belts disposed on both sides, and does not apply force to the film when the film is conveyed by the conveyor belts.

[0005] However, in a stretch wrapping machine that employs a structure where the clamp device is away from the conveyor belts in this way, there are cases where part of the film—for example, the leading section in the conveyance direction—conveyed while being held by the conveyor belts comes away from the conveyor belts and sags. In this case, the film becomes slack prior to the wrapping, resulting in the visual attractiveness of the wrapping becoming poor and hindrances occurring in the conveyance of the film.

[0006] It is a problem of the present invention to provide a stretch wrapping machine that can stably convey film even in a case where, for the purpose of wrapping, a holding component that holds the film is provided separately from belts for conveyance.

<Solution to Problem>

[0007] A stretch wrapping machine pertaining to a first aspect of the present invention comprises a conveyance component, a holding component, a wrapping component, and a control component. The conveyance component is configured to convey film pulled out from a film

roll. The holding component is configured to hold the film conveyed by the conveyance component. The wrapping component is configured to push a wrapping item against the film held by the holding component and uses the film to wrap the wrapping item. The control component is configured to control the operations of the conveyance component, the holding component, and the wrapping component. Furthermore, the conveyance component has a first conveyance unit and a force applying component. The first conveyance unit includes a first belt and a second belt that are configured to sandwich an end portion of the film. The force applying component is configured to apply force to the first belt so as to increase the force with which the first belt and the second belt sandwich. Additionally, the control component is configured to control the force applying component so that during the conveyance of the film by the conveyance component the force resulting from the force applying component acts on the first belt and so as to cancel the force after the conveyance of the film by the conveyance component. The force results from the force applying component and has acted on the first belt.

[0008] In this stretch wrapping machine, during the conveyance of the film the force from the force applying component acts on one (the first belt) of the first belt and the second belt that sandwich the end portion of the film, so the force with which both belts sandwich the film becomes stronger. Because of this, the conveyance of the film becomes carried out stably. After the conveyance of the film the force that had acted on the first belt from the force applying component is cancelled, so the conveyed film is no longer excessively restrained by both belts, and the wrapping of the wrapping item by the wrapping component with the film held by the holding component is also carried out excellently.

[0009] A stretch wrapping machine pertaining to a second aspect of the present invention is the stretch wrapping machine pertaining to the first aspect, wherein after the conveyance of the film by the conveyance component, the control component is configured to have the holding component hold the film and cause the wrapping by the wrapping component to be carried out in a state in which the force is cancelled. The force results from the force applying component and has acted on the first belt.

[0010] In this stretch wrapping machine, the force that had acted on the first belt from the force applying component is cancelled prior to the wrapping, so the wrapping can be started in a state in which the film is not being excessively restrained by both belts. Because of this, the wrapping is stable.

[0011] A stretch wrapping machine pertaining to a third aspect of the present invention is the stretch wrapping machine pertaining to the first aspect or the second aspect, wherein the holding component has a first holding member with a first holding surface and a second holding member with a second holding surface that is opposite to the first holding surface. Additionally, the first holding member and the second holding member are configured

to hold the film by sandwiching a section of the film other than the section of the film positioned between the first belt and the second belt.

[0012] In this stretch wrapping machine, the section of the film sandwiched by both holding members of the holding component is not the section of the film between the first belt and the second belt but is located in a position away from that section. For this reason, the position of the section of the film held by the holding component can be set in a position suitable for the wrapping.

[0013] A stretch wrapping machine pertaining to a fourth aspect of the present invention is the stretch wrapping machine pertaining to the third aspect, wherein the force applying component has a pressing member with a pressing surface that is configured to press the first belt and a drive component that is configured to move the pressing member. Additionally, the area of the pressing surface of the pressing member is smaller than that of the first holding surface of the first holding member.

[0014] In this stretch wrapping machine, the area of the pressing surface of the pressing member of the force applying component is small, and the area of the first holding surface of the first holding member of the holding component is larger than that. Because of this, the film can be strongly held by the holding component when pushing the wrapping item against the film. Furthermore, during the conveyance of the film, frictional resistance between the pressing surface of the pressing member and the first belt can be kept down.

[0015] A stretch wrapping machine pertaining to a fifth aspect of the present invention is the stretch wrapping machine pertaining to any of the first aspect to the fourth aspect, wherein the first conveyance unit is configured to use the first belt and the second belt to sandwich the end portion of the film, and convey the film. The end portion is one end portion of the film. The conveyance component further has a second conveyance unit. The second conveyance unit is configured to use a third belt and a fourth belt to sandwich another end portion of the film, and convey the film. Furthermore, the stretch wrapping machine pertaining to the fifth aspect further comprises a first unit moving component and a second unit moving component. The first unit moving component is configured to cause the first conveyance unit to move in a film width direction intersecting a conveyance direction of the film. The second unit moving component causes the second conveyance unit to move in the film width direction. Additionally, the control component is configured to control, in accordance with the width dimension of the film, the first unit moving component to change a first distance and the second unit moving component to change a second distance. The first distance is a distance from one end edge of the film in the one end portion of the film sandwiched by the first belt and the second belt of the first conveyance unit. The second distance is a distance from another end edge of the film in the other end portion of the film sandwiched by the third belt and the fourth belt of the second conveyance unit.

[0016] This stretch wrapping machine employs a configuration where the first conveyance unit that uses the first belt and the second belt to sandwich the one end portion of the film and the second conveyance unit that uses the third belt and the fourth belt to sandwich the other end portion of the film move together in the film width direction. Additionally, by moving the conveyance units in accordance with the width dimension of the film, the first distance and the second distance are changed in accordance with the width dimension of the film. Because of this, the distances from the film end edges in the sections of the film sandwiched by both belts of each conveyance unit can be set to appropriate distances in accordance with the film width, and slackness in the film during film conveyance is reduced or the film is kept from coming out from between both belts of each conveyance unit.

[0017] A stretch wrapping machine pertaining to a sixth aspect of the present invention is the stretch wrapping machine pertaining to the fifth aspect, wherein the control component is configured to increase the first distance and increase the second distance in accordance with an increase of the width dimension of the film.

[0018] In this stretch wrapping machine, the first distance and the second distance increase when the width dimension of the film increases, so each conveyance unit conveys the film while sandwiching, with both belts, sections of the film positioned more inward in the film width direction when the width dimension of the film is large than when it is small. Because of this, there is less sagging in the film width direction central section of the film, and the conveyance of the film is stable.

<Advantageous Effects of Invention>

[0019] According to the stretch wrapping machine pertaining to the present invention, the film sandwiching force resulting from both belts during the film conveyance becomes stronger so that the film conveyance becomes stable, and after the conveyance of the film there is no longer excessive restraining of the film by both belts so that the wrapping is carried out satisfactorily.

BRIEF DESCRIPTION OF DRAWINGS

[0020]

FIG. 1 is an external perspective view of a stretch wrapping machine pertaining to an embodiment of the present invention.

FIG. 2 is a front general view of the interior of the stretch wrapping machine.

FIG. 3 is a perspective view seen from arrows III-III of FIG. 2.

FIG. 4 is a front general view of the interior of the stretch wrapping machine.

FIG. 5 is a general plan view of a film insertion plate unit.

FIG. 6 is a plan general view of the interior of the stretch wrapping machine.

FIG. 7 is a correlation diagram of a first unit, a second unit, and two unit moving devices.

FIG. 8 is a perspective view of the second unit excluding belts.

FIG. 9 is a side general view of the second unit.

FIG. 10 is a side general view of the second unit in a state in which force is applied from a pressing member to an upper belt.

FIG. 11 is a plan arrangement diagram of clamp members and pressing members.

FIG. 12 is a drawing showing some control targets of a control device.

FIG. 13 is a drawing for describing the operation of the stretch wrapping machine.

FIG. 14 is a drawing for describing the operation of the stretch wrapping machine.

FIG. 15 is a drawing for describing the operation of the stretch wrapping machine.

FIG. 16 is a drawing for describing the operation of the stretch wrapping machine.

FIG. 17 is a drawing for describing the operation of the stretch wrapping machine.

FIG. 18 is a drawing showing solenoid control during film conveyance.

FIG. 19 is a drawing showing control of forward and backward movement, corresponding to film width, of each unit of a film conveyance and holding mechanism.

FIG. 20 is a drawing showing proper first distances and second distances corresponding to the width dimension of the film.

FIG. 21 is a front general view of the interior of the stretch wrapping machine pertaining to example modification C.

DESCRIPTION OF EMBODIMENT

[0021] A stretch wrapping machine 1 pertaining to an embodiment of the present invention will be described below with reference to the drawings.

(1) Configuration of Stretch Wrapping machine 1

[0022] FIG. 1 is an external perspective view of the stretch wrapping machine 1. In the following description, expressions indicating directions-such as front/rear/left/right, upper/lower, front surface, and back surface-will be used, and unless otherwise specified these will be understood to mean the directions shown in the lower right of FIG. 1.

[0023] First, a general overview of the stretch wrapping machine 1 will be described. The stretch wrapping machine 1 is a machine that pushes, from below, a tray T containing product G such as perishable food (corresponding to a wrapping item) against tensioned held film F (see FIG. 14, etc.) and tucks the peripheral edge por-

tions of the film F under the tray T to thereby wrap the tray T in the film. It will be noted that a method of use where the product G is wrapped without being contained in the tray T is also possible.

[0024] The configuration of the stretch wrapping machine 1 will be described below using FIG. 1 to FIG. 7.

[0025] The stretch wrapping machine 1 is equipped with a loading mechanism 2, a wrapping station 3, a roll support mechanism 4, a film feed mechanism 5, a film conveyance and holding mechanism 6, a sealing mechanism 8, and a discharge table 11. The wrapping station 3 has a lifter mechanism 30 and a tucking mechanism 7 as a wrapping component.

(1-1) Loading Mechanism 2

[0026] The loading mechanism 2 is provided on the front surface side of a body 1a of the stretch wrapping machine 1 and functions as a loading component by which the tray T containing the product G is loaded into the body 1a. The loading mechanism 2 has a weigh scale that weighs the product G contained in the tray T, a weigh pan placed on the weigh scale, and plural infeed conveyor belts provided between a pair of rollers. Projections for conveyance are provided on the infeed conveyor belts. When the tray T containing the product G is placed on the weigh pan as shown in FIG. 3, the product G is weighed by the weigh scale and thereafter the tray T is pushed from the front surface side by the projections secured to the infeed conveyor belts and delivered onto support members 33 of the lifter mechanism 30 of the wrapping station 3.

(1-2) Wrapping Station 3

[0027] The wrapping station 3 is a wrapping space formed in the body 1a. The wrapping station 3 has the role of a wrapping component that administers a series of wrapping operations on the tray T including the product G that has been weighed. The wrapping station 3 has the lifter mechanism 30 and the tucking mechanism 7 as a wrapping component. When the film F (stretch film) is stretched by the film conveyance and holding mechanism 6, the lifter mechanism 30 pushes the tray T containing the product G against the stretched film F (see FIG. 15). Then, the tucking mechanism 7 tucks the peripheral portions of the film F under the tray T having the film F pressed against it, whereby the tray T and the product G become covered by the film F.

[0028] The lifter mechanism 30 is provided in the lower portion of the wrapping station 3. The lifter mechanism 30 functions as a raising and lowering mechanism that holds the bottom surface of the tray T and raises up and lowers down the tray T and the product G. As shown in FIG. 3, the lifter mechanism 30 has a support base 31, plural support bars 32 secured on the support base 31, and support members 33 supported in such a way that they may freely turn on the upper end portions of the

support bars 32 and which receive the bottom surface of the tray T. Furthermore, an electrically powered ball screw mechanism 34 that moves the support base 31 up and down is disposed in the lower portion of the lifter mechanism 30.

[0029] It will be noted that each support bar 32 has in its central portion a hinge that bends forward/backward and rightward/leftward, and the hinge is configured to temporarily fall over when right and left tucking plates 76 and 77 (see FIG. 2 and FIG. 3) and a rear tucking plate 78 of the tucking mechanism 7 come under the tray T.

[0030] As shown in FIG. 2 and FIG. 3, the tucking mechanism 7 has right and left tucking plates 76 and 77, a rear tucking plate 78, and a front tucking rod 79. The right and left tucking plates 76 and 77 tuck both film conveyance direction end portions of the film F to the bottom surface side of the tray T. The rear tucking plate 78 tucks the side portion of the film F on a second unit 62 side to the bottom surface side of the tray T. The right and left tucking plates 76 and 77 and the rear tucking plate 78 can be moved horizontally by motors and timing belts not shown in the drawings. The front tucking rod 79 is disposed in such a way that, when the tray T is discharged, the side portion of the film F on a first unit 61 side becomes tucked to the bottom surface side of the tray T. The discharging of the tray T is carried out by a discharge pusher 75 pushing the tray T out toward the sealing mechanism 8 (the front surface side).

[0031] Furthermore, a hold-down mechanism 81 is disposed in the upper portion of the wrapping station 3. The hold-down mechanism 81 keeps the tray T and the product G from losing their posture and falling over when the product G and the tray T resting on the lifter mechanism 30 are pushed up and stop (see FIG. 15).

(1-3) Roll Support Mechanism 4

[0032] The roll support mechanism 4 is a mechanism that supports film rolls R, and as shown in FIG. 2 is disposed in the left side portion of the body 1a. The roll support mechanism 4 is mainly configured from two roll bars. The roll bars are inserted through the film rolls R and hold the film rolls R using holders or the like. The roll bars are supported in such a way that they may freely rotate in the body 1a. A pulley 4b is secured to one end of each roll bar, and a belt 4c is entrained about each pulley 4b. The two roll bars are disposed out of alignment with each other in the up/down and right/left directions.

[0033] The belts 4c are driven by one film roll drive motor 4d. The film roll drive motor 4d is capable of forward and reverse rotation; when the film roll drive motor 4d forwardly rotates, the film roll drive motor 4d drives in such a way that the film roll R having one roll bar inserted through it is rotated, and when the film roll drive motor 4d reversely rotates, the film roll drive motor 4d drives in such a way that the film roll R having the other roll bar inserted through it is rotated. One-way clutches 4e are provided between the belt 4c and the film roll drive motor

4d.

(1-4) Film Feed Mechanism 5

[0034] The film feed mechanism 5 is a mechanism for feeding to the film conveyance and holding mechanism 6 the film F that has been pulled out from the film rolls R. As shown in FIG. 2 and FIG. 5, the film feed mechanism 5 is mainly configured from a film insertion plate unit 51 for holding the film F and a film insertion plate drive motor (not shown in the drawings) that causes the film insertion plate unit 51 to swing using a predetermined shaft as a fulcrum.

[0035] The film insertion plate unit 51 has a first film insertion plate 51a mainly configured from two plate members 57a and 58a and a second film insertion plate 51b mainly configured from two plate members 57b and 58b.

[0036] The film insertion plate unit 51 is disposed above the film rolls R and extends along the longitudinal direction of the film rolls R. It will be noted that the longitudinal direction length of the film insertion plate unit 51 is longer than the longitudinal direction length of the film rolls R.

[0037] Cutouts 53a to 53h are formed in each of the two plate members 57a and 58a. Although FIG. 5 shows only the plate members 57a and 58a, the two plate members 57b and 58b have the same configuration. Below, the plate members 57a and 58a will be taken as an example and described. The distances between the cutouts 53a and the cutouts 53b to 53h are distances corresponding to several types of film F having different film widths. For example, the distance between the outer side of the cutouts 53a and the outer side of the cutouts 53h generally coincides with the film width of the film F having the largest film width.

[0038] It will be noted that the width dimension of the cutouts 53a is larger than the width dimension of the other cutouts 53b to 53h, but this will be described in detail later.

[0039] The two plate members 57a and 58a are coupled to each other at one end by a hinge not shown in the drawings, so that the two plate members 57a and 58a can open and close. Because of this, the operator can easily insert the film F between the plate member 57a and the plate member 58a. As shown in FIG. 5, the plate member 57a and the plate member 58a have substantially the same shape.

[0040] The film insertion plate drive motor causes the film insertion plate unit 51 to swing in a predetermined range using the hinge section as a shaft. Because of the film insertion plate drive motor, the film insertion plate unit 51 can take, for example, a first position (the position indicated by the long dashed short dashed lines in FIG. 2) and a second position (the position indicated by the long dashed double-short dashed lines in FIG. 4) positioned below the first position. Specifically, the first position is a position in which the longitudinal direction of the second film insertion plate 51b extends in a substantially

horizontal direction (a position in which the second film insertion plate 51b is substantially parallel to later-described belt conveyance units 220). The second position is a position in which the longitudinal direction of the first film insertion plate 51a extends in a substantially horizontal direction (a position in which the first film insertion plate 51a is substantially parallel to the belt conveyance units 220).

[0041] It will be noted that the film insertion plate unit 51 is positioned in either the first position or the second position while the stretch wrapping machine 1 is operating. The operator selects the position of the film insertion plate unit 51 by deciding which of the two disposed film rolls R to use.

[0042] Furthermore, the film insertion plate drive motor causes the film insertion plate unit 51 to move horizontally toward the film conveyance and holding mechanism 6. This allows the film feed mechanism 5 to hand over the film F to the film conveyance and holding mechanism 6.

(1-5) Film Conveyance and Holding Mechanism 6

[0043] The film conveyance and holding mechanism 6 receives the film F fed thereto from the film feed mechanism 5 and conveys the film F to the central section of the wrapping station 3. Furthermore, after conveying the film F to the wrapping station 3, the film conveyance and holding mechanism 6 tensions and holds the film F in preparation for the wrapping operation by carrying out a stretching operation.

[0044] The film conveyance and holding mechanism 6 mainly has a first unit 61, a second unit 62, a first unit moving device 63, a second unit moving device 64, and a conveyance drive unit 65.

[0045] As shown in FIG. 6, the first unit 61 is disposed in the front surface-side section of the body 1a. The second unit 62 is disposed in the back surface-side section of the body 1a.

[0046] The first unit 61 and the second unit 62 sandwich, using pairs of upper and lower belts (upper belts 221 and lower belts 222), both width direction side portions of the film F (i.e., the front surface-side section and the back surface-side section of the film F) held by the film insertion plate unit 51 and convey, with the conveyance drive unit 65, the film F in the direction of arrow A1 (see FIG. 2).

[0047] Furthermore, the first unit 61 moves in the width direction of the film F by activation of the first unit moving device 63, and the second unit 62 moves in the width direction of the film F by activation of the second unit moving device 64. Both the first unit 61 and the second unit 62 are supported in such a way that they may freely move in the width direction of the film F along slide shafts 66 and 67 extending along the width direction of the film F.

[0048] As shown in FIG. 7, the unit moving devices 63 and 64 have drive motors 63a and 64a and belts 63b and 64b that move in the width direction of the film F by activation of the drive motors 63a and 64a. Additionally, the

units 61 and 62 individually move in the width direction of the film F by activation of the belts 63b and 64b.

[0049] The detailed configuration of the first unit 61 and the second unit 62 will be described below. It will be noted that because the first unit 61 and the second unit 62 have generally the same configuration, mainly the second unit 62 will be taken as an example and described below.

[0050] FIG. 8 is a perspective view of the second unit 62. FIG. 9 is a front view of the second unit, and shows the upper belt 221 and the lower belt 222 not shown in FIG. 8. FIG. 10 is a front view of the second unit, and shows a state in which the lower surface section of the upper belt 221 is pressed down to the lower belt 222 by a pressing member 221a of a later-described belt pressing mechanism (force applying device) 90. FIG. 11 is a general plan view of the first unit 61 and the second unit 62, and shows the planar arrangement of clamp members 250 to 252 of a clamp device 23 functioning as a holding component for holding the film F after conveyance, pressing members 221e of belt pressing mechanisms 90, the upper belts 221, and the lower belts 222.

[0051] As shown in FIG. 8, the second unit 62 mainly comprises a frame 21, a conveyance device 22, and a clamp device 23.

[0052] The frame 21 configures a frame of the first unit 61 and supports pulleys that support the upper belt 221 and the lower belt 222, a receiving unit 230, solenoids 62b to 62d (see FIG. 12) that drive the clamp members 250 to 252, a solenoid 62e and a non-illustrated spring member that drive a pressing member 221e, the clamp members 250 to 252, and a support shaft 62f of the pressing member 221e.

(1-5-1) Conveyance Device 22

[0053] The conveyance device 22 mainly has a belt conveyance unit 220, a receiving unit 230, and a belt pressing mechanism 90.

(1-5-1-1) Belt Conveyance Unit 220

[0054] The belt conveyance unit 220 contacts both the upper and lower surfaces of the film F and conveys the film F to the wrapping station 3, and is configured from the upper belt 221 and the lower belt 222 (see FIG. 9). The upper belt 221 contacts the upper surface-which is one surface-of the film F and is positioned above the lower belt 222. As shown in FIG. 9, the upper belt 221 is entrained about four pulleys 221a, 221b, 221c, and 221d.

[0055] The lower belt 222 contacts the lower surface-which is the other surface-of the film F. As shown in FIG. 9, the lower belt 222 is entrained about four pulleys 222a, 222b, 222c, and 222d. Additionally, when a drive motor 65a (see FIG. 12) is driven by a control device 9, driving force resulting from the drive motor 65a is transmitted via a belt and the like to one of the four pulleys 222a, 222b, 222c, and 222d. More specifically, the lower belts 222 of both units 61 and 62 have a setup where they

move synchronously owing to the driving force resulting from the drive motor 65a of the conveyance drive unit 65. It will be noted that the upper belt 221 located above the lower belt 222 moves following the movement of the lower belt 222 via a gear (not shown in the drawings).

(1-5-1-2) Receiving Unit 230

[0056] The receiving unit 230 is disposed in the left side section of the second unit 62, that is, in the neighbourhood of the film feed mechanism 5, and receives the film F fed thereto from the film feed mechanism 5. As shown in FIG. 8, the receiving unit 230 is configured from a frame, the pulley 221a attached to the frame, and a shaft member 231a serving as a spindle on which the receiving unit 230 swings. The pulley 221a is supported by the shaft member 231b, whereby the pulley 221a is secured to the frame. The upper belt 221 is, as described above, entrained about the pulley 221a. That is, the upper belt 221 is integrated with the receiving unit 230 via the pulley 221a. Thus, the upper belt 221 also has the functions of a gripping component that grips the film F, an introducing component that introduces the gripped film F to the film conveyance and holding mechanism 6, and a conveyance component for conveying the film F to the wrapping station 3.

[0057] The receiving unit 230 of the second unit 62 swings using the shaft member 231 as a spindle so to take a first posture (see FIG. 8) and a second posture (see FIG. 9) by activation/non-activation of a twenty-first solenoid 62a (an eleventh solenoid 61a in the receiving unit 230 of the first unit 61). The first posture is a posture in which the longitudinal direction (i.e., the right-left direction) of the receiving unit 230 is a substantially horizontal direction. The second posture is a posture in which the longitudinal direction of the receiving unit 230 is inclined upward relative to the horizontal plane.

[0058] When the twenty-first solenoid 62a is activated, the distal end portion of the receiving unit 230 is pushed down using the shaft member 231a as a spindle and the receiving unit 230 moves to a predetermined position (i.e., the receiving unit 230 takes the first posture). Because of this, the gripping component of the upper belt 221 entrained about the pulley 221a comes into contact with the film. When the activation of the twenty-first solenoid 62a is cancelled, the distal end portion of the receiving unit 230 is pushed up using the shaft member 231a as a spindle and the receiving unit 230 returns to a predetermined position (the second posture). Because of this, the gripping component of the upper belt 221 goes out of contact with the film.

[0059] Consequently, by activating the eleventh and twenty-first solenoids 61a and 62a, the gripping components of the upper belts 221 of the units 61 and 62 come into contact with the film F, so the film F fed from the film feed mechanism 5 can be received.

(1-5-1-3) Belt Pressing Mechanism 90

[0060] As shown in FIG. 8, FIG. 9, and FIG. 12, the belt pressing mechanism 90 of the second unit 62 is mainly configured from a twenty-fifth solenoid 62e (a fifteenth solenoid 61e in the first unit 61) and a pressing member 221e. The pressing member 221e is a member that can swing about the support shaft 62f, and the distal end section thereof is positioned between the upper-side belt and the lower-side belt of the upper belt 221. Additionally, when the twenty-fifth solenoid 62e is not being driven, the distal end section of the pressing member 221e presses downward the lower-side belt of the upper belt 221a using the force of a spring member not shown in the drawings. That is, when the twenty-fifth solenoid 62e is not energized, the lower-side belt of the upper belt 221 is pressed toward the lower belt 222 by the distal end section of the pressing member 221e (see the solid lines in FIG. 10). When the twenty-fifth solenoid 62e becomes driven by the control device 9, the distal end section of the pressing member 221e moves upward and the pressing on the lower-side belt of the upper belt 221 is cancelled (see FIG. 9). In this state in which the pressing is cancelled, the belt pressing mechanism 90 no longer applies force to the upper belt 221.

[0061] It will be noted that when the lower-side belt of the upper belt 221 is receiving the downward force by the belt pressing mechanism 90, as shown in FIG. 10, a gap dimension G2 between the lower-side belt of the upper belt 221 and the upper-side belt of the lower belt 222 in the neighbourhood of the receiving unit 230 becomes relatively smaller. When the force resulting from the belt pressing mechanism 90 is not acting on the upper belt 221, as shown in FIG. 9, a gap dimension G1 between the lower-side belt of the upper belt 221 and the upper-side belt of the lower belt 222 in the neighbourhood of the receiving unit 230 becomes relatively larger. The gap dimension G2 in FIG. 10 is smaller than the gap dimension G1 in FIG. 9. Consequently, in the state shown in FIG. 9 in which the force resulting from the belt pressing mechanism 90 is not acting on the upper belt 221, the film F sandwiched between the upper belt 221 and the lower belt 222 is not subjected to much restraint by both belts 221 and 222. However, when the force resulting from the belt pressing mechanism 90 acts on the upper belt 221, as shown in FIG. 10, the vertical gap dimension G2 between both belts 221 and 222 becomes smaller and the degree to which the film F sandwiched between both belts 221 and 222 is in close contact with both belts 221 and 222 becomes higher.

(1-5-2) Clamp Device 23

[0062] As shown in FIG. 11, the clamp device 23 is disposed on the inner side of the units 61 and 62 in the width direction of the film F (the front-rear direction). The clamp device 23 has a front surface-side clamp mechanism 23b disposed in the neighbourhood of the first unit

61 and a back surface-side clamp mechanism 23c disposed in the neighbourhood of the second unit 62.

[0063] The front surface-side clamp mechanism 23b and the back surface-side clamp mechanism 23c each have a first side clamp member 250, a central clamp member 251, and a second side clamp member 252. The first side clamp member 250, the central clamp member 251, and the second side clamp member 252 are arranged side by side on a straight line as seen in a plan view.

[0064] The front surface-side clamp mechanism 23b and the back surface-side clamp mechanism 23c extend in the right-left direction and clamp both width direction side end portions of the film F. Resin strips 23a for sandwiching the film F together with the clamp members 250, 251, and 252 are disposed under the clamp members 250, 251, and 252. Furthermore, the strips 23a also extend in the right-left direction and have substantially the same length as the combined longitudinal direction length of the clamp members 250, 251, and 252. Thus, the clamp members 250, 251, and 252, together with the strips 23a, have the role of a holding component that clamps the film F. The strips 23a are located in positions in which the height positions of their upper surfaces are slightly lower than the height positions of the upper surfaces of the belts on the upper sides of the lower belts 222.

[0065] As shown in FIG. 12, the clamp device 23 is activated by solenoids provided in correspondence to the clamp members 250, 251, and 252. Specifically, in the front surface-side clamp mechanism 23b, the first side clamp member 250 is activated by a twelfth solenoid 61b, the central clamp member 251 is activated by a thirteenth solenoid 61c, and the second side clamp member 252 is activated by a fourteenth solenoid 61d. In the back surface-side clamp mechanism 23c, the first side clamp member 250 is activated by a twenty-second solenoid 62b, the central clamp member 251 is activated by a twenty-third solenoid 62c, and the second side clamp member 252 is activated by a twenty-fourth solenoid 62d.

[0066] When the solenoids 61b, 61c, 61d, 62b, 62c, and 62d are activated, the six clamp members 250, 251, and 252 of the clamp device 23 are pressed down and apply downward loads to the strips 23a. Thus, by activating the solenoids 61b, 61c, 61d, 62b, 62c, and 62d when there is film F between the clamp members 250, 251, and 252 and the strips 23a, the film F is held in close contact between the clamp members 250, 251, and 252 and the strips 23a. By cancelling the activation of the solenoids 61b, 61c, 61d, 62b, 62c, and 62d, the holding of the film F is cancelled.

[0067] It will be noted that, as shown in FIG. 11, the area in which the first side clamp members 250, the central clamp members 251, and the second side clamp members 252 contact the film F is large. In contrast, the area in which the pressing members 221e of the belt pressing mechanisms 90 contact the upper belts 221 is small.

[0068] Furthermore, as shown in FIG. 2 and FIG. 4, a cutter mechanism 69 is provided on the upstream side, in the film conveyance direction, of the film conveyance and holding mechanism 6. After the film F handed over from the film feed mechanism 5 to the film conveyance and holding mechanism 6 is conveyed a predetermined amount, the cutter mechanism 69 cuts the film F between both mechanisms 5 and 6. The cutter mechanism 69 has a cutting blade that is longer than the width of the film, and the film F is cut as a result of the cutting blade being moved by an actuator.

(1-6) Sealing Mechanism 8

[0069] The sealing mechanism 8 heats and seals the bottom surface of the tray T pushed out by the discharge pusher 75. It will be noted that, at this time, the hold-down mechanism 81 also fulfills the role of pressing the tray T containing the product G against the upper surface of the sealing mechanism 8.

(1-7) Discharge Table 11

[0070] The discharge table 11 for discharging the completely wrapped tray T containing the product G is provided on the front surface side of the sealing mechanism 8. A label issuer 16 affixes a label printed by a label printer 15 to the tray T that has finished being wrapped.

(1-8) Control Device 9

[0071] The control device 9 is configured from a CPU, a RAM, a ROM, and the like, controls the motors and solenoids shown in FIG. 12, and causes the conveyance and the wrapping of the film F to be carried out.

[0072] The operation of the stretch wrapping machine 1 carried out by the control device 9 will be described below.

(2) Operation of Stretch Wrapping machine 1

[0073] FIG. 13 to FIG. 17 are explanatory drawings for describing the operation of the stretch wrapping machine 1 carried out by the control device 9.

(2-1) General Operation of Stretch Wrapping machine 1

[0074] First, as shown in FIG. 13, when the operator places the tray T containing the product G on the weigh scale of the loading mechanism 2, the weigh scale waits for the weigh value to become stable and for the weighing to finish, and then the infeed conveyor belts start to move. As the infeed conveyor belts move, the projections secured to the infeed conveyor belts move from the front surface side to the back surface side. Because of this, the product G placed on the weigh scale is pushed out onto the support members 33 of the lifter mechanism 30 (see FIG. 14).

[0075] Meanwhile, the film F that has been handed over by the film feed mechanism 5 from the film roll R to the film conveyance and holding mechanism 6 is carried to over the lifter mechanism 30 by the conveyance devices 22 of the first unit 61 and the second unit 62. Then, over the lifter mechanism 30, both width direction end portions of the film F become held by activation of the clamp members 250 to 252.

[0076] Then, the ball screw mechanism 34 pushes the product G and the tray T resting on the lifter mechanism 30 against the film F held by the clamp members 250 to 252 (see FIG. 15). Because of this, the film F held by the clamp members 250 to 252 stretches so as to cover the upper portion of the product G and the tray T.

[0077] In this state, when the rear tucking plate 78 and the right and left tucking plates 76 and 77 move horizontally under the tray T, the five clamp members other than the central clamp member 251 of the front surface-side clamp mechanism 23b cancel their holding of the film F at an appropriate timing, and three peripheral sides of the film F become tucked under the tray T (see FIG. 15). Then, when the discharge pusher 75 pushes out the tray T toward the sealing mechanism 8, the one side of the film F on the front surface side that was not tucked hits the front tucking rod 79 and becomes tucked under the tray T as the tray T moves toward the sealing mechanism 8. It will be noted that the central clamp member 251 of the front surface-side clamp mechanism 23b at this time cancels its holding of the film F. Furthermore, as the tray T moves, the film F tucked under the tray T is heat-sealed by heat rollers of the sealing mechanism 8 (see FIG. 16), and when the tray T is discharged to the position shown in FIG. 17 (when the tray T is discharged to the discharge table 11), the wrapping is finished and the film F entirely covers the product G and the tray T.

[0078] Moreover, the price, weight, and so forth of the product that have been calculated on the basis of the weighed value in the control device 9 are printed on a label by the label printer 15. Then, the label is affixed by the label issuer 16 to the tray T that has finished being wrapped.

(2-2) Conveyance of Film F

[0079] Next, the conveyance of the film F, and the holding of the film after the conveyance, by the film conveyance and holding mechanism 6 will be described with reference to FIG. 18.

[0080] At the stage before the film insertion plate unit 51 that holds the distal end of the film F approaches by horizontal movement, the receiving units 230 of the film conveyance and holding mechanism 6 are in the second posture in which activation of the eleventh solenoid 61a and the twenty-first solenoid 62a is cancelled. That is, the distal end portions of the receiving units 230 are pushed up using the shaft members 231a as spindles, so that the gripping components of the upper belts 221 are out of contact with the film.

[0081] In this state, when the film insertion plate unit 51 approaches by horizontal movement, the eleventh solenoid 61a and the twenty-first solenoid 62a are driven so that the gripping components of the upper belts 221 come into contact with the film (step S1). Next, the driving of the fifteenth solenoid 61e and the twenty-fifth solenoid 62e of the belt pressing mechanisms 90 is cancelled, so that the pressing members 221e of the belt pressing mechanisms 90 press down the lower-side belts of the upper belts 221 using the force of the spring members (step S2). This is the state shown in FIG. 10, in which the gap dimension G2 between the lower-side belts of the upper belts 221 and the upper-side belts of the lower belts 222 in the neighborhoods of the receiving units 230 becomes relatively smaller.

[0082] Next, the drive motor 65a of the conveyance drive unit 65 is activated to rotate the endless upper belts 221 and lower belts 222 of the units 61 and 62 and horizontally convey the film F to the upper portion of the wrapping station 3 (step S3). At this time, because the gap dimension G2 between the lower-side belts of the upper belts 221 and the upper-side belts of the lower belts 222 is relatively small, conveyance becomes carried out in a state in which the film F is in suitably close contact with both belts 221 and 222.

[0083] When the film F is conveyed a predetermined amount, the drive motor 65a of the conveyance drive unit 65 stops and the conveyance of the film F is finished (step S4). Next, the wrapping is carried out, but during this wrapping, in view of the fact that wrapping cannot be done well if the film F is being subjected to excessive restraint by the upper belts 221 and the lower belts 222 for conveyance, the fifteenth solenoid 61e and the twenty-fifth solenoid 62e of the belt pressing mechanisms 90 are driven when the conveyance is finished (step S5). Because of this, the distal end sections of the pressing members 221e of the belt pressing mechanisms 90 move upward, the pressing on the lower-side belts of the upper belts 221 is cancelled (see FIG. 9), and the belt pressing mechanisms 90 no longer apply force to the upper belts 221. That is, because of step S5, the degree with which the film F is restrained by the upper belts 221 and the lower belts 222 becomes extremely small.

[0084] At the same timing as step S5, in preparation for the wrapping, the six solenoids consisting of the twelfth solenoid 61b, the thirteenth solenoid 61c, the fourteenth solenoid 61d, the twenty-second solenoid 62b, the twenty-third solenoid 62c, and the twenty-fourth solenoid 62d provided in correspondence to the clamp members 250, 251, and 252 of the clamp device 23 are driven (step S6). The timing of step S6 may also be earlier than the timing of step S5.

[0085] After this, as described above, the product G and the tray T resting on the lifter mechanism 30 are pushed up against the film F held by the clamp members 250 to 252, and the wrapping begins.

(2-3) Control of Forward and Rearward Movement of Units 61 and 62 Corresponding to Film Width

[0086] Next, the deciding of the front-rear positions of the first unit 61 and the second unit 62 of the film conveyance and holding mechanism 6 will be described with reference to FIG. 19.

[0087] The control device 9 acquires information relating to the product G from an internal storage device or from the outside. This information includes information relating to the type and dimension of the film F to be used for wrapping. In this control, the control device 9 acquires the width dimension of the film F to be used (step S11).

[0088] The control device 9 has built-in data of proper wrapping conditions corresponding to the width dimension of the film F. The proper wrapping conditions include conditions relating to the positions at which the film F should be held by the upper belts 221 and the lower belts 222 during conveyance of the film F. Specifically, first distances and second distances are set with respect to several prescribed width dimensions of the film F. The first distances are a distance WS1a and a distance WS1b shown in FIG. 20, and are front-rear distances between the proper position in which the belts 221 and 222 of the first unit 61 should hold the film F and the front surface-side end edge of the film F. The second distances are a distance WS2a and a distance WS2b shown in FIG. 20, and are front-rear distances between the proper position in which the belts 221 and 222 of the second unit 62 should hold the film F and the back surface-side end edge of the film F. In the example shown in FIG. 20, when the width dimension of the film F is FW1, the first distance is WS1a and the second distance is WS2a. Furthermore, when the width dimension of the film F is FW2 (FW2 > FW1), the first distance is WS1b (WS1b > WS1a) and the second distance is WS2b (WS2b > WS2a). That is, the control device 9 increases the first distance and the second distance when the width dimension of the film F increases.

[0089] The control device 9 decides the first distance and the second distance on the basis of the data of the proper wrapping conditions corresponding to the width dimension of the film F (step S12).

[0090] Then, the control device 9 decides the front-rear position of the first unit 61 corresponding to the first distance (step S13) and decides the front-rear position of the second unit 62 corresponding to the second distance (step S14). Next, the control device 9 activates the drive motors 63a and 64a of the unit moving devices 63 and 64 in order to set the units 61 and 62 in those front-rear positions (step S15).

[0091] It will be noted that the front-rear position of the first unit 61 is decided in the range of the width of the cutouts 53a in the two plate members 57a and 58a (or the two plate members 57b and 58b). In a conventional stretch wrapping machine, the width of the cutouts 53a is narrow and the first unit 61 has practically been unable to be moved forward and backward. However, in the

stretch wrapping machine 1 pertaining to the present embodiment, the width dimension of the cutouts 53a is made larger than the width dimension of the other cutouts 53b to 53h, and the first unit 61 can be shifted somewhat in the front-rear direction (the width direction of the film F). Because of this, it is possible to set the first distance to WS1a or WS2a for example (see FIG. 20).

(3) Characteristics of Stretch Wrapping machine 1

(3-1)

[0092] The stretch wrapping machine 1 pertaining to the present embodiment is equipped with the conveyance devices 22 of the film conveyance and holding mechanism 6, the clamp device 23, the lifter mechanism 30 and the tucking mechanism 7 that serve as a wrapping component, and the control device 9. Furthermore, the conveyance devices 22 have the belt conveyance units 220, which include the upper belts 221 and the lower belts 222, and the belt pressing mechanisms 90. Additionally, the pressing members 221e of the belt pressing mechanisms 90 apply force to the upper belts 221 so that the force with which the upper belts 221 and the lower belts 222 sandwich the film F increases. Additionally, the control device 9 controls the belt pressing mechanisms 90 so that during the conveyance of the film F the force resulting from the belt pressing mechanisms 90 acts on the upper belts 221 and so that after the conveyance of the film F the force resulting from the belt pressing mechanisms 90 that had acted on the upper belts 221 is cancelled (see steps S2 and S5 in FIG. 18).

[0093] Because the stretch wrapping machine 1 employs this configuration, during the conveyance of the film F the force from the belt pressing mechanisms 90 acts on one (the upper belts 221) of the upper belts 221 and the lower belts 222 that sandwich the end portions of the film F. For this reason, the force with which both belts 221 and 222 sandwich the film F becomes stronger. Because of this, the conveyance of the film F is carried out stably. After the conveyance of the film F the force that had acted on the upper belts 221 from the belt pressing mechanisms 90 is cancelled, so the conveyed film F is no longer excessively restrained by both belts 221 and 222, and the wrapping with the film F held by the clamp devices 23 is also carried out excellently.

(3-2)

[0094] In the stretch wrapping machine 1 pertaining to the present embodiment, the force that had acted on the upper belts 221 from the belt pressing mechanisms 90 is cancelled prior to the wrapping, so the wrapping can be started in a state in which the film F is not being excessively restrained by both belts 221 and 222. Because of this, the wrapping is stable.

(3-3)

[0095] The clamp devices 23 of the film conveyance and holding mechanism 6 of the stretch wrapping machine 1 pertaining to the present embodiment have the six clamp members 250, 251, and 252 and the strips 23a. The lower surfaces of the clamp members 250, 251, and 252 are holding surfaces (first holding surfaces) that hold the film F. The upper surfaces of the strips 23a are holding surfaces (second holding surfaces) that hold the film F and oppose the lower surfaces of the clamp members 250, 251, and 252. Additionally, the clamp members 250, 251, and 252 and the strips 23a hold the film F by sandwiching sections of the film F other than the sections of the film F positioned between the upper belts 221 and the lower belts 222. Specifically, the clamp members 250, 251, and 252 and the strip 23a of the front surface-side clamp mechanism 23b hold the film F further on the back surface side than the upper belt 221 and the lower belt 222 of the first unit 61, and the clamp members 250, 251, and 252 and the strip 23a of the back surface-side clamp mechanism 23c hold the film F further on the front surface side than the upper belt 221 and the lower belt 222 of the second unit 62 (see FIG. 11).

[0096] In the stretch wrapping machine 1 employing this configuration, the sections of the film F held by the clamp devices 23 are not the sections of the film F between the upper belts 221 and the lower belts 222 but are located in positions away from those sections. For this reason, the positions of the sections of the film F held by the clamp devices 23 can be set in positions suitable for the wrapping.

(3-4)

[0097] In the stretch wrapping machine 1 pertaining to the present embodiment, the areas in which the pressing members 221e of the belt pressing mechanisms 90 contact the upper belts 221—that is, the areas of the pressing surfaces of the pressing members 221e—are small. The areas in which the clamps 250, 251, and 252 contact the film F are larger than the areas of the pressing surfaces of the pressing members 221e.

[0098] Because the stretch wrapping machine 1 employs this configuration, the clamp devices 23 can strongly hold the film F when pushing the tray T and the product G against the film F during the wrapping.

[0099] Furthermore, during the conveyance of the film F, frictional resistance between the pressing surfaces of the pressing members 221e and the upper belts 221 can be kept down because the areas of the pressing surfaces of the pressing members 221e of the belt pressing mechanisms 90 are small. Because of this, the movement of the upper belts 221 becomes smooth, and in the stretch wrapping machine 1 the conveyance of the film F is stable.

(3-5)

[0100] The film conveyance and holding mechanism 6 of the stretch wrapping machine 1 pertaining to the present embodiment is equipped with the first unit 61, which uses the upper belt 221 and the lower belt 222 to hold the front surface-side end portion of the film F and convey the film F, and the second unit 62, which uses the upper belt 221 and the lower belt 222 to hold the back surface-side end portion of the film F and convey the film F. Moreover, in the film conveyance and holding mechanism 6, the first unit 61 is configured to move in the width direction of the film F by activation of the first unit moving device 63 and the second unit 62 is configured to move in the width direction of the film F by activation of the second unit moving device 64. Additionally, the control device 9 decides the first distance and the second distance on the basis of the data of the proper wrapping conditions corresponding to the width dimension of the film F (see step S12 in FIG. 18) and causes the first unit 61 and the second unit 62 to move to positions corresponding to the first distance and the second distance.

[0101] In the stretch wrapping machine 1 employing this configuration, the distances (the first distance and the second distance) from the end edges of the film F in the sections of the film F sandwiched by both belts 221 and 222 of each unit 61 and 62 can be set to appropriate distances in accordance with the width dimension of the film. Because of this, slackness in the film F during the conveyance of the film F is reduced and therefore the conveyance of the film F is stable.

[0102] Specifically, the control device 9 increases the first distance and also increases the second distance when the width dimension of the film F increases (see FIG. 20). That is, in the stretch wrapping machine 1, the first distance and the second distance increase when the width dimension of the film F increases, so each unit 61 and 62 conveys the film F while sandwiching, with both belts 221 and 222, sections of the film F positioned more inward in the film width direction when the width dimension of the film F is large than when it is small. Because of this, there is less sagging in the film width direction central section of the film F, and the conveyance of the film F is stable.

(4) Example Modifications

[0103] An embodiment of the present invention has been described above on the basis of the drawings, but the specific configurations are not limited to the embodiment and can be changed to the extent that they do not depart from the spirit of the invention.

(4-1) Example Modification A

[0104] In the embodiment, the force resulting from the belt pressing mechanisms 90 acts on the upper belts 221, but it is also possible to employ belt pressing mech-

anisms that press the lower belts 222 up toward the upper belts 221.

(4-2) Example Modification B

[0105] In the embodiment, the belt pressing mechanism 90 of each unit 61 and 62 uses one pressing member 221e to press the upper belt 221, but it is also possible to employ a belt pressing mechanism having plural pressing members. In a case where pressing members are provided in several places along the conveyance direction of the film F, the film holding force during the conveyance by the pair of upper and lower belts can be increased.

(4-3) Example Modification C

[0106] To the stretch wrapping machine 1 of the embodiment may also be added a blower device 300 that further improves the stability of the conveyance of the film F. As shown in FIG. 21, it is preferred that the blower device 300 be disposed in the section where conveyance is started by the film conveyance and holding mechanism 6—that is, in the space above the receiving units 230—and gently blow air toward the leading end of the film when conveyance starts. When the downward air flow indicated by arrow A2 in FIG. 21 hits the leading end of the film F when conveyance starts, the leading end of the film F faces a little downward during conveyance, and the leading end of the film F is kept from curling up while the film F is conveyed.

[0107] In this way, the phenomenon of up-floating of the leading end of the film F upward during conveyance is controlled, so that there no longer arise troubles such as the leading end of the film F getting caught on the right and left tucking plates 76 and 77 of the tucking mechanism 7.

[0108] It will be noted that although it is also conceivable to use a metal guide member to prevent up-floating of the leading end of the film F upward during conveyance, in that case contact between the film F and the guide member impairs the stability of the conveyance of the film F and ends up creating resistance. With the stretch wrapping machine pertaining to example modification C, the stability of the conveyance of the film is virtually not impaired.

REFERENCE SIGNS LIST

[0109]

1 Stretch Wrapping machine
3 Wrapping Station (Wrapping Component)
7 Tucking Mechanism (Wrapping Component)
9 Control Device (Control Component)
22 Conveyance Device (Conveyance Component) of Film Conveyance and Holding Mechanism
23 Clamp Device (Holding Component) of Film Con-

veyance and Holding Mechanism

23a Strip (Second Holding Member of Holding Component) 30 Lifter Mechanism (Wrapping Component)

61e Fifteenth Solenoid (Drive Component of Force Applying Component)

62e Twenty-Fifth Solenoid (Drive Component of Force Applying Component)

90 Belt Pressing Mechanism 90 (Force Applying Component)

61 First Unit (First Conveyance Unit) of Film Conveyance and Holding Mechanism

62 Second Unit (Second Conveyance Unit) of Film Conveyance and Holding Mechanism

63 First Unit Moving Device (First Unit Moving Component)

64 Second Unit Moving Device (Second Unit Moving Component)

220 Belt Conveyance Unit (First Conveyance Unit; Second Conveyance Unit)

221 Upper Belt (First Belt; Third Belt)

221e Pressing Member (Pressing Member of Force Applying Component)

222 Lower Belt (Second Belt; Fourth Belt)

250 First Side Clamp Member (First Holding Member of Holding Component)

251 Central Clamp Member (First Holding Member of Holding Component)

252 Second Side Clamp Member (First Holding Member of Holding Component)

F Film

FW1 Width Dimension of Film

FW2 Width Dimension of Film

G Product (Wrapping Item)

T Tray (Wrapping Item)

WS1a, WS1b First Distances

WS2a, WS2b Second Distances

CITATION LIST

<Patent Literature>

[0110] Patent Document 1: JP-A No. 2006-327670

Claims

1. A stretch wrapping machine comprising:

a conveyance component configured to convey film pulled out from a film roll;
a holding component configured to hold the film conveyed by the conveyance component;
a wrapping component configured to push a wrapping item against the film held by the holding component and use the film to wrap the wrapping item; and
a control component configured to control the

- operations of the conveyance component, the holding component, and the wrapping component;
wherein
the conveyance component has
- a first conveyance unit including a first belt and a second belt that are configured to sandwich an end portion of the film, and a force applying component configured to apply force to the first belt so as to increase the force with which the first belt and the second belt sandwich the film; and
- the control component configured to control the force applying component:
- so that, during the conveyance of the film by the conveyance component, the force resulting from the force applying component acts on the first belt, and
so as to cancel the force after the conveyance of the film by the conveyance component, the force resulting from the force applying component and having acted on the first belt.
2. The stretch wrapping machine according to claim 1, wherein
after the conveyance of the film by the conveyance component, the control component is configured to have the holding component hold the film, and cause the wrapping by the wrapping component to be carried out in a state in which the force is cancelled, the force resulting from the force applying component and having acted on the first belt.
3. The stretch wrapping machine according to claim 1 or 2, wherein
the holding component has a first holding member with a first holding surface and a second holding member with a second holding surface that is opposite to the first holding surface; and
the first holding member and the second holding member are configured to hold the film by sandwiching a section of the film other than the section of the film positioned between the first belt and the second belt.
4. The stretch wrapping machine according to claim 3, wherein
the force applying component has a pressing member with a pressing surface that is configured to press the first belt and a drive component that is configured to move the pressing member; and
the area of the pressing surface of the pressing member is smaller than that of the first holding surface of the first holding member.
5. The stretch wrapping machine according to any one of claims 1 to 4, wherein
the first conveyance unit is configured to use the first belt and the second belt to sandwich the end portion of the film, and convey the film, the end portion being one end portion of the film;
the conveyance component further has a second conveyance unit that is configured to use a third belt and a fourth belt to sandwich another end portion of the film, and convey the film;
the stretch wrapping machine further comprises:
- a first unit moving component configured to cause the first conveyance unit to move in a film width direction intersecting a conveyance direction of the film, and
a second unit moving component configured to cause the second conveyance unit to move in the film width direction; and
- the control component is configured to control, in accordance with the width dimension of the film,
- the first unit moving component to change a first distance which is a distance from one end edge of the film in the one end portion of the film sandwiched by the first belt and the second belt of the first conveyance unit, and
the second unit moving component to change a second distance which is a distance from another end edge of the film in the other end portion of the film sandwiched by the third belt and the fourth belt of the second conveyance unit.
6. The stretch wrapping machine according to claim 5, wherein
the control component is configured to increase the first distance and increase the second distance in accordance with an increase of the width dimension of the film.

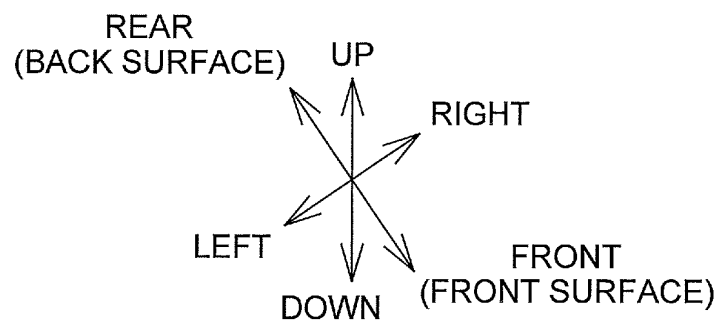
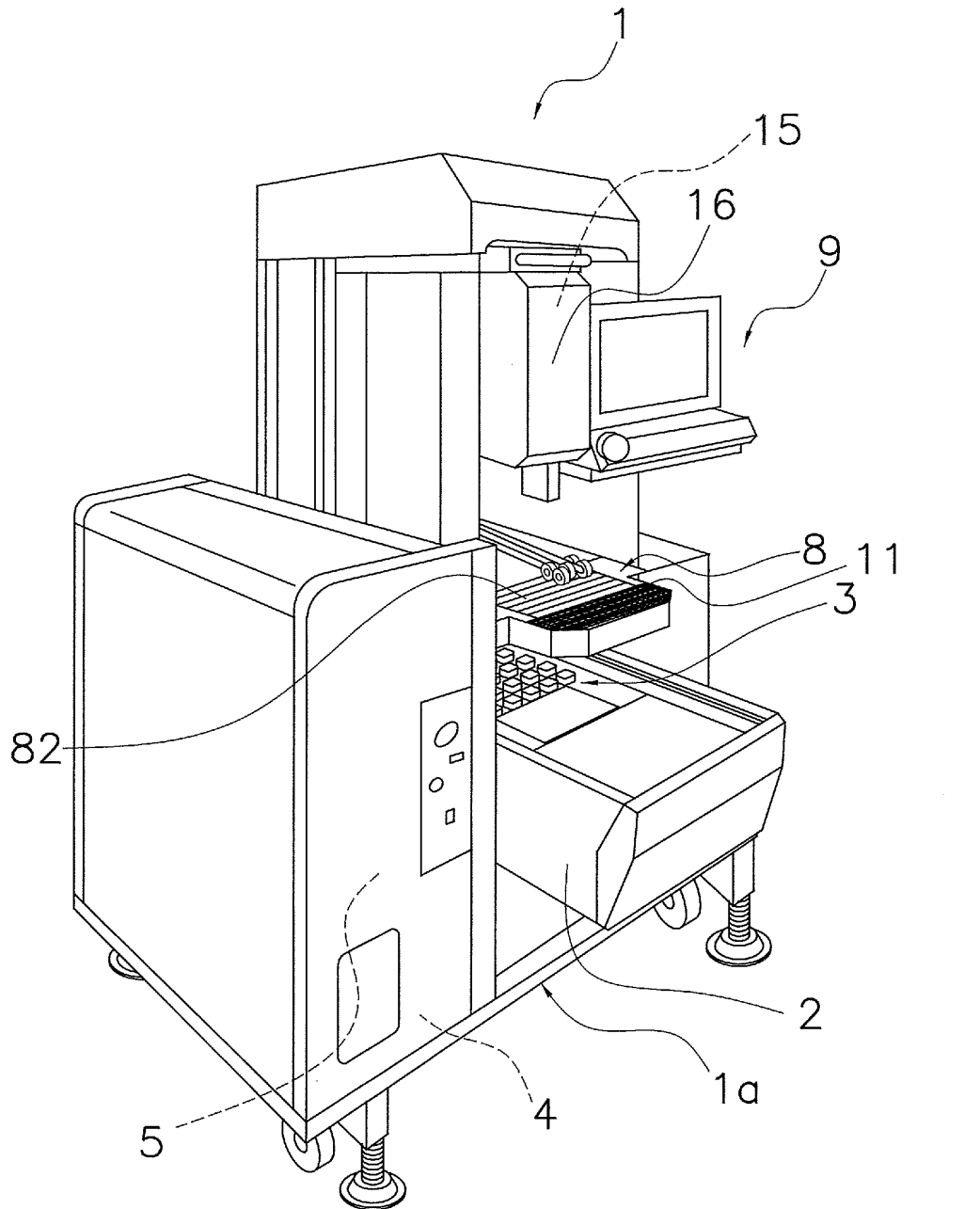


FIG. 1

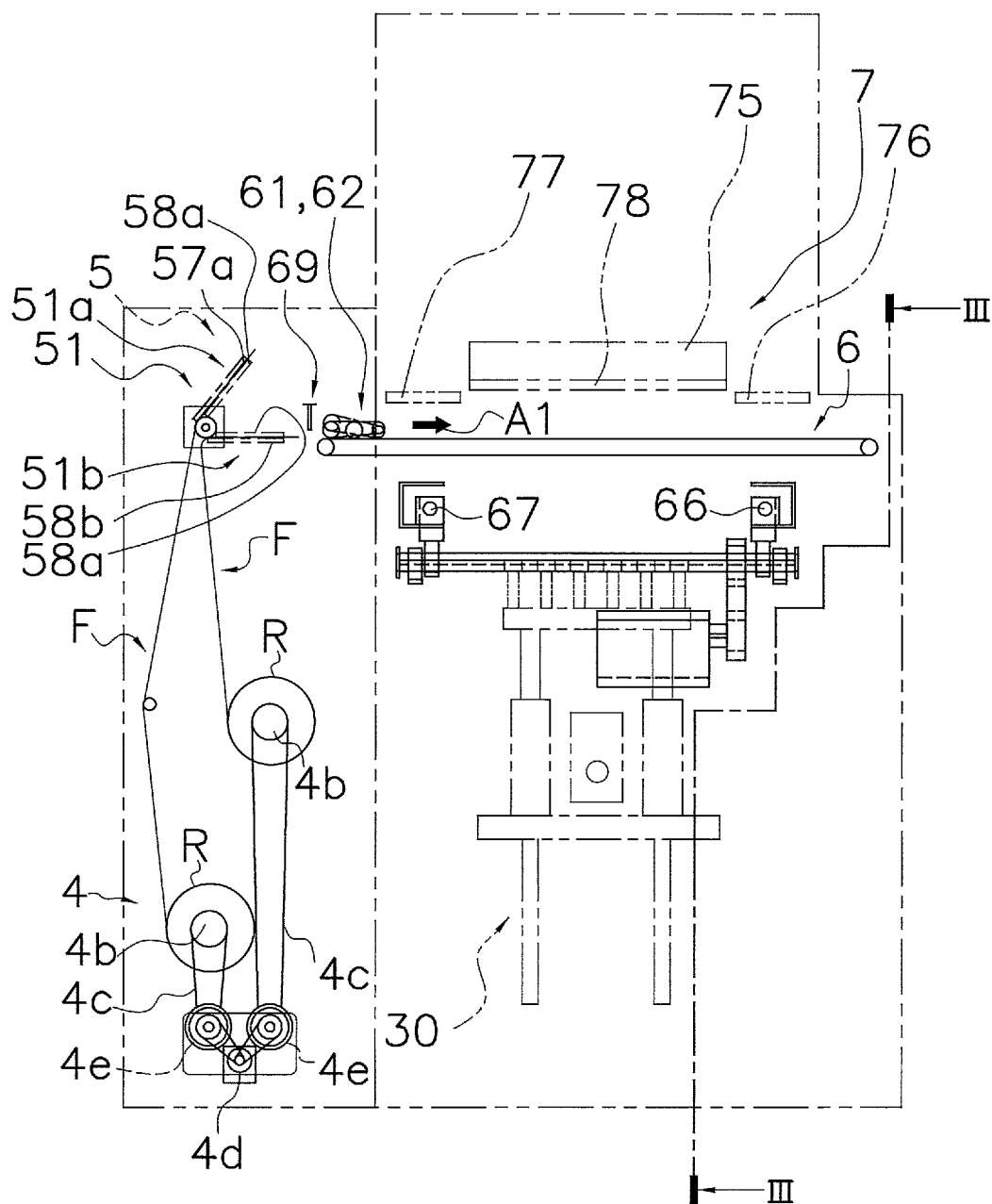


FIG. 2

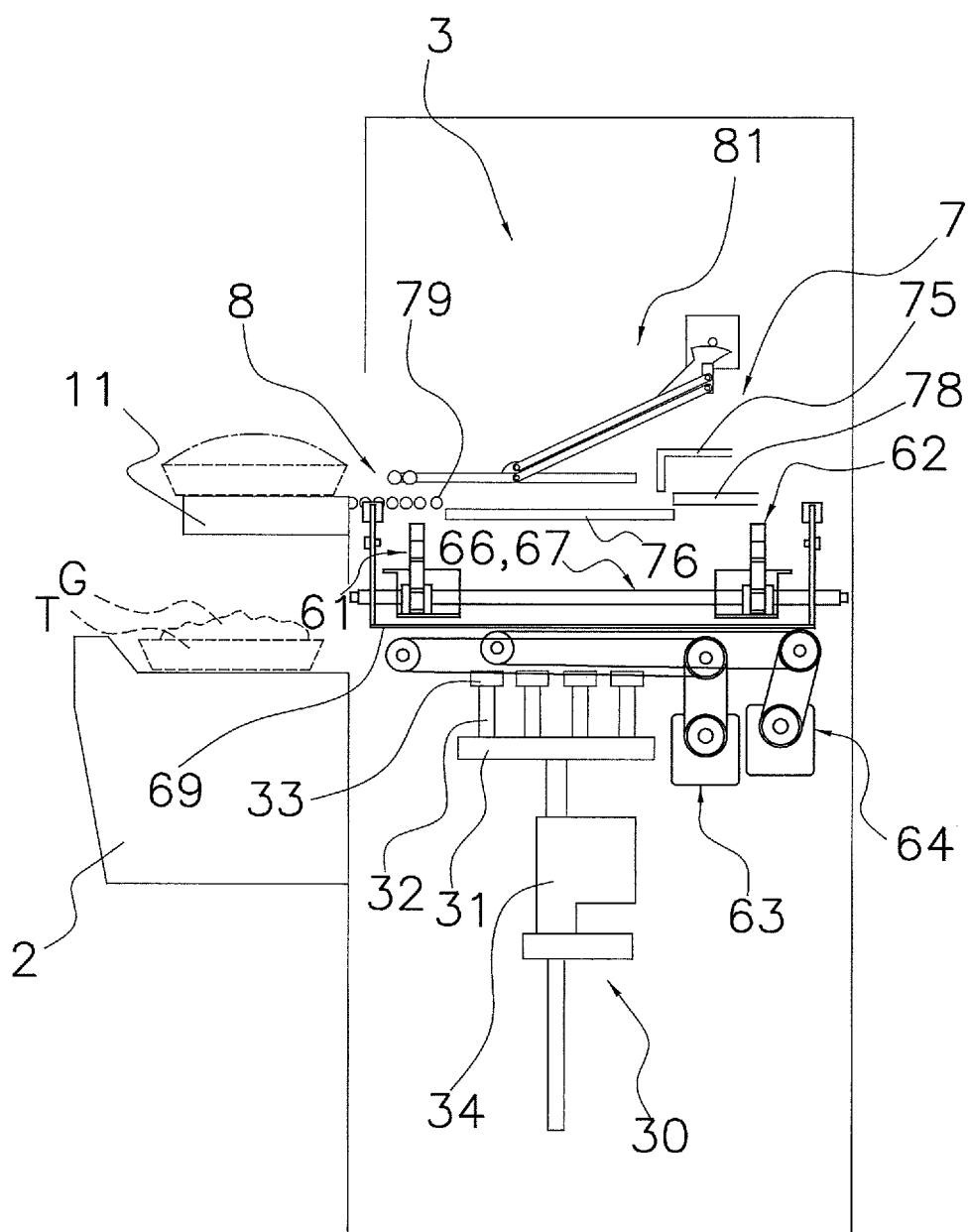


FIG. 3

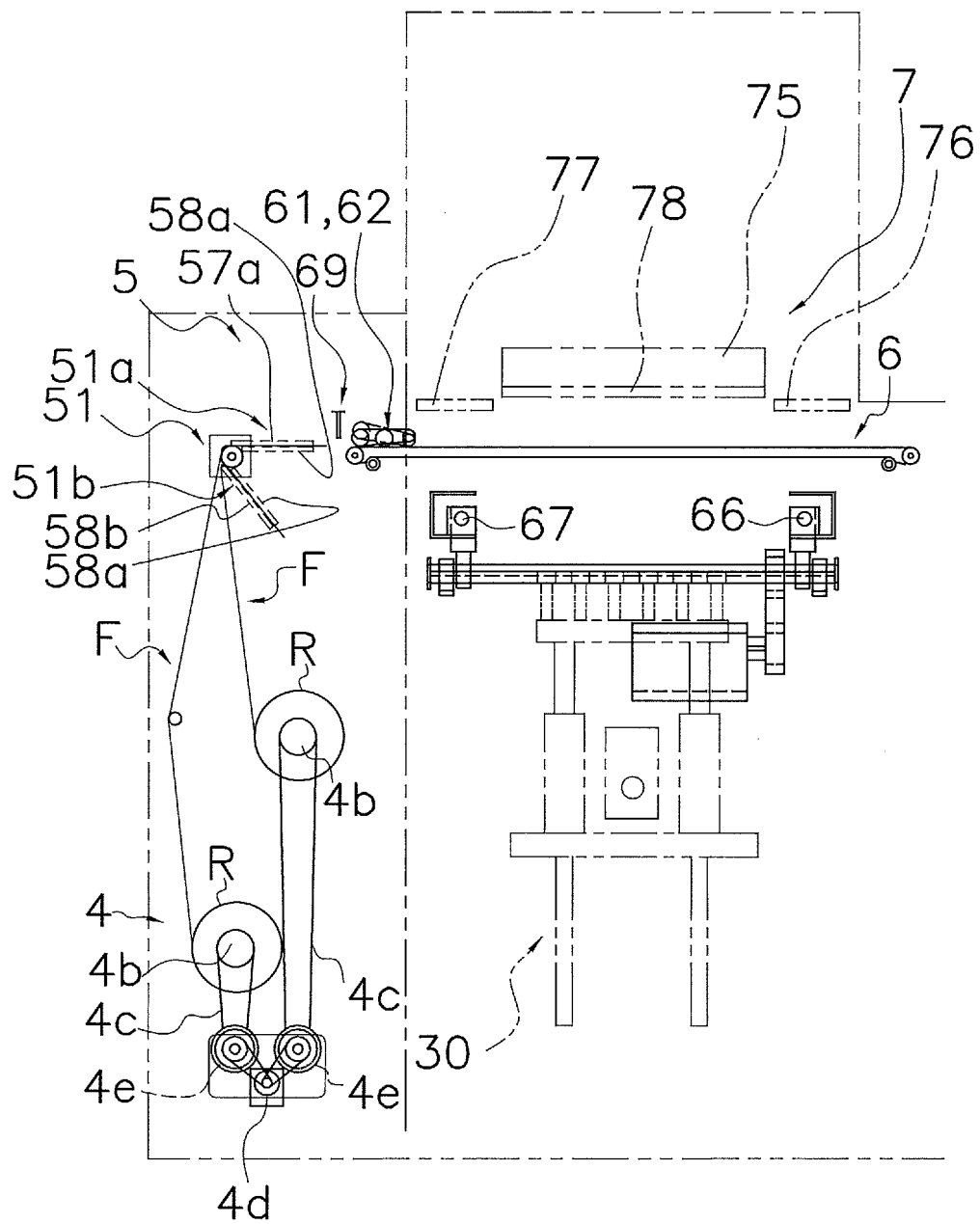


FIG. 4

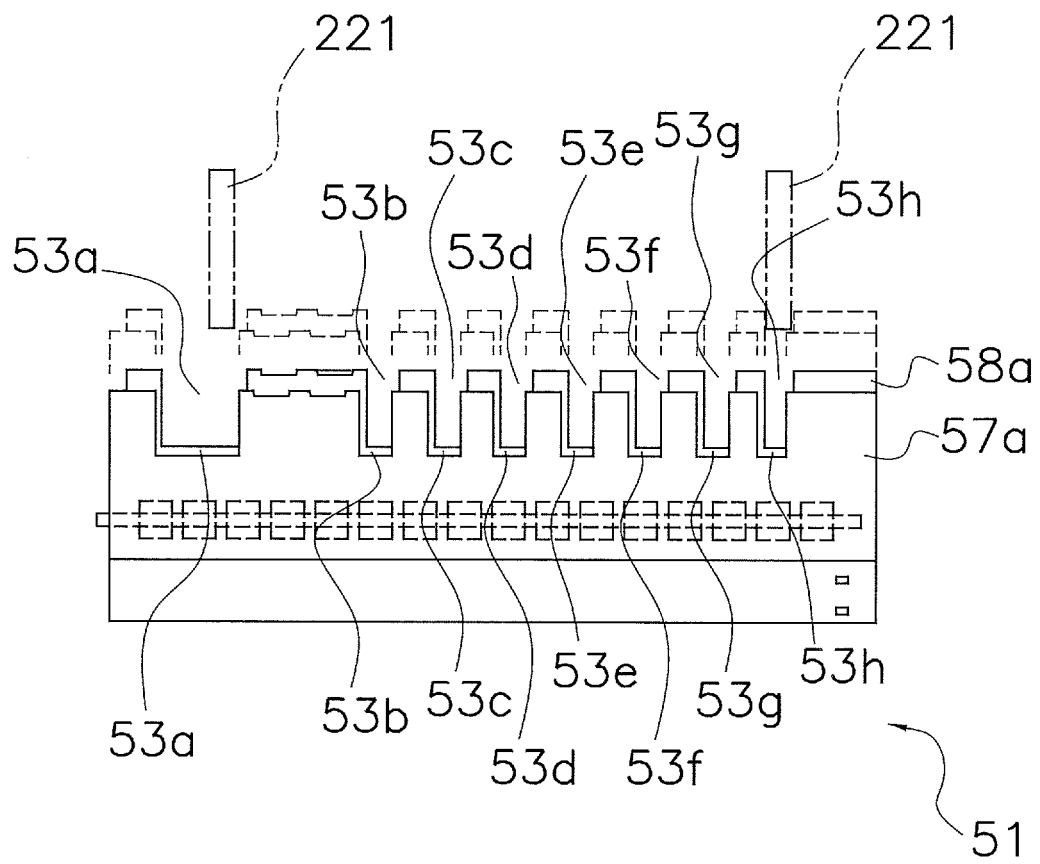


FIG. 5

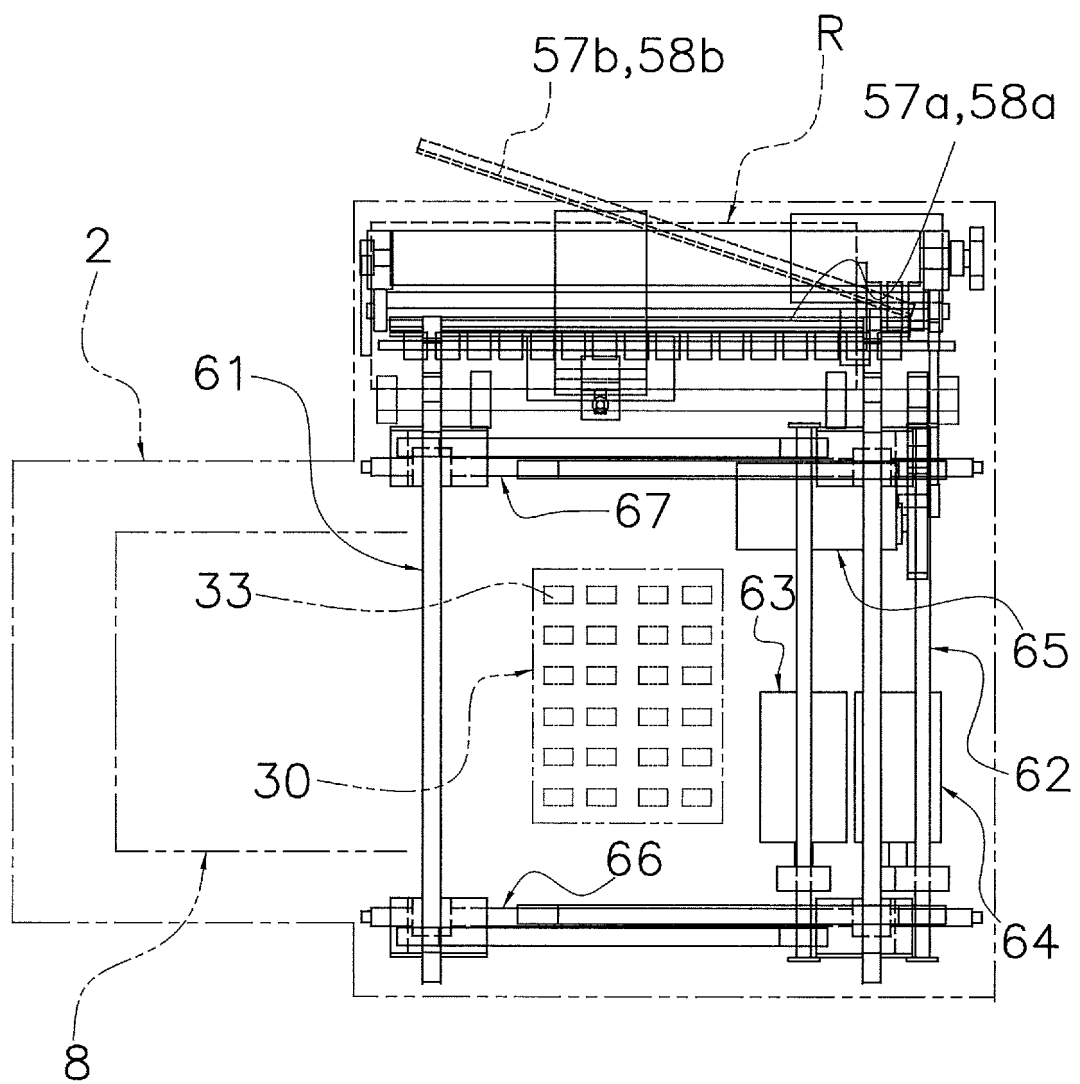


FIG. 6

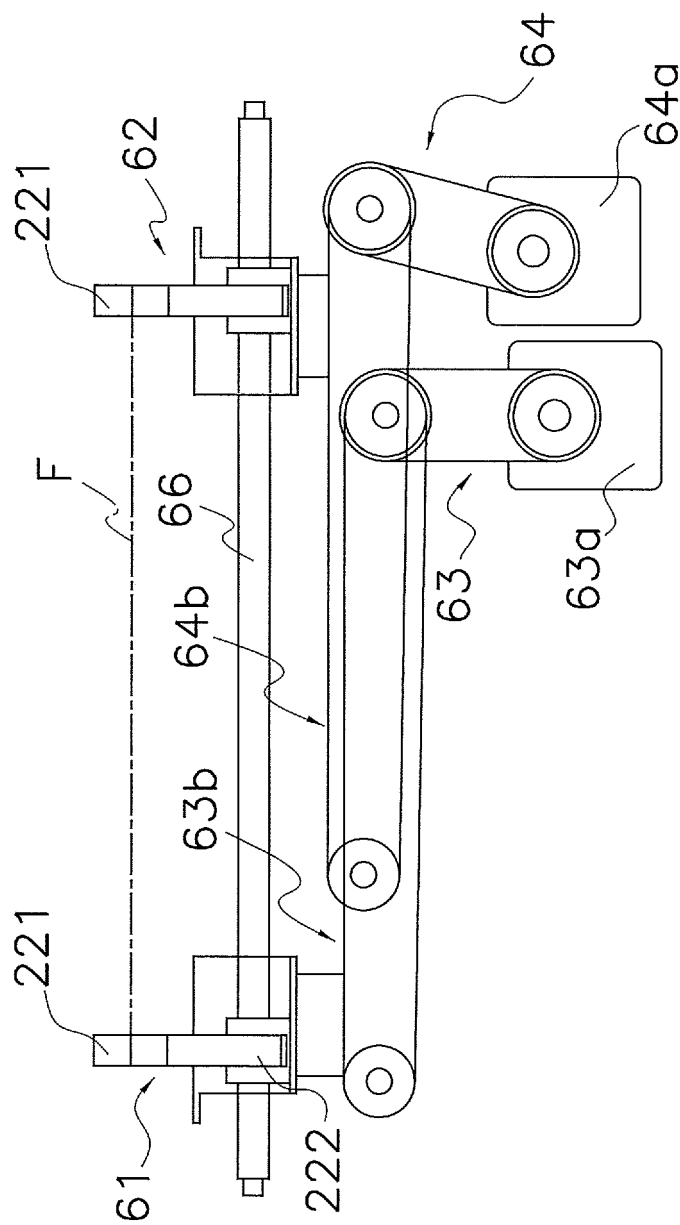


FIG. 7

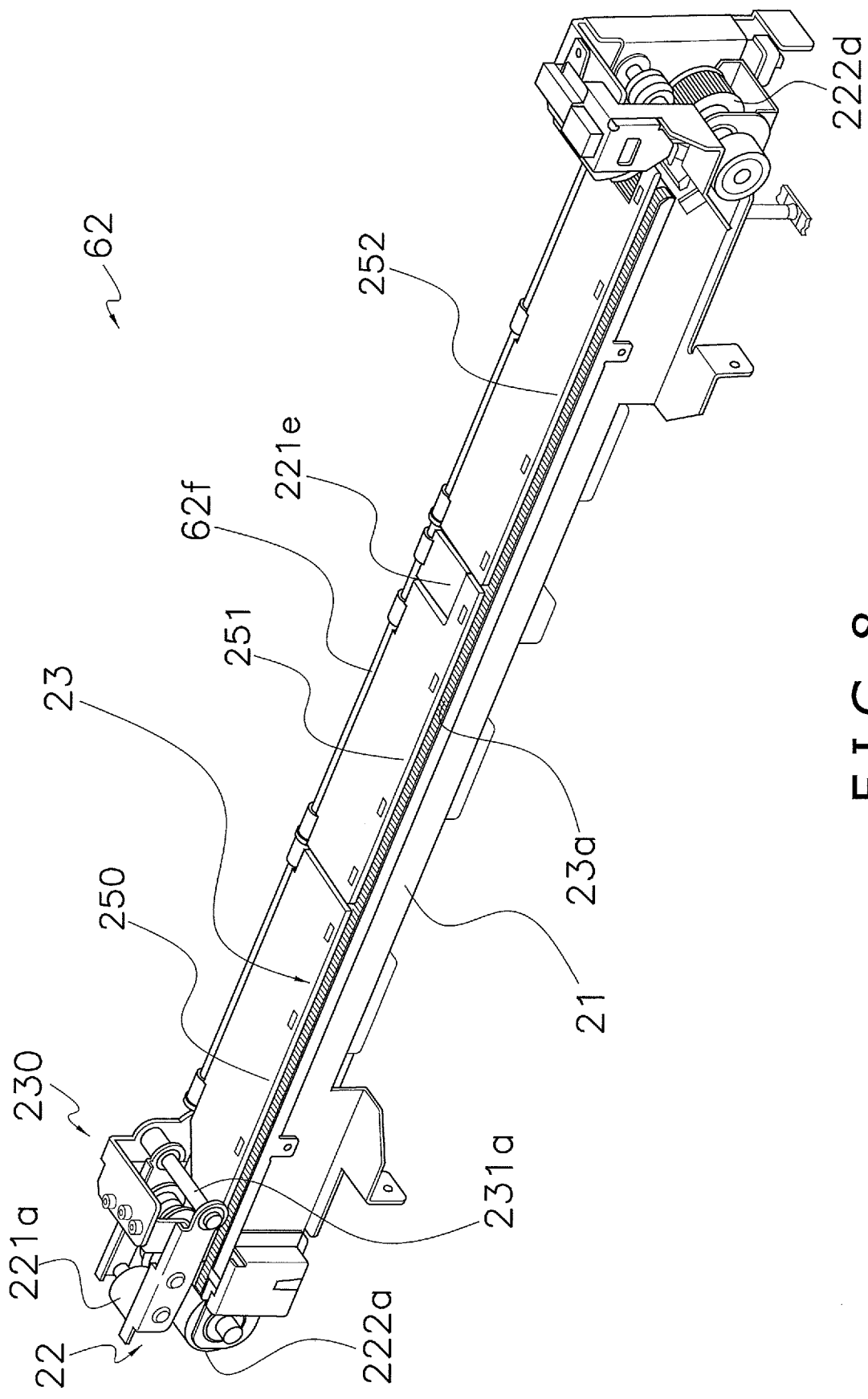


FIG. 8

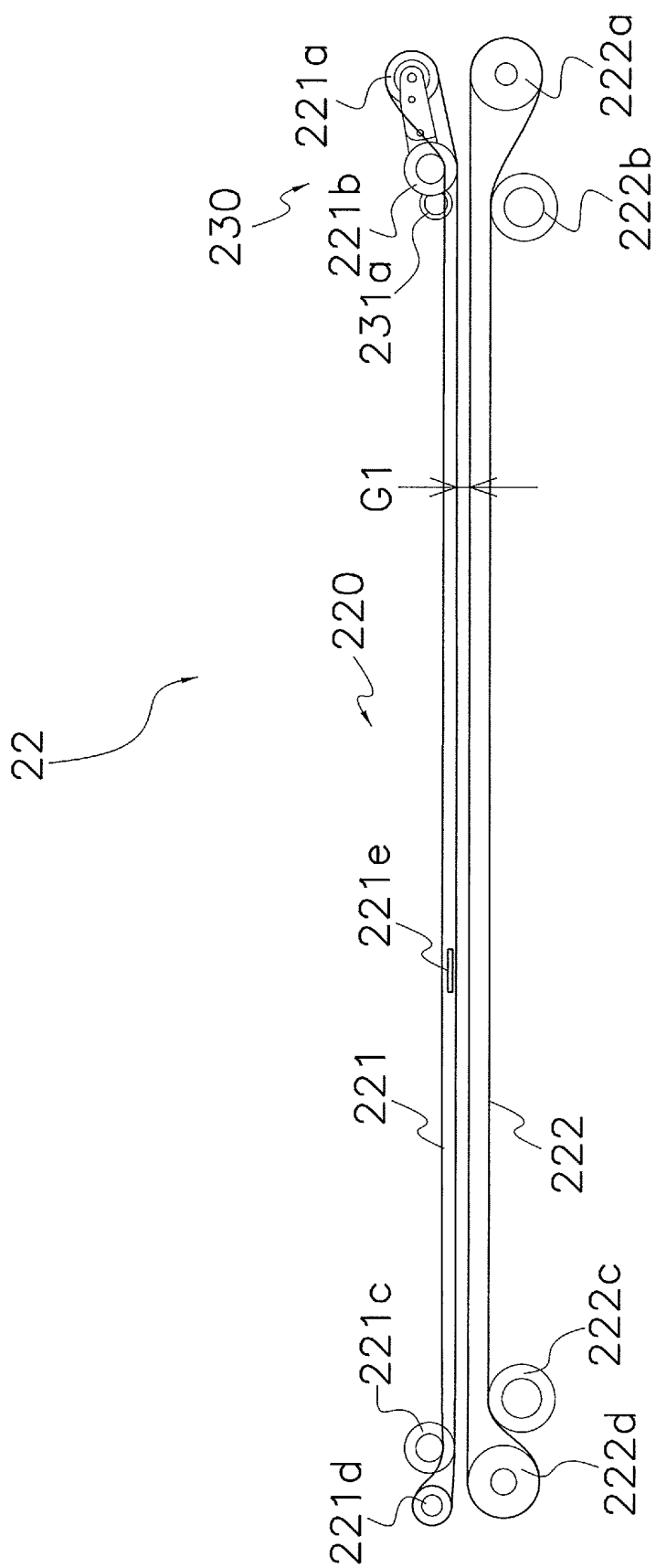


FIG. 9

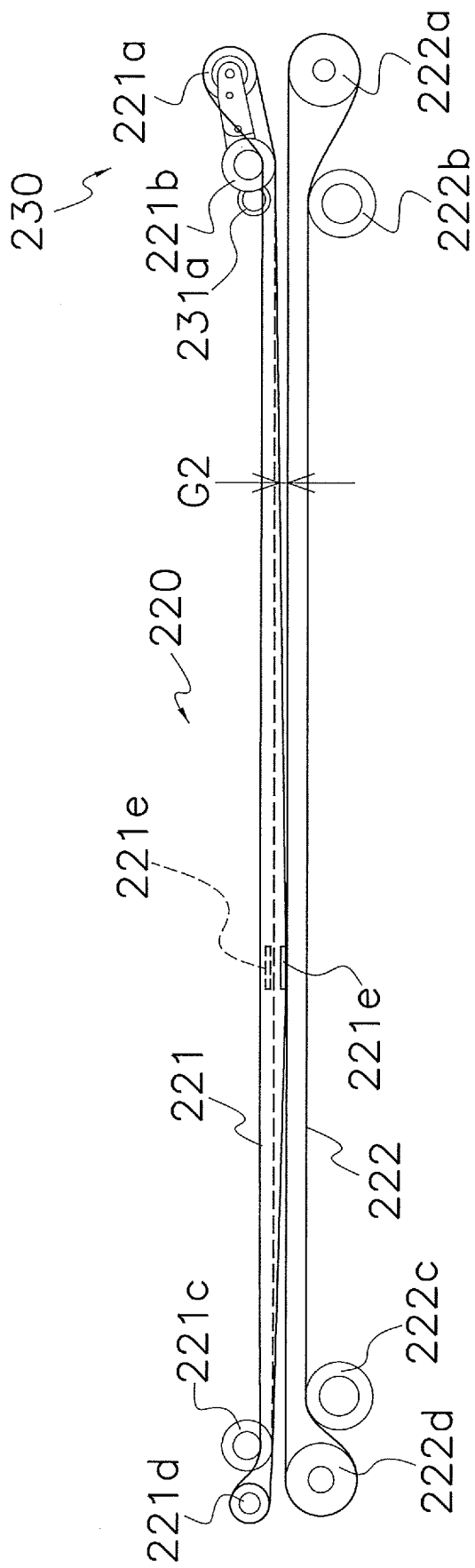


FIG. 10

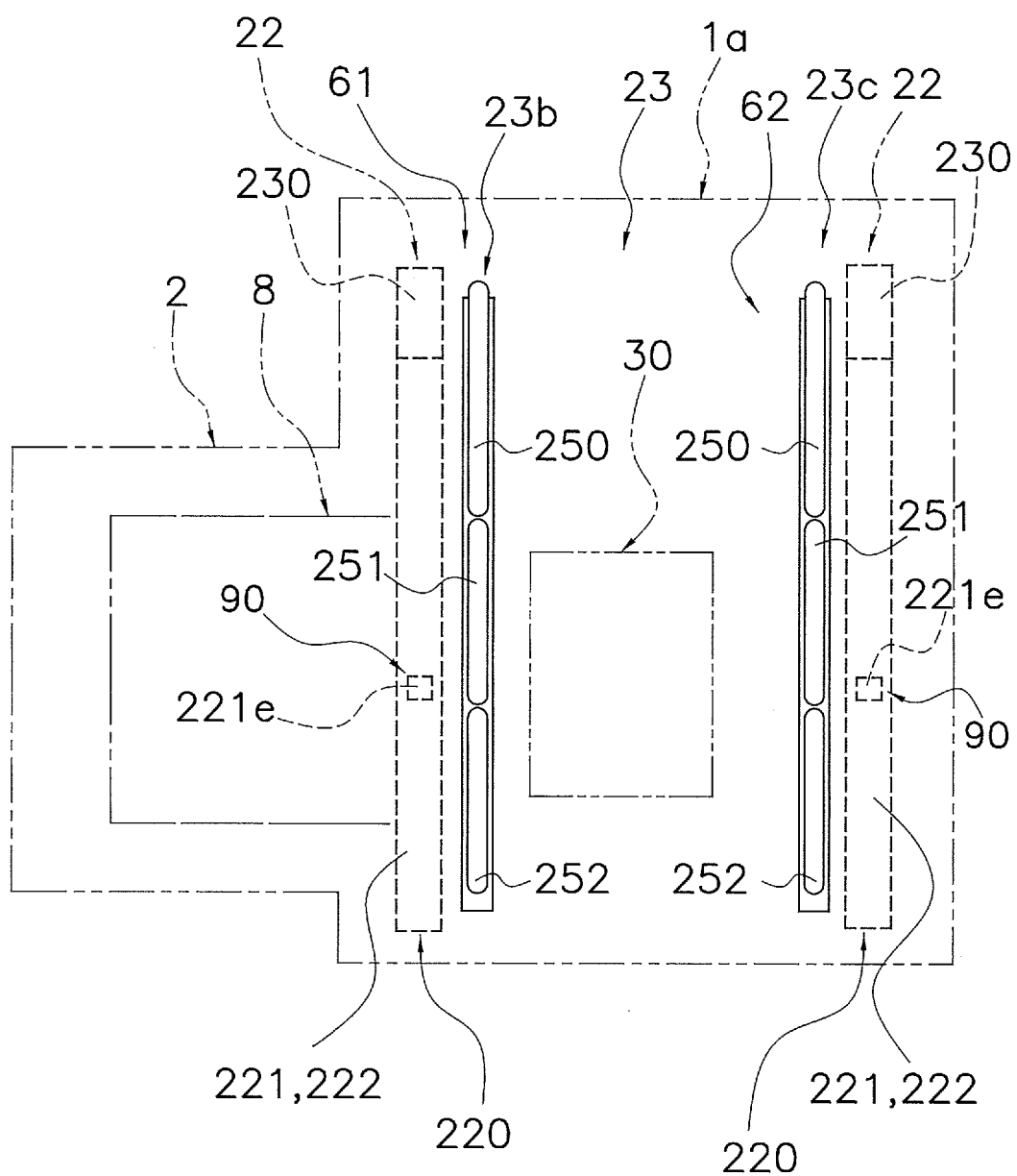


FIG. 11

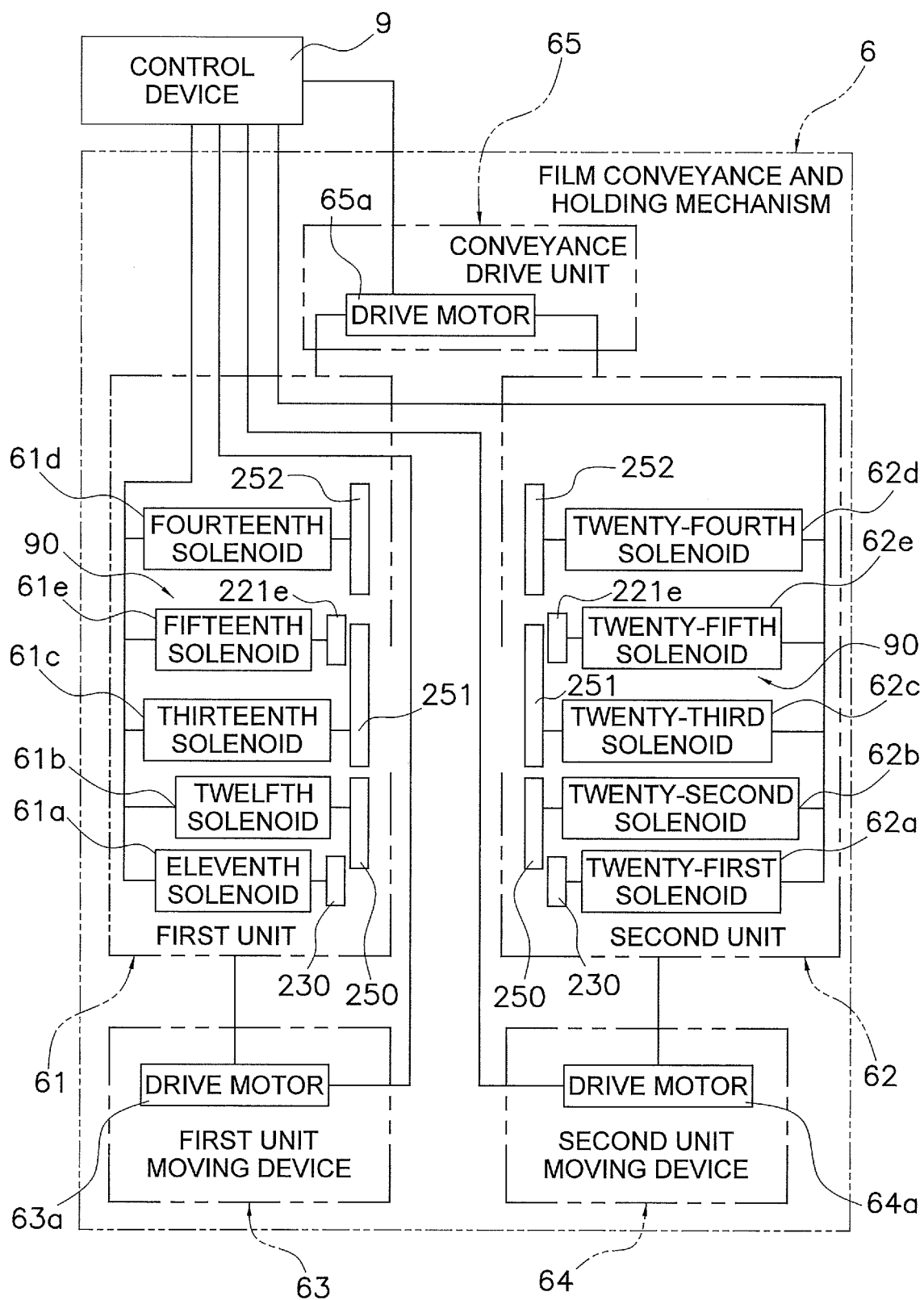


FIG. 12

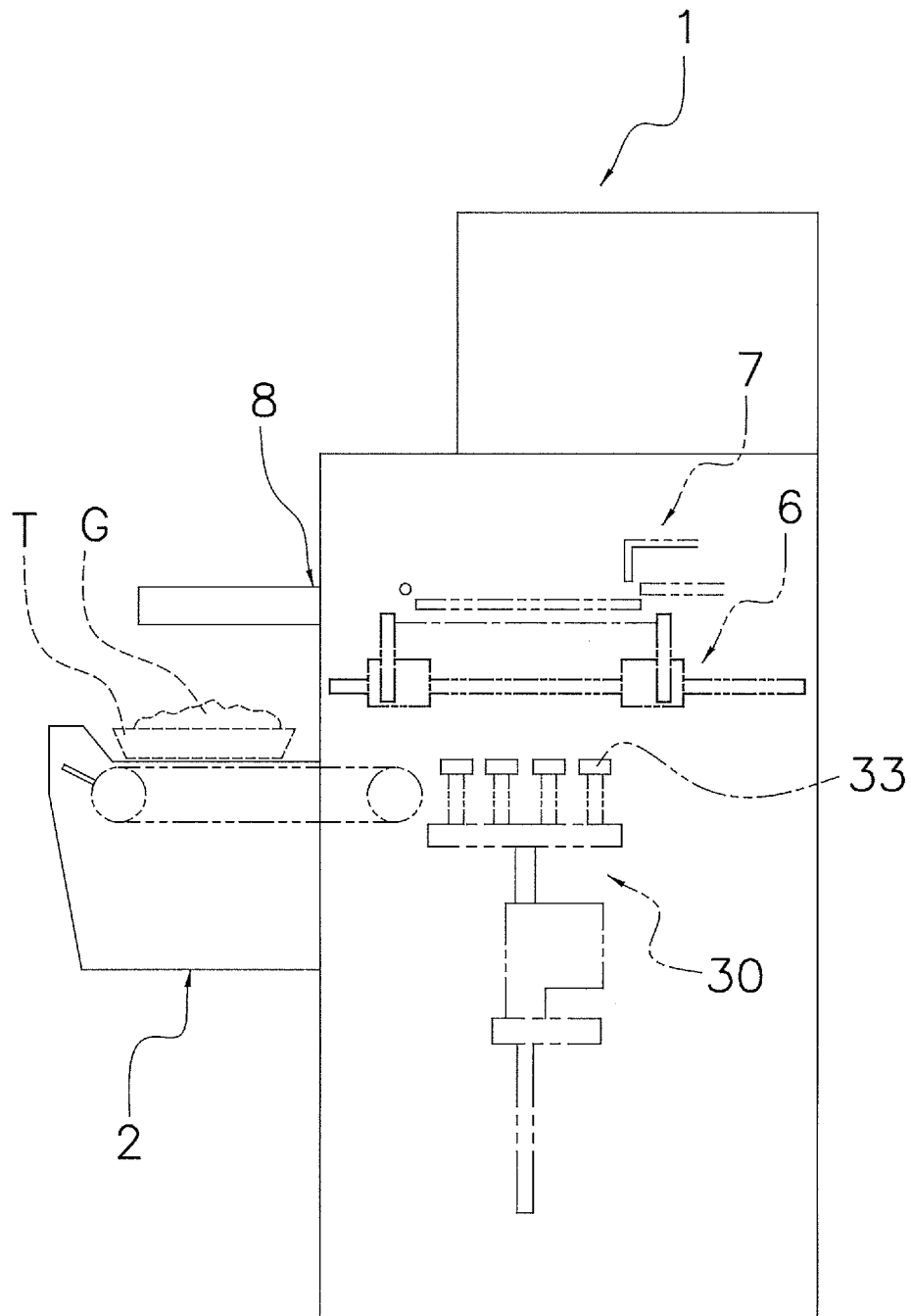


FIG. 13

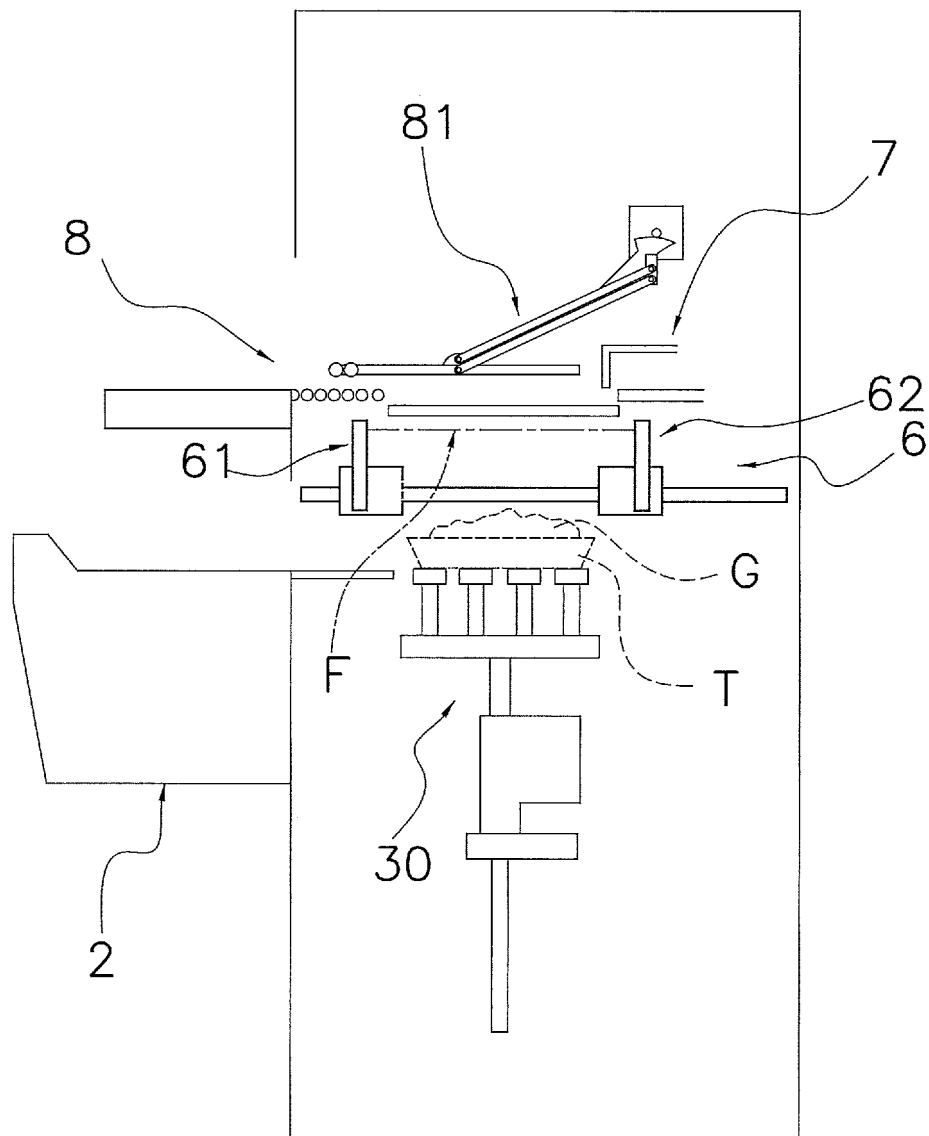


FIG. 14

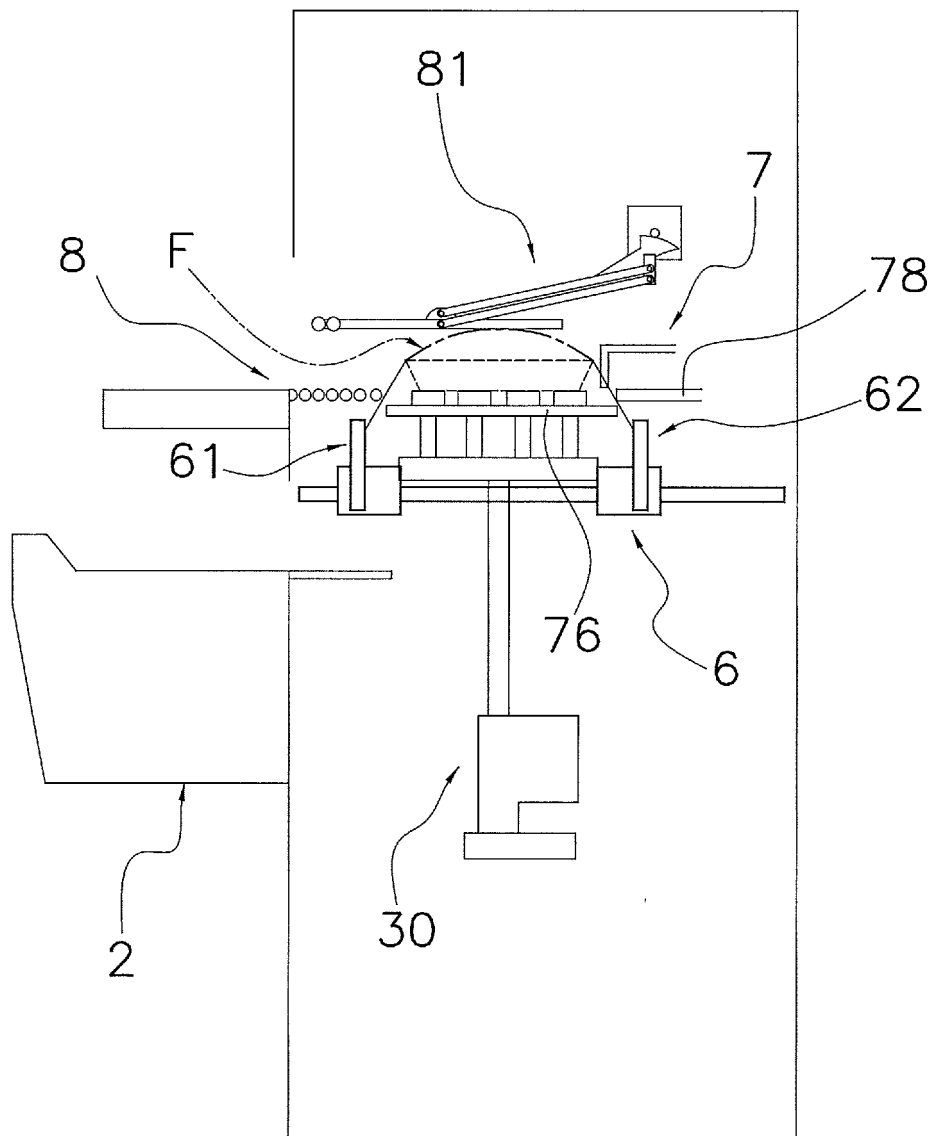


FIG. 15

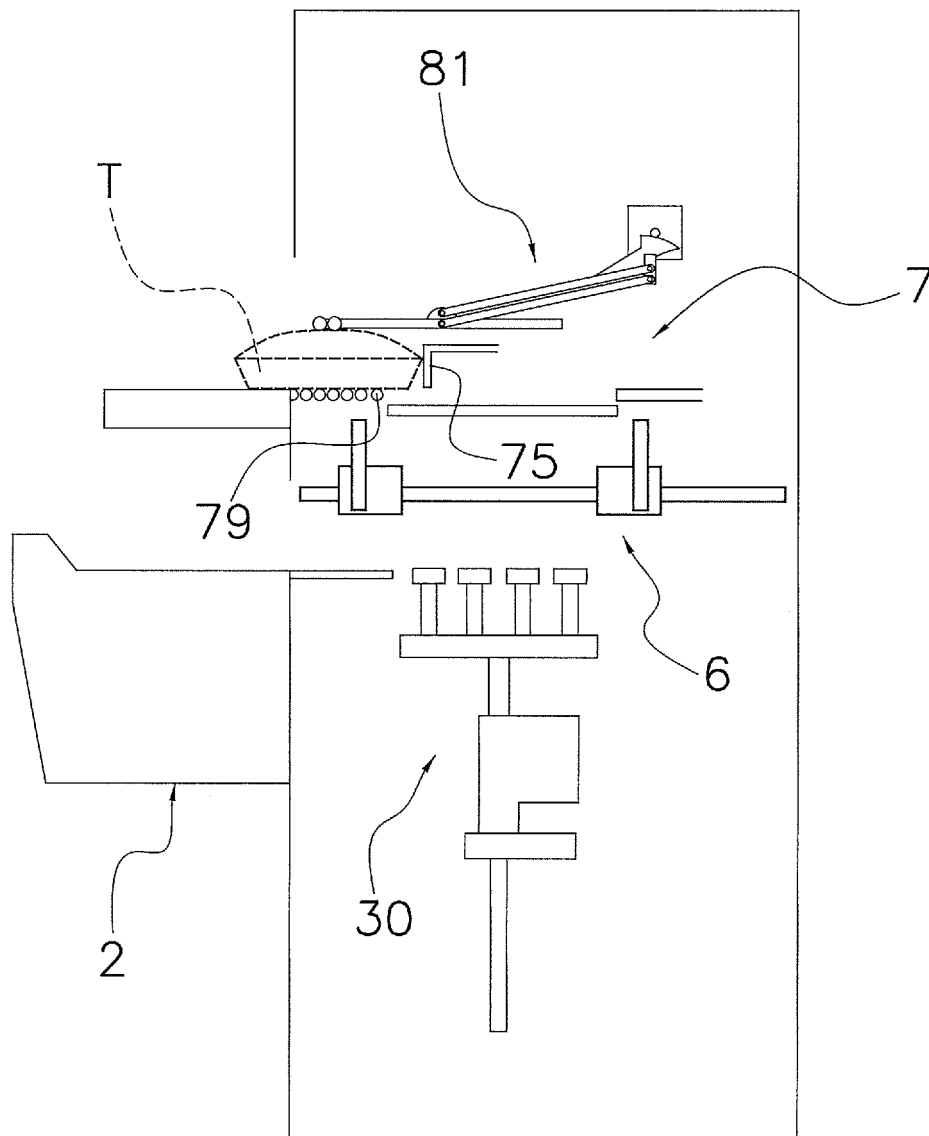


FIG. 16

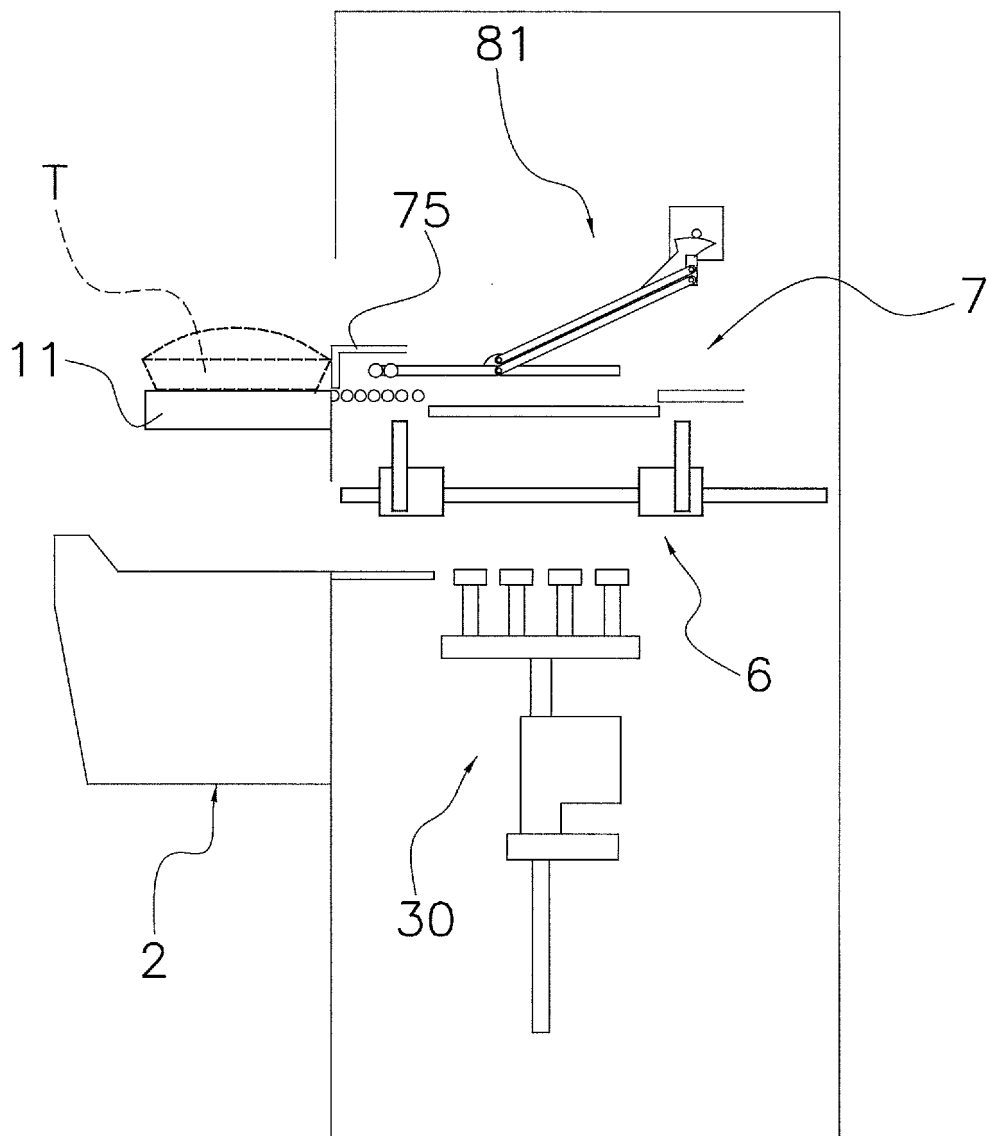


FIG. 17

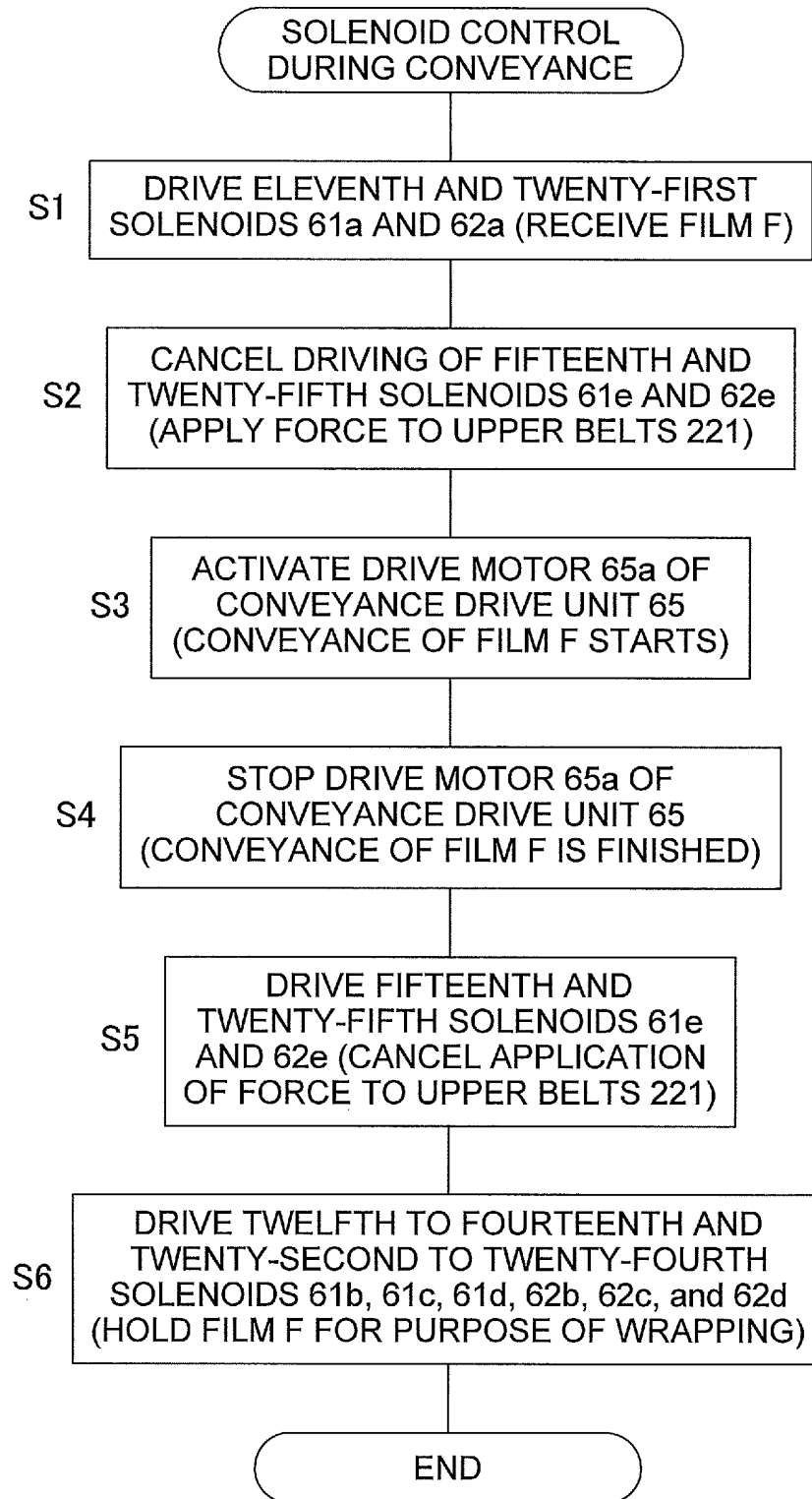


FIG. 18

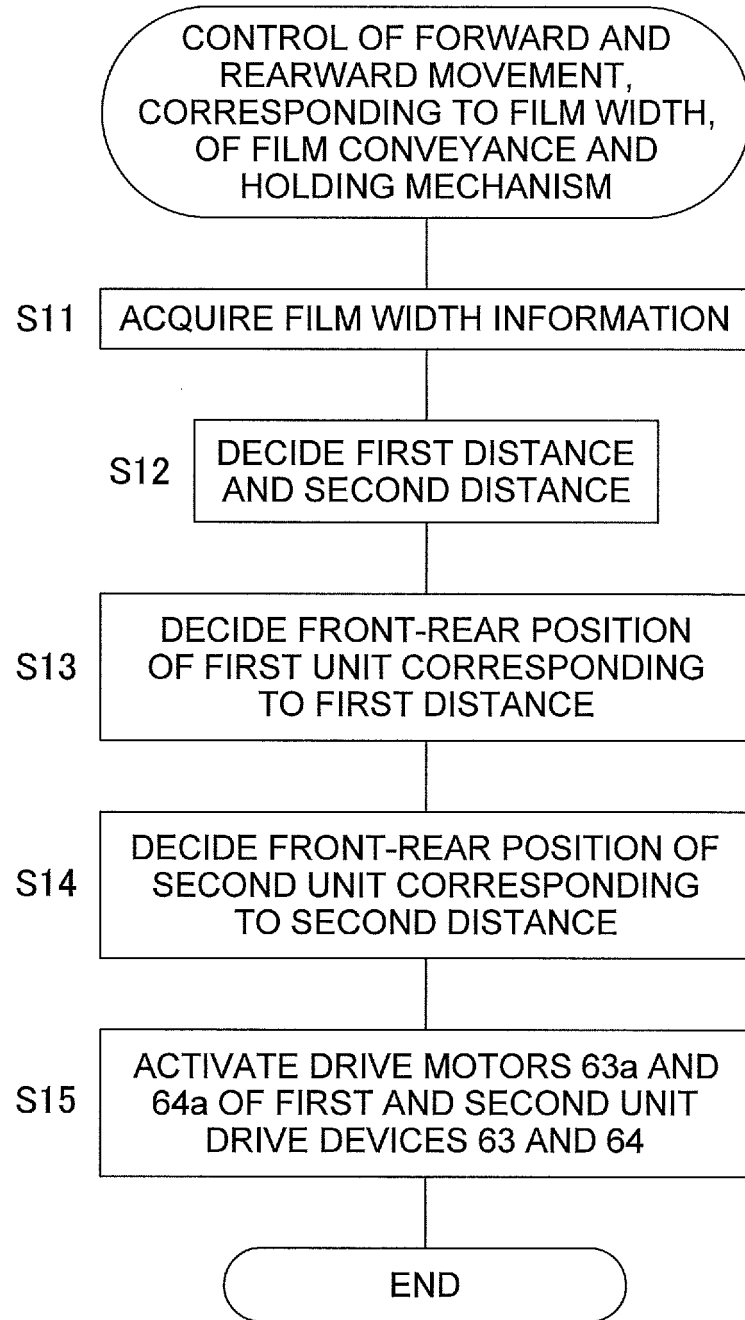


FIG. 19

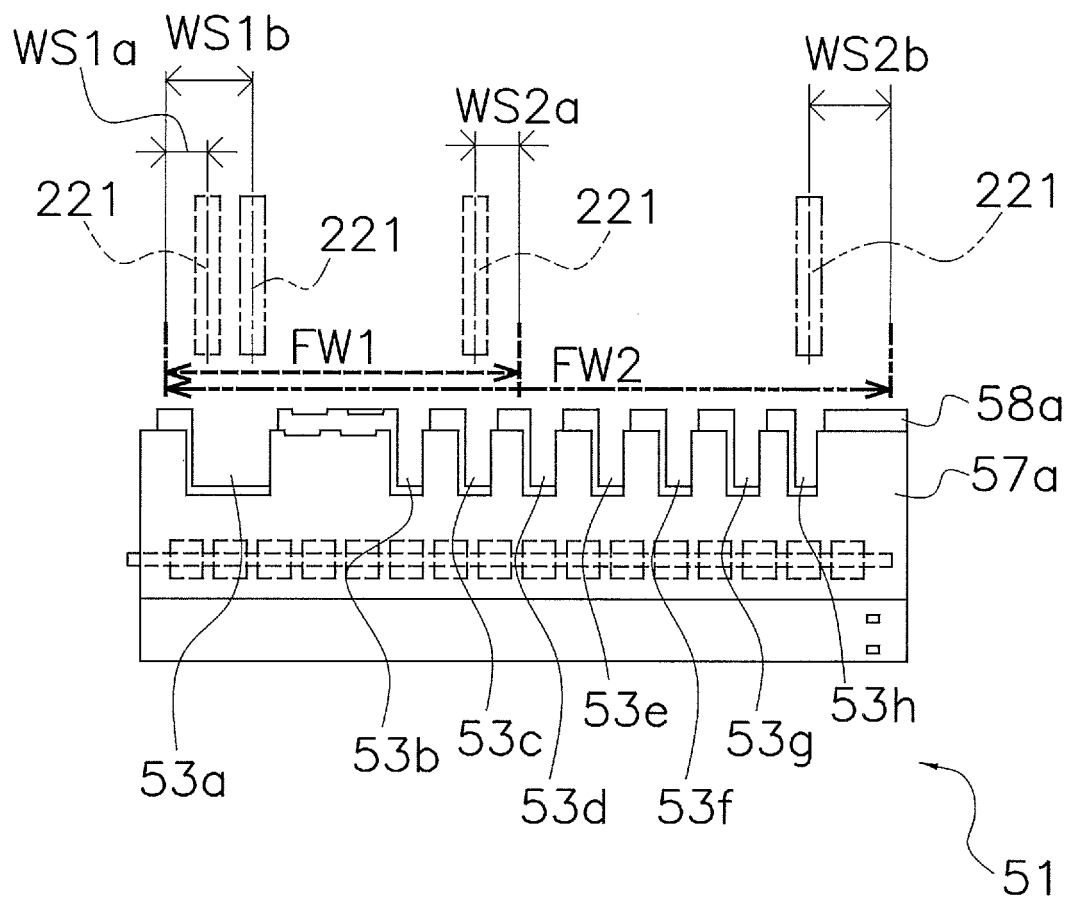


FIG. 20

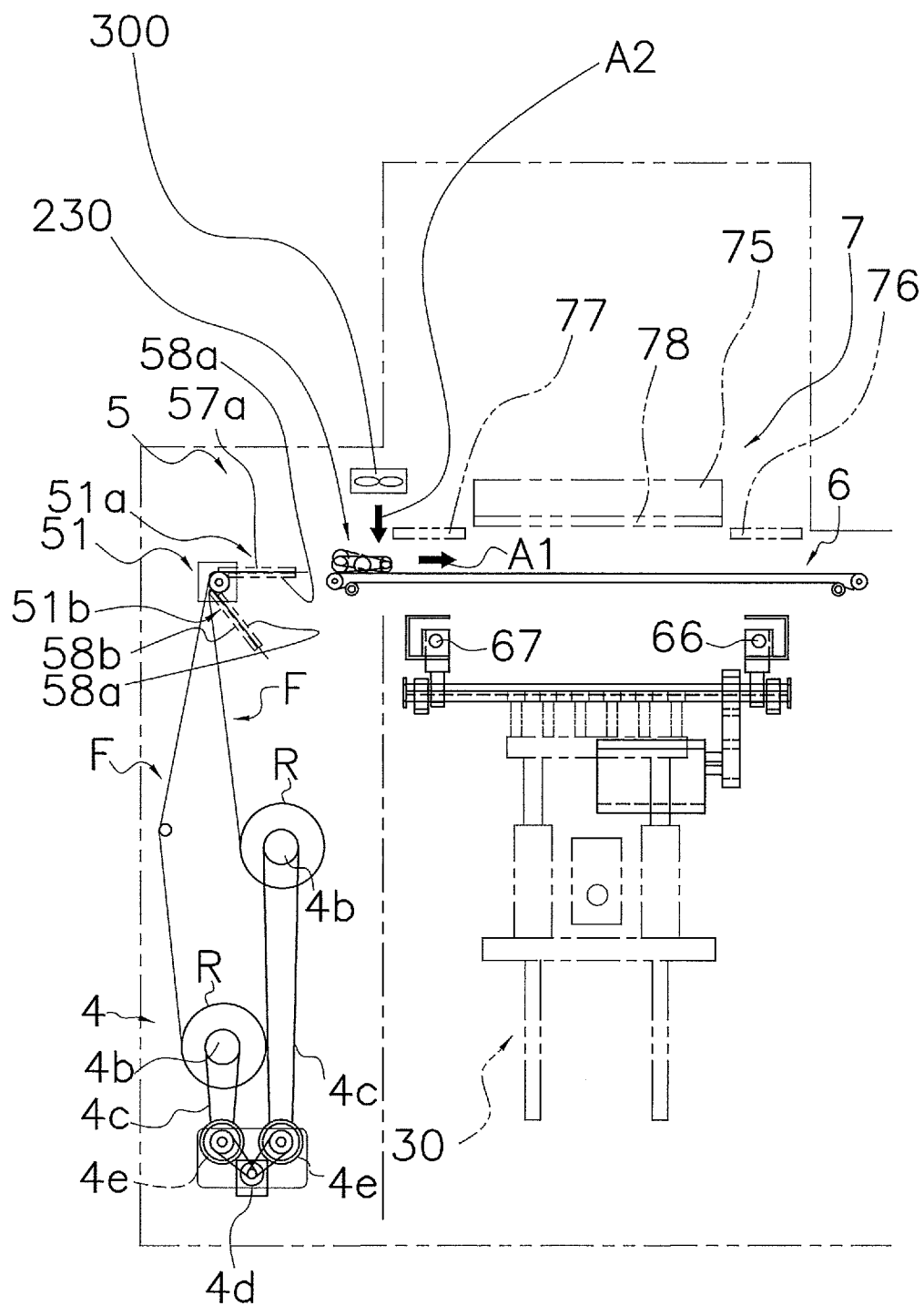


FIG. 21

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2016/053407

A. CLASSIFICATION OF SUBJECT MATTER

B65B11/54(2006.01)i, B65B11/18(2006.01)i, B65B57/00(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)

B65B11/54, B65B11/18, B65B57/00

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 2007-230577 A (Ishida Co., Ltd.), 13 September 2007 (13.09.2007), entire text; all drawings (Family: none)	1-6
A	JP 2009-96486 A (Teraoka Seiko Co., Ltd.), 07 May 2009 (07.05.2009), entire text; all drawings (Family: none)	1-6
A	US 4178740 A (GROOM James S), 18 December 1979 (18.12.1979), entire text; all drawings (Family: none)	1-6



Further documents are listed in the continuation of Box C.



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later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&"

document member of the same patent family

Date of the actual completion of the international search
06 April 2016 (06.04.16)Date of mailing of the international search report
19 April 2016 (19.04.16)Name and mailing address of the ISA/
Japan Patent Office
3-4-3, Kasumigaseki, Chiyoda-ku,
Tokyo 100-8915, Japan

Authorized officer

Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2006327670 A [0002] [0110]