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(54) PROCESSING APPARATUS

(57) Processing positional accuracy for processing a work 1 is improved in a processing apparatus 10 that processes a work 1 while intermittently halting the same without affecting the carrying of the work 1 at upstream and downstream processing positions Pn-1, Pn+1.
The processing apparatus 10 intermittently halts and processes, at a processing position Pn, a belt-like work 1 that is continuously carried along a predetermined direction. The processing apparatus includes: a processing section 20 that is provided at the processing position Pn and that performs the processing on the work 1 while the work 1 is being halted; an entering-side buffer mechanism 34a that is provided on an upstream side of the processing section 20 in the predetermined direction and that can accumulate the work 1 carried from upstream; an exit-side buffer mechanism 34b that is provided on a downstream side of the processing section 20 in the predetermined direction and that can accumulate the work 1 having been processed and to be carried downstream; and a sending section 31b that is provided between the entering-side buffer mechanism 34a and the processing section 20 and that sends out the work 1 accumulated by the entering-side buffer mechanism 34a to the processing section 20. By restricting the work 1, the sending section 31b halts the work 1 at the processing position Pn, and performs simultaneously decrease of an accumulation amount of work accumulated by the exit-side buffer mechanism 34b and increase of an accumulation amount of work accumulated by the entering-side buffer mechanism 34a in such a manner as the decrease in the accumulation amount of the exit-side buffer mechanism 34b and the increase in the accumulation amount of the entering-side buffer mechanism 34a equal to one another. By canceling the restriction on the work 1, the sending section 31b releases the halt of the work 1, and performs simultaneously increase of the accumulation amount of the exit-side buffer mechanism 34b and decrease of the accumulation amount of the entering-side buffer mechanism 34a in such a manner as the increase in the accumulation amount of the exit-side buffer mechanism 34b and the decrease in the accumulation amount of the entering-side buffer mechanism 34a equal to one another.

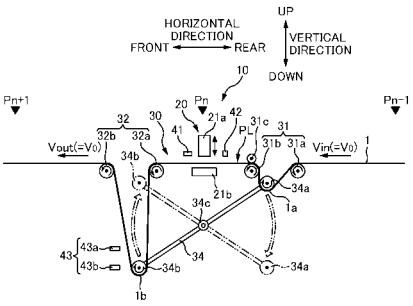


FIG. 3

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Description

Technical Field

[0001] The present invention relates to a processing apparatus for intermittently halting and processing, at a predetermined processing position, a belt-like work that is continuously carried in a predetermined direction along which a plurality of processing positions are lined up.

Background Art

[0002] Conventional production lines for disposable diapers, for example, include a plurality of processing positions aligned front-to-rear along the horizontal direction. Semi-finished diapers are carried continuously in the state of a continuously-formed belt-like work in the above-mentioned front/rear direction, and during this course, various processes are applied thereto at the respective processing positions and the work is finally cut into units of products, thereby completing finished products.

[0003] In cases where press-working is to be applied at one of the above-mentioned processing positions, carrying of the belt-like work will be intermittently halted with every die-pressing motion using press dies. This halt, however, affects the carrying at processing positions immediately upstream and downstream of the press-working position. That is, it is inevitable that the belt-like work will temporarily be halted also at the immediately adjacent processing positions.

[0004] In this regard, a processing apparatus 90 disclosed in Japanese Patent No. 3452577 allows to intermittently halt the carrying of the belt-like work 1 only at the processing apparatus 90, without stopping the carrying thereof at positions upstream and downstream of the processing apparatus 90.

[0005] Describing this in detail, as shown in Fig. 1, the processing apparatus 90 has a pair of rolls 91a, 91b lined up front-to-rear along the horizontal direction. The belt-like work 1 is wound around the pair of rolls 91a, 91b; thus, loops 1La, 1Lb consisting of the belt-like work 1 are formed thereon in the front/rear direction, and rotation of the rolls 91a, 91b causes the belt-like work 1 to be carried forward at a predetermined carry speed Vt. Further, the pair of rolls 91a, 91b is connected into a single unit by a separator 93 and is also reciprocatably guided in the front/rear direction.

[0006] In this example, by translationally moving the pair of rolls 91a, 91b horizontally at a predetermined moving speed Vm in the rearward direction which is opposite from the carrying direction of the belt-like work 1 (refer to the chain double-dashed lines in Fig. 1) during the carrying state of the belt-like work 1, the carry speed Vt and the moving speed Vm cancel out one another and thus the absolute speed of the belt-like work 1 in the front/rear direction becomes zero at a position R1 between the pair of rolls 91a, 91b.

[0007] To make use of the above-described cancel-out relationship, the processing apparatus 90 therefore arranges a processing section 95 in the position R1 between the pair of rolls 91a, 91b and applies processing using this processing section 95 while moving the pair of rolls 91a, 91b rearwardly at the above-mentioned moving speed Vm. In this way, the intermittently-halted state necessary for applying such processing is realized at the processing apparatus 90, while maintaining the normal continuous-carrying state at the processing positions upstream and downstream of the processing apparatus 90.

Disclosure of Invention

Problem to be Solved by the Invention

[0008] The processing apparatus 90 of Japanese Patent No. 3452577, however, merely realizes a pseudo-halted state of the belt-like work 1 by the canceling between the carry speed Vt and the moving speed Vm, without actually halting the carrying of the belt-like work 1. Therefore, there is a possibility that the belt-like work 1 may slightly shift with respect to the processing section 95 owing to synchronization failure between the carry speed Vt and the moving speed Vm. In this case, the position of the processing applied on the belt-like work 1 by the processing section 95 may deviate from the target position.

[0009] The present invention has been made in view of such a conventional problem as that described above, and an object thereof is to provide a processing apparatus that processes a work while intermittently halting the same without affecting the carrying of the work at upstream and downstream processing positions, and that has superior processing positional accuracy for processing the work.

Means for Solving the Problem

[0010] A main aspect of the invention for achieving the above-mentioned object is a processing apparatus for intermittently halting and processing, at a processing position, a belt-like work that is continuously carried along a predetermined direction, the processing apparatus including:

a processing section that is provided at the processing position and that performs the processing on the work while the work is being halted;
an entering-side buffer mechanism that is provided upstream in the predetermined direction from the processing section and that can accumulate the work carried from upstream;
an exit-side buffer mechanism that is provided downstream in the predetermined direction from the processing section and that can accumulate the work having been processed and to be carried downstream; and

a sending section that is provided between the entering-side buffer mechanism and the processing section and that sends out the work accumulated by the entering-side buffer mechanism to the processing section;
the sending section,
by restricting the work, halting the work at the processing position, and
performing simultaneously decrease of an accumulation amount of work accumulated by the exit-side buffer mechanism and increase of an accumulation amount of work accumulated by the entering-side buffer mechanism in such a manner as the decrease in the accumulation amount of the exit-side buffer mechanism and the increase in the accumulation amount of the entering-side buffer mechanism equal to one another;
the sending section,
by canceling the restriction on the work, releasing the halt of the work, and
performing simultaneously increase of the accumulation amount of the exit-side buffer mechanism and decrease of the accumulation amount of the entering-side buffer mechanism in such a manner as the increase in the accumulation amount of the exit-side buffer mechanism and the decrease in the accumulation amount of the entering-side buffer mechanism equal to one another.

[0011] Other features of the invention will be made clear by the description of the present specification and accompanying drawings.

Effect of the Invention

[0012] The present invention can provide a processing apparatus that processes a work while intermittently halting the same without affecting the carrying of the work at upstream and downstream processing positions, and that has superior processing positional accuracy for processing the work.

Brief Description of Drawings

[0013]

Fig. 1 is a side view showing an example of a conventional processing apparatus 90.
Fig. 2 is a conceptual diagram of a continuous production line 5 to which a processing apparatus 10 according to a first embodiment is applied.
Fig. 3 is a side view of the processing apparatus 10 according to the first embodiment.
Figs. 4A to 4C are explanatory diagrams describing an oscillating motion of a seesaw member 34 during the intermittent halt of a belt-like work 1.
Figs. 5A to 5C are explanatory diagrams describing an oscillating motion of the seesaw member 34 when the intermittent halt of the belt-like work 1 is released.
Fig. 6 is a chart indicating a rotation speed V of a drive roll 31b.
Fig. 7 is a side view of a processing apparatus 10a according to a second embodiment.
Fig. 8 is a side view of another embodiment of a processing apparatus 10.

List of Reference Numerals

[0014] 1: belt-like work (work); 1a: portion; 1b: portion; 5: continuous production line; 10: processing apparatus; 10a: processing apparatus; 20: press device (processing section);
21a: male die; 21b: female die; 30: intermittent carry device;
31: group of pass-line rolls; 31a: pass-line roll;
31b: drive roll (sending section); 31c: pressing roll;
31d: brake-equipped non-drive roll (sending section);
32: group of pass-line rolls; 32a: pass-line roll;
32b: pass-line roll; 34: seesaw member;
34a: entering-side roll (entering-side buffer mechanism);
34b: exit-side roll (exit-side buffer mechanism);
34c: oscillation central shaft;
36: air cylinder (oscillation drive device);
36a: piston; 41: pressing-motion monitoring sensor;
42: processing-target-section monitoring sensor;
43: oscillating-motion monitoring sensor;
43a: sensor at upper lower-limit position;
43b: sensor at lower lower-limit position;
90: processing apparatus; 91a: roll; 91b: roll; 93: separator;
95: processing section; 1La: loop; 1Lb: loop; Pn-1: processing position;
Pn: processing position; Pn+1: processing position; PL: pass line;
V: carry speed; Vin: entering-side carry speed;
Vout: exit-side carry speed; A1: normal range; A2: deceleration range;
A3: intermittent halt range; A4: acceleration range;
A5: deceleration range; Vt: carry speed; Vm: moving speed; R1: position

Best Mode for Carrying Out the Invention

[0015] At least the following matters will be made clear by the description of the present specification and the accompanying drawings.
[0016] A processing apparatus for intermittently halting and processing, at a processing position, a belt-like work that is continuously carried along a predetermined direction, includes:

a processing section that is provided at the processing position and that performs the processing on the work while the work is being halted;
an entering-side buffer mechanism that is provided upstream in the predetermined direction from the

processing section and that can accumulate the work carried from upstream;
an exit-side buffer mechanism that is provided downstream in the predetermined direction from the processing section and that can accumulate the work having been processed and to be carried downstream; and
a sending section that is provided between the entering-side buffer mechanism and the processing section and that sends out the work accumulated by the entering-side buffer mechanism to the processing section;
the sending section,
by restricting the work, halting the work at the processing position, and
performing simultaneously decrease of an accumulation amount of work accumulated by the exit-side buffer mechanism and increase of an accumulation amount of work accumulated by the entering-side buffer mechanism in such a manner as the decrease in the accumulation amount of the exit-side buffer mechanism and the increase in the accumulation amount of the entering-side buffer mechanism equal to one another;
the sending section,
by canceling the restriction on the work, releasing the halt of the work, and
performing simultaneously increase of the accumulation amount of the exit-side buffer mechanism and decrease of the accumulation amount of the entering-side buffer mechanism in such a manner as the increase in the accumulation amount of the exit-side buffer mechanism and the decrease in the accumulation amount of the entering-side buffer mechanism equal to one another.

[0017] With such a processing apparatus, the accumulation amount of the entering-side buffer mechanism and the exit-side buffer mechanism is adjusted as described above. Thus, the processing apparatus can intermittently halt the work while buffering the influence of the halting of the work at the processing apparatus through adjustment of the accumulation amount without causing the influence to spill over to the processing positions located upstream and downstream of the processing apparatus--i.e., without affecting the carrying at processing positions upstream and downstream of the processing apparatus whatsoever.

[0018] Further, processing is performed in a state where the carrying of the work is halted owing to the sending section restricting the work. Therefore, the work is at a complete stop and will not move, and thus, processing can be applied with high accuracy at a target position on the work to be processed.

[0019] Furthermore, while the work is being halted, the decrease in the accumulation amount of the exit-side buffer mechanism and the increase in the accumulation amount of the entering-side buffer mechanism are kept equal to one another. Therefore, the tension of the work can be maintained constant even during the halt. On the other hand, the increase in the accumulation amount of the exit-side buffer mechanism and the decrease in the accumulation amount of the entering-side buffer mechanism are also kept equal to one another even when the halt of the work is released. Therefore, the tension of the work can be maintained constant even during the release.

[0020] In the above processing apparatus, it is preferable that: the sending section is a roll; and the roll is a drive roll that carries the work to the processing section by being driven to rotate while winding the work from the entering-side buffer mechanism around an outer circumferential surface of the roll.

[0021] With such a processing apparatus, the work is wound around the roll and is carried by the driving rotation of the roll. Therefore, restricting the rotation of the roll will reliably halt the work, and thus, the work can reliably be brought to a carry-halt state.

[0022] In the above processing apparatus, it is preferable that: the sending section includes a roll that is in contact with the work and a pressing roll that is pressed against an outer circumferential surface of the above-mentioned roll; and the work is carried sandwiched between the roll and the pressing roll.

[0023] With such a processing apparatus, the responsiveness for halting the carrying of the work with the roll can be improved.

[0024] In the above processing apparatus, it is preferable that: the entering-side buffer mechanism accumulates the work carried from upstream by forming a loop consisting of the work in an intersecting direction that intersects with the predetermined direction; and the exit-side buffer mechanism accumulates the work having been processed and to be carried downstream by forming, in the intersecting direction, a loop consisting of the work having been processed.

[0025] With such a processing apparatus, the direction in which the loops of the entering-side buffer mechanism and the exit-side buffer mechanism are formed is in the intersecting direction, which intersects with the predetermined direction. Thus, the processing apparatus can be kept from becoming large in size in the predetermined direction along with the formation of the loops. In other words, the entire length of the processing apparatus can be kept short with respect to the predetermined direction which is the direction in which the work is carried.

[0026] In the above processing apparatus, it is preferable that the intersecting direction is a direction orthogonal to the predetermined direction.

[0027] With such a processing apparatus, the entire length of the processing apparatus can be minimized with respect to the predetermined direction.

[0028] In the above processing apparatus, it is preferable that: the entering-side buffer mechanism includes an entering-side roll that is reciprocatably guided in the intersecting direction, and the loop is formed by winding

the work around the entering-side roll; the exit-side buffer mechanism includes an exit-side roll that is reciprocatably guided in the intersecting direction, and the loop is formed by winding the work having been processed around the exit-side roll; and the entering-side roll and the exit-side roll move in the intersecting direction interlocked with one another, and move in opposite directions from one another at the same speed when moving in the intersecting direction.

[0029] With such a processing apparatus, the entering-side roll and the exit-side roll carry out opposite motions with respect to one another in the intersecting direction. Thus, the total amount of the length of the work accumulated by the entering-side roll and the length of the work accumulated by the exit-side roll is always kept constant, regardless of whether the work is being intermittently halted or the halt is released. Accordingly, it is possible to reliably achieve synchronization between the carry speed of the work both at positions upstream and downstream of the processing apparatus while keeping the tension of the work constant. In other words, it is possible to pass the work having been processed on to the downstream processing position at the same carry speed as the carry speed of the work received from the upstream processing position, while effectively reducing any change in tension of the work.

[0030] Incidentally, the above can also be stated as follows. Since the entering-side roll and the exit-side roll carry out opposite motions with respect to one another in the intersecting direction, the decrease in the accumulation amount of the exit-side buffer mechanism and the increase in the accumulation amount of the entering-side buffer mechanism can be kept equal to one another while the work is being halted, and on the other hand, the increase in the accumulation amount of the exit-side buffer mechanism and the decrease in the accumulation amount of the entering-side buffer mechanism can be kept equal to one another when the halt of the work is released. As a result, the tension of the work can be maintained constant both during the halt of the work and during the release of the halt.

[0031] In the above processing apparatus, it is preferable that: the processing apparatus further includes a seesaw member that oscillates about a predetermined axis, wherein both the entering-side roll and the exit-side roll are mounted on the seesaw member, and wherein the axis is located at a midpoint between a position where the entering-side roll is mounted and a position where the exit-side roll is mounted.

[0032] With such a processing apparatus, the above-mentioned opposite-motion relationship in the intersecting direction between the entering-side roll and the exit-side roll can easily be created by the oscillating motion of the seesaw member, thus simplifying the configuration of the processing apparatus.

[0033] In the above processing apparatus, it is preferable that: the entering-side buffer mechanism includes a plurality of the entering-side rolls for forming the loop of the work by winding the work around the entering-side rolls in a zigzag form; and the exit-side buffer mechanism includes a plurality of the exit-side rolls for forming the loop of the work having been processed by winding the processed work around the exit-side rolls in a zigzag form.

With such a processing apparatus, the oscillation stroke amount of the seesaw member can be reduced, compared to a case where the loops are not formed in a zigzag form, i.e., a case where one each of the entering-side roll and the exit-side roll is provided and each roll forms a single loop. Thus, it is possible to reduce the oscillating motion speed and thereby reduce the impact upon vertically reversing the oscillating motion.

[0034] In the above processing apparatus, it is preferable that a motion for increasing the accumulation amount of the exit-side buffer mechanism and a motion for decreasing the accumulation amount of the entering-side buffer mechanism performed upon releasing the halt of the work are achieved by making a carry speed at which the work is carried between the entering-side buffer mechanism and the exit-side buffer mechanism faster than both a carry speed at which the work is carried on a side upstream from the entering-side buffer mechanism and a carry speed at which the work having been processed is carried on a side downstream from the exit-side buffer mechanism.

[0035] With such a processing apparatus, the above-described motions of the entering-side buffer mechanism and the exit-side buffer mechanism can be achieved reliably while the halt of the work is released.

=== FIRST EMBODIMENT ===

[0036] Fig. 2 is a conceptual diagram of a continuous production line 5 to which a processing apparatus 10 according to the present first embodiment is applied. Fig. 3 is a side view of the processing apparatus 10. Below, the vertical direction is referred to also as the up/down direction, and the horizontal direction orthogonal to the vertical direction is referred to also as the front/rear direction. Incidentally, the "front" of the front/rear direction is the downstream side of the carrying direction of the belt-like work 1, and the "rear" is the upstream side of the same. Further, the upstream side of the processing apparatus 10 is referred to also as the entering side, and the downstream side of the same is referred to also as the exit side.

[0037] As shown in Fig. 2, the continuous production line 5 includes a plurality of processing positions P1, P2, ... arranged front-to-rear along the horizontal direction, which serves as a predetermined direction. At each processing position P1, P2, ..., appropriate processing is successively applied on a semi-finished belt-like work 1 that is carried continuously, to thereby complete finished products.

[0038] As shown in Fig. 3, the processing apparatus 10 according to the first embodiment is incorporated into

one processing position Pn (in this example, a position for press-working the belt-like work 1) of the plurality of processing positions P1, P2, ... The belt-like work 1 is drawn into the processing apparatus 10 from an immediately upstream processing position Pn-1 at an entering-side carry speed Vin, and on the other hand, after being subjected to predetermined processing by the processing apparatus 10, the work is drawn out toward an immediately downstream processing position Pn+1 at an exit-side carry speed Vout.

[0039] According to the constant mass flow principle, the entering-side carry speed Vin and the exit-side carry speed Vout of the processing apparatus 10 should basically be equal to one another; however, in cases where the belt-like work 1 is a stretchable material such as nonwoven fabric, the entering-side carry speed Vin and the exit-side carry speed Vout may differ from one another owing to the stretching deformation of the material, and for example, the entering-side carry speed Vin may range from 95% to 105% of the exit-side carry speed Vout. The explanation below, however, is based on the premise that the entering-side carry speed Vin and the exit-side carry speed Vout are controlled in such a manner that they are equal to one another and are at a reference speed V0.

[0040] Incidentally, the processing carried out by the processing apparatus 10 is, for example, press-working. It is therefore necessary to intermittently halt the carrying of the belt-like work 1 during this press-working. The processing apparatus 10, however, is devised so that it can keep the entering-side carry speed Vin and the exit-side carry speed Vout constant at approximately the above-mentioned reference speed V0, regardless of the intermittent halt. In other words, this processing apparatus 10 allows intermittent carrying to be performed only at the processing apparatus 10, while continuously carrying the belt-like work 1 at the immediately upstream and downstream processing positions Pn-1, Pn+1 without stopping the carrying thereat whatsoever. The following describes the processing apparatus 10 in detail.

[0041] The processing apparatus 10 includes: a press device 20, which serves as a processing section, for applying press-working on the belt-like work 1; an intermittent carry device 30 for intermittently carrying the belt-like work 1 along a horizontal pass line PL and making the work pass the position of the press device 20 with every pressing motion of the press device 20; a group of sensors 41, 42, 43 for detecting the state of the press device 20 and the intermittent carry device 30; and a controller (not shown) for controlling the press device 20 and the intermittent carry device 30 in cooperation with one another based on the detection results of the group of sensors 41, 42, 43.

[0042] The press device 20 includes, for example, a male die 21a that can be driven to ascend/descend up and down in the vertical direction, and a female die 21b arranged below the male die 21a in opposition thereto. The pass line PL is set between the male and female dies 21a, 21b with respect to the up/down direction. A section targeted for processing ("processing target section") of the belt-like work 1 is carried in the horizontal direction along the pass line, and then, while the carrying is being intermittently halted, the male die 21a descends toward the female die 21b and sandwiches and presses the processing target section of the belt-like work 1, to thus apply press-working. When the male die 21a ascends and the pressing motion is finished, the carrying motion of the belt-like work 1 is resumed, and the press device 20 stays on standby until the subsequent processing target section of the belt-like work 1 moves below the male die 21a and halts. Note that in this example, a hydraulic cylinder (not shown) is employed as a drive source of the ascending/descending motion of the male die 21a, but the invention is not limited thereto.

[0043] The intermittent carry device 30 includes: groups of pass-line rolls 31, 32 that form the horizontal pass line PL for the belt-like work 1 with respect to the press device 20; an entering-side buffer mechanism 34a that is provided on the upstream side of the press device 20 and that can accumulate the belt-like work 1 in a state strung like a loop that is convex downward in the vertical direction; and an exit-side buffer mechanism 34b that is provided on the downstream side of the press device 20 and that can accumulate the press-worked belt-like work 1 in a state strung like a loop that is convex downward in the vertical direction.

[0044] The groups of pass-line rolls 31, 32 mainly consist, for example, of a pair of pass-line rolls 31a, 31b arranged at the same height and on the upstream side of the press device 20, and a pair of pass-line rolls 32a, 32b arranged at the same height and on the downstream side of the press device 20. The belt-like work 1 is passed over and supported by the pass-line rolls 31a, 31b, 32a, 32b, and thereby the horizontal pass line PL for the belt-like work 1 is formed stretching across the press device 20 front-to-rear in the horizontal direction.

[0045] Among these pass-line rolls 31a, 31b, 32a, 32b, only the roll 31b immediately upstream of the press device 20 (also referred to below as a drive roll) is a drive roll that can be driven to rotate by a drive source such as a servomotor, and the other rolls are driven rolls that are not driven. Accordingly, the carry state of the belt-like work 1 in the press device 20 is controlled by controlling the rotational speed of the drive roll 31b (which corresponds to a "sending section"). That is, when the drive roll 31b rotates, the belt-like work 1 in the press device 20 is carried, and on the other hand, when the drive roll 31b halts, the carrying of the belt-like work 1 in the press device 20 also halts. With the present processing apparatus 10, since the above-mentioned press-working is performed under this carry-halt state, the press-working can be applied accurately at a target position on the belt-like work 1.

[0046] Note that a pressing roll 31c that followingly rotates about a rotation axis parallel to that of the drive roll 31b is pressed against the outer circumferential surface

of the drive roll 31b at a predetermined pressing pressure. Being sandwiched between the drive roll 31b and the pressing roll 31c, the belt-like work 1 is carried without causing any relative slippage with the drive roll 31b. Thus, the responsiveness of the carrying motion of the belt-like work 1 by the drive roll 31b is improved, and as a result, the halt position accuracy of the belt-like work 1 is improved.

[0047] The entering-side buffer mechanism 34a and the exit-side buffer mechanism 34b employ, as their main body, a seesaw member 34 whose respective ends in the front and rear in the horizontal direction can oscillate up and down about an oscillation central shaft 34c. The ends of the seesaw member respectively have a pair of rolls 34a, 34b that are equal in diameter and weight and that are for forming the loops of the belt-like work 1. In this state, the seesaw member 34 is in balance such that it can rotate back and forth about the oscillation central shaft 34c that is located in the middle of the rolls 34a, 34b. The rolls 34a, 34b are respectively located at a position between the pair of pass-line rolls 31a, 31b and at a position between the pair of pass-line rolls 32a, 32b. Accordingly, the rolls 34a, 34b respectively have a portion 1a of the belt-like work 1 passed over between the pair of pass-line rolls 31a, 31b and a portion 1b of the belt-like work 1 passed over between the pair of pass-line rolls 32a, 32b wound around the respective rolls 34a, 34b from below.

[0048] Therefore, when the seesaw member 34 rotates to oscillate, the amount of the loop (the accumulation amount) of the belt-like work 1 formed by the descending roll 34b (34a) increases, thereby accumulating the belt-like work 1; on the other hand, the amount of the loop (the accumulation amount) of the belt-like work 1 formed by the ascending roll 34a (34b) decreases, thereby sending out the belt-like work 1. That is, the roll 34a of the entering-side buffer mechanism and the roll 34b of the exit-side buffer mechanism always move in an opposite-motion relationship with one another. As a result, the total amount of the length of the loops formed by these rolls 34a, 34b is always kept constant, and thus, it is possible to reliably achieve synchronization between the entering-side carry speed Vin and the exit-side carry speed Vout of the processing apparatus 10 while keeping the tension of the belt-like work 1 constant.

[0049] The following describes this in detail. First, the initial state is a state where a loop is greatly accumulated on the roll 34b of the exit-side buffer mechanism whereas there is almost no loop on the roll 34a of the entering-side buffer mechanism, as shown with the solid lines in Fig. 3. Even if, in this state, the rotation of the drive roll 31b is restricted by the servomotor and halted in order to intermittently halt the carrying of the belt-like work 1 in the press device 20, it is still necessary to send out the belt-like work 1 to the downstream processing position Pn+1 at the exit-side carry speed Vout, regardless of the halted state. In this case, the roll 34b of the exit-side buffer mechanism (also referred to below as an "exit-side roll") is raised upward owing to the tension of the belt-like work 1, and thus, the belt-like work 1 is sent out from the loop of the exit-side buffer mechanism, as shown in Figs. 4A to 4C. In this way, it is possible to send out the belt-like work 1 at the carry speed Vout equal to the reference speed V0, regardless of the halt of the drive roll 31b.

[0050] On the other hand, at this time, the roll 34a of the entering-side buffer mechanism (also referred to below as an "entering-side roll") which is at its upper-limit position descends and accumulates the belt-like work 1, which is carried from the upstream processing position Pn-1, into a downwardly-convex loop shape while pulling the work downward, as shown in Figs. 4A to 4C. Note here that the entering-side roll 34a is also provided on the seesaw member 34, alike the exit-side roll 34b. Therefore, the descending motion of the entering-side roll 34a takes place simultaneously and in parallel with the above-mentioned ascending motion of the exit-side roll 34b, as an opposite motion thereof, without any delay in motion. That is, the entering-side roll 34a descends at the same speed as the ascending speed of the exit-side roll 34b, and the descending amount thereof is the same as the ascending amount of the roll 34b. Thus, the amount of the belt-like work 1 accumulated by the roll 34a of the entering-side buffer mechanism becomes equal to the amount of the belt-like work 1 sent out from the roll 34b of the exit-side buffer mechanism. As a result, it is possible to make the entering-side carry speed Vin and the exit-side carry speed Vout almost equal; in other words, it is possible to reliably achieve synchronization between the entering-side carry speed Vin and the exit-side carry speed Vout.

[0051] Note that, when this intermittently-halted state is cancelled, the restriction on the rotation of the drive roll 31b is also cancelled--that is, the rotation is resumed--and thus, the belt-like work 1 in the press device 20 is carried until it reaches the subsequent intermittent-halt position. During this carrying, however, it is necessary to return the seesaw member 34 from the state shown in Fig. 4C to the initial state shown in Fig. 4A in preparation for the subsequent intermittent halt; this return to the initial state is achieved by setting the carry speed V of the belt-like work 1 in the press device 20 for the intermittent carrying.

[0052] More specifically, when the intermittent halt is released, the drive roll 31b starts to rotate again as shown in Fig. 5A. Here, the rotation speed V thereof at this time is set higher than the entering-side carry speed Vin and the exit-side carry speed Vout. Accordingly, as shown in Figs. 5A to 5C, the belt-like work 1 in the press device 20 is carried at a speed V faster than the entering-side carry speed Vin and the exit-side carry speed Vout, and thus, the amount of belt-like work 1 sent out from the entering-side roll 34a becomes larger than the amount of belt-like work 1 supplied to the entering-side roll 34a at the entering-side carry speed Vin, thereby making the amount of work at the entering-side roll run short. As a

result, the amount of the loop at the entering-side roll 34a decreases, and the entering-side roll 34a ascends from its lower-limit position to its upper-limit position. On the other hand, the belt-like work 1 is sent out from the exit-side roll 34b, which is at its upper-limit position, at the carry speed Vout. However, since the belt-like work 1 is supplied to the exit-side roll 34b at a speed V faster than the carry speed Vout, the belt-like work 1 becomes over-supplied. As a result, the amount of the loop at the exit-side roll 34b increases, and the exit-side roll 34b descends from its upper-limit position to its lower-limit position. In other words, the seesaw member 34 carries out a seesawing motion in which the entering-side roll 34a ascends and the exit-side roll 34b descends, and in this way, the seesaw member 34 returns to the above-described initial state.

[0053] As shown in Fig. 3, the group of sensors 41, 42, 43 includes a pressing-motion monitoring sensor 41 for monitoring the pressing motion of the press device 20, a processing-target-section monitoring sensor 42 for monitoring the position of the processing target section on the belt-like work 1, and an oscillating-motion monitoring sensor 43 for monitoring the oscillating motion of the seesaw member 34.

[0054] The pressing-motion monitoring sensor 41 is, for example, a proximity switch provided at the upper-limit position of the male die 21a and outputs a detection signal every time the male die 21a reaches the upper-limit position. The processing-target-section monitoring sensor 42 is a sensor that is arranged immediately upstream of the press device 20 and that outputs a detection signal every time the sensor detects a mark indicating a processing location (referred to below as a "processing-location mark") formed on the belt-like work 1 at a predetermined pitch. An example thereof includes a photoelectric tube that outputs a signal having an intensity corresponding to the amount of light received. The oscillating-motion monitoring sensor 43 is, for example, a proximity switch provided near the lower-limit position of the exit-side roll 34b of the seesaw member 34, and the proximity switch outputs a detection signal when the exit-side roll 34b reaches the lower-limit position. Note here that two positions--an upper lower-limit position, and a lower lower-limit position situated slightly below the upper lower-limit position--are set as the lower-limit position, and proximity switches 43a, 43b are respectively arranged at those positions.

[0055] The controller is a suitable sequencer and/or a computer, and controls the various drive sources relating to the processing apparatus 10 based on the detection results output from the above-described group of sensors 41, 42, 43. More specifically, the controller controls the hydraulic cylinder that drives the male die 21a of the press device 20 so that it ascends and descends, and controls the rotational speed of the servomotor, which serves as the drive source of the drive roll 31b.

[0056] With the processing apparatus 10 configured as above, rotating the drive roll 31b as described below allows the belt-like work 1 to be intermittently carried in the press device 20 and press-working to be applied to the belt-like work 1 at an appropriate pitch while maintaining the carry speed Vin, Vout of the belt-like work 1 at the respective processing positions Pn-1, Pn+1 upstream and downstream of the press device 20 at the normal reference speed V0.

[0057] Fig. 6 is a chart showing the rotation speed V of the drive roll 31b. The horizontal axis indicates time, and the vertical axis indicates speed (meters/second). Note that, since the carrying of the belt-like work 1 in the press device 20 is controlled by the drive roll 31b, the vertical axis of Fig. 6 also indicates the carry speed V of the belt-like work 1 for carrying the work in the press device 20.

[0058] First, in the initial state, it is assumed that the entering-side roll 34a and the exit-side roll 34b of the seesaw member 34 are respectively located at the upper-limit position and the lower-limit position as shown with the solid lines in Fig. 3, and the belt-like work 1 in the press device 20 is being carried by the drive roll 31b at the reference speed V0 equal to the entering-side carry speed Vin and the exit-side carry speed Vout.

[0059] When a detection signal indicating detection of a processing-location mark on the belt-like work 1 is transmitted from the processing-target-section monitoring sensor 42 during the normal range A1 of Fig. 6 in which carrying is performed in the initial state, the controller halts the rotation of the drive roll 31b according to a predetermined deceleration pattern as shown in the deceleration range A2 of Fig. 6, to thus intermittently halt the carrying of the belt-like work 1 in the press device 20.

[0060] During this intermittent halt A3, the controller makes the press device 20 perform its pressing motion (Fig. 4B).

[0061] Note that during this intermittent halt A3, the seesaw member 34 performs its oscillating motion from the initial state (Fig. 4A) to the opposite state (Fig. 4C) as described above (that is, the entering-side roll 34a descends while the exit-side roll 34b ascends). Thus, it is possible to receive the belt-like work 1 sent in from the upstream processing position Pn-1 at the reference speed V0 in its stretched-out state and to send out the belt-like work 1 to the downstream processing position Pn+1 at the reference speed V0. Therefore, the carrying state at the respective upstream and downstream processing positions Pn-1, Pn+1 is not interrupted whatsoever by the intermittent halt.

[0062] When receiving a signal indicating completion of the pressing motion from the pressing-motion monitoring sensor 41 after a while, the controller resumes the rotation of the drive roll 31b. At this time, however, as shown in the acceleration range A4 of Fig. 6, the controller increases the rotation speed according to a predetermined acceleration pattern up to a speed faster than the reference speed V0 in order to make the speed eventually faster than the entering-side carry speed Vin and the exit-side carry speed Vout, to thus return the seesaw member

34 in the state shown in Fig. 5A back to the initial state shown in Fig. 5C and prepare for the intermittent halt of the subsequent pressing motion.

[0063] Note that the fact that the seesaw member has returned to its initial state (Fig. 5C) is detected by the oscillating-motion monitoring sensor 43. This is described in detail. Immediately before returning to the initial state, the exit-side roll 34b first passes the position of the sensor 43a at the upper lower-limit position, and therefore, the sensor 43a at the upper lower-limit position sends a detection signal. Then, the controller starts to decelerate the drive roll 31b, as shown in the deceleration range A5 of Fig. 6. Then, when the exit-side roll 34b reaches the lower lower-limit position and the sensor 43b at the lower lower-limit position sends a detection signal, the controller sets the rotation speed of the drive roll 31b to the reference speed V0, which completes a single processing cycle.

[0064] After this, the above-described processing cycle is repeated every time the processing-target-section monitoring sensor 42 detects a processing-location mark on the belt-like work 1.

=== SECOND EMBODIMENT ===

[0065] Fig. 7 is a side view of a processing apparatus 10a according to a second embodiment. In the above-described first embodiment, the drive roll 31b controlled the carrying state of the belt-like work 1 in the press device 20. In the present second embodiment, the carrying state is controlled by a brake-equipped non-drive roll 31d provided in place of the drive roll 31b and an oscillation drive device 36 for driving the seesaw member 34 to oscillate. Note that the features other than the above are almost the same as those in the first embodiment, and thus explanation thereon is omitted.

[0066] The brake-equipped non-drive roll 31d includes a non-drive roll 31d installed at the same position as the drive roll 31b in place thereof, and a brake mechanism (not shown) of, for example, the drum-type or the disk-type for braking the rotation of the non-drive roll 31d. Accordingly, when the brake mechanism is not in operation, the non-drive roll 31d rotates along with the carrying of the belt-like work 1 which is in contact with the roll, whereas when the brake mechanism is in operation, not only is the roll itself halted, but the belt-like work 1 in contact therewith is also halted.

[0067] The oscillation drive device 36 is, for example, an air cylinder, and the tip end of its piston 36a is connected to the seesaw member 34. Thus, by supplying compressed air (pressurized air) from a predetermined compressed-air source to a cylinder chamber in the air cylinder via a diverter valve such as a solenoid valve, it is possible to oscillate the seesaw member 34 up and down via the ascending/descending motion of the piston 36a.

[0068] The non-drive roll 31d and the oscillation drive device 36 are controlled by the above-described controller, and thus, the belt-like work 1 is intermittently carried in the press device 20 as follows.

[0069] As in the above example, explanation is made based on the assumption that the processing apparatus 10a is in the initial state shown in Fig. 3. More specifically, the entering-side roll 34a and the exit-side roll 34b of the seesaw member 34 are respectively located at the upper-limit position and the lower-limit position as shown by the solid lines in Fig. 7, and the belt-like work 1 in the press device 20 is pulled by the downstream processing position Pn+1 and thus carried at the reference speed V0 equal to the entering-side carry speed Vin and the exit-side carry speed Vout.

[0070] When a detection signal indicating detection of a processing-location mark is transmitted from the processing-target-section monitoring sensor 42 while performing the carrying in the initial state, the controller activates the brake mechanism to restrict and stop the rotation of the non-drive roll 31d, to thus intermittently halt the carrying of the belt-like work 1 in the press device 20.

[0071] Then, during this intermittent halt, the controller makes the press device 20 perform its pressing motion.

[0072] Note that during this intermittent halt, the cylinder chamber of the air cylinder 36 is cut off from the compressed-air source by the diverter valve and opened to the atmosphere, and thus, the seesaw member 34 is brought to a state where it can freely oscillate owing to even the slightest load. Thus, the exit-side roll 34b of the seesaw member 34 is raised by the tension of the belt-like work 1 and ascends, whereas the entering-side roll 34a performs the opposite motion and descends. In other words, the seesaw member 34 performs its oscillating motion from the initial state shown with the solid lines in Fig. 7 to the opposite state shown with the chain double-dashed lines. Thus, the seesaw member 34 can receive the belt-like work 1 sent in from the upstream processing position Pn-1 at the entering-side carry speed Vin in its stretched-out state and send out the belt-like work 1 to the downstream processing position Pn+1 at the exit-side carry speed Vout. Therefore, the carrying state at the respective upstream and downstream processing positions Pn-1, Pn+1 is not interrupted whatsoever by the intermittent halt.

[0073] Then, when receiving a signal indicating completion of the pressing motion from the pressing-motion monitoring sensor 41, the controller releases the brake on the non-drive roll 31d (i.e., cancels the restriction on the rotation). Then, the non-drive roll 31d comes to rotate along with the belt-like work 1 carried by being pulled by the downstream processing position Pn+1. During this carrying, however, it is necessary to return the seesaw member 34 to the initial state shown with the solid lines (i.e., to the state in which the entering-side roll 34a is at the upper-limit position and the exit-side roll 34b is at the lower-limit position) in preparation for the subsequent intermittent halt. To do so, the controller switches the diverter valve and supplies the compressed air from the

compressed-air source to the cylinder chamber of the air cylinder 36, thereby extending the piston 36a of the air cylinder 36 and oscillating the seesaw member 34, i.e., raising the entering-side roll 34a and lowering the exit-side roll 34b.

[0074] Note that the fact that the seesaw member has returned to its initial state is detected by the oscillating-motion monitoring sensor 43. This is described in detail. Immediately before returning to the initial state, the exit-side roll 34b passes the position of the sensor 43a at the upper lower-limit position. Therefore, when the sensor 43a at the upper lower-limit position sends a detection signal, the controller first starts to decelerate the extending motion of the piston 36a of the air cylinder 36. Then, when the exit-side roll 34b reaches the lower lower-limit position and the sensor 43b at the lower lower-limit position sends a detection signal, the controller halts the extending motion of the air cylinder 36, which completes a single processing cycle.

[0075] Incidentally, the above-described second embodiment uses a brake-equipped non-drive roll 31d for intermittently halting the belt-like work 1 and releasing the same. It is instead possible to use a simple non-drive roll (driven roll) having no brake mechanism. In this case, however, a separate mechanism for restricting and halting the belt-like work 1 becomes necessary. An example thereof may include a nip mechanism that is arranged immediately downstream of the non-drive roll and that includes a pair of upper and lower nipping members provided so that they can nip the belt-like work 1 from above and below. When halting the carrying of the belt-like work 1, the pair of upper and lower nipping members moves toward one another and nips the belt-like work 1, to thereby restrict the downstream movement of the belt-like work 1. On the other hand, when resuming the carrying of the belt-like work 1, the nipping members move away from one another to thus cancel the nipped state of the belt-like work 1, thereby canceling the restriction on the movement of the belt-like work 1.

=== OTHER EMBODIMENTS ===

[0076] Although embodiments of the present invention have been described above, the invention is not limited to those embodiments, and modifications such as those described below are possible.

[0077] The foregoing embodiments describe, as methods for returning the seesaw member 34 to the initial state, an example in which the drive roll 31b is rotated rapidly, and an example in which the seesaw member 34 is moved by the air cylinder 36. The invention, however, is not limited thereto whatsoever, and it is possible, for example, to use a cam mechanism such as a plate cam to return the seesaw member 34 to the initial state.

[0078] The foregoing embodiments illustrate a configuration in which the entering-side roll 34a serving as the entering-side buffer mechanism and the exit-side roll 34b serving as the exit-side buffer mechanism are connected into a single unit by the seesaw member 34. The invention, however, is not limited thereto whatsoever, as long as the two members carry out opposite motions interlocked with one another. That is, the two members do not have to be connected together by the seesaw member 34.

[0079] For example, the entering-side roll 34a and the exit-side roll 34b may be configured so that they are reciprocatably guided in the up/down direction respectively, for example, by suitable guide rails and that the entering-side roll 34a and the exit-side roll 34b can ascend/descend up and down by a drive source such as an air cylinder. However, it is needless to say that, when the entering-side roll 34a and the exit-side roll 34b move in the up/down direction, the entering-side roll 34a and the exit-side roll 34b are controlled to move interlocked with one another--i.e., are controlled to move in opposite directions from one another at the same speed.

[0080] The foregoing embodiments do not particularly describe the materials etc. for the belt-like work 1. However, any belt-like element having moderate flexibility is applicable, and examples thereof may include nonwoven fabrics, woven fabrics, sheets, and film-like elements. Materials therefor may include resins, such as synthetic resins, and pulp.

[0081] The foregoing embodiments give press-working as an example of processing applied to the belt-like work 1. The invention, however, is not limited thereto whatsoever, and for example, the processing may include embossing for applying projecting-and-depressed patterns through pressing with dies, and sealing for melt-joining the belt-like work 1.

[0082] In the foregoing embodiments, one entering-side roll 34a and one exit-side roll 34b are provided on the seesaw member 34 to thus form a single downwardly-convex loop on each roll. It is, however, possible to increase the number of loops to two or more. For example, as shown in Fig. 8, two zigzag loops of belt-like work 1 may be formed by providing two each of the entering-side rolls 34a and the exit-side rolls 34b on the seesaw member 34 and providing respective fixed rolls 35 (rolls that are fixed at a predetermined position so that they do not move) between the entering-side rolls 34a, 34a and between the exit-side rolls 34b, 34b. Note that increasing the number of loops to two or more allows the stroke amount of the oscillating motion of the seesaw member 34 to be reduced compared to a case where the number of loops is one, and thus, it is possible to reduce the oscillating motion speed and thereby reduce the impact upon vertically reversing the oscillating motion.

Claims

1. A processing apparatus for intermittently halting and processing, at a processing position, a belt-like work that is continuously carried along a predetermined direction, the processing apparatus comprising:

a processing section that is provided at the processing position and that performs the processing on the work while the work is being halted;
an entering-side buffer mechanism that is provided upstream in the predetermined direction from the processing section and that can accumulate the work carried from upstream;
an exit-side buffer mechanism that is provided downstream in the predetermined direction from the processing section and that can accumulate the work having been processed and to be carried downstream; and
a sending section that is provided between the entering-side buffer mechanism and the processing section and that sends out the work accumulated by the entering-side buffer mechanism to the processing section;
the sending section,
by restricting the work, halting the work at the processing position, and
performing simultaneously decrease of an accumulation amount of work accumulated by the exit-side buffer mechanism and increase of an accumulation amount of work accumulated by the entering-side buffer mechanism in such a manner as the decrease in the accumulation amount of the exit-side buffer mechanism and the increase in the accumulation amount of the entering-side buffer mechanism equal to one another;
the sending section,
by canceling the restriction on the work, releasing the halt of the work, and
performing simultaneously increase of the accumulation amount of the exit-side buffer mechanism and decrease of the accumulation amount of the entering-side buffer mechanism in such a manner as the increase in the accumulation amount of the exit-side buffer mechanism and the decrease in the accumulation amount of the entering-side buffer mechanism equal to one another.

2. A processing apparatus according to claim 1, wherein:

the sending section is a roll; and
the roll is a drive roll that carries the work to the processing section by being driven to rotate while winding the work from the entering-side buffer mechanism around an outer circumferential surface of the roll.

3. A processing apparatus according to claim 1 or 2, wherein:

the sending section includes
a roll that is in contact with the work and
a pressing roll that is pressed against an outer circumferential surface of the above-mentioned roll; and
the work is carried sandwiched between the roll and the pressing roll.

4. A processing apparatus according to any one of claims 1 to 3, wherein:

the entering-side buffer mechanism accumulates the work carried from upstream by forming a loop consisting of the work in an intersecting direction that intersects with the predetermined direction; and
the exit-side buffer mechanism accumulates the work having been processed and to be carried downstream by forming, in the intersecting direction, a loop consisting of the work having been processed.

5. A processing apparatus according to claim 4, wherein:

the intersecting direction is a direction orthogonal to the predetermined direction.

6. A processing apparatus according to claim 4 or 5, wherein:

the entering-side buffer mechanism includes an entering-side roll that is reciprocatably guided in the intersecting direction, and the loop is formed by winding the work around the entering-side roll;
the exit-side buffer mechanism includes an exit-side roll that is reciprocatably guided in the intersecting direction, and the loop is formed by winding the work having been processed around the exit-side roll; and
the entering-side roll and the exit-side roll move in the intersecting direction interlocked with one another, and move in opposite directions from one another at the same speed when moving in the intersecting direction.

7. A processing apparatus according to claim 6, further comprising:

a seesaw member that oscillates about a predetermined axis,
wherein both the entering-side roll and the exit-side roll are mounted on the seesaw member, and
wherein the axis is located at a midpoint between a position where the entering-side roll is mounted and a position where the exit-side roll is mounted.

8. A processing apparatus according to claim 7, wherein:

the entering-side buffer mechanism includes a plurality of the entering-side rolls for forming the loop of the work by winding the work around the entering-side rolls in a zigzag form; and
the exit-side buffer mechanism includes a plurality of the exit-side rolls for forming the loop of the work having been processed by winding the processed work around the exit-side rolls in a zigzag form.

9. A processing apparatus according to any one of claims 1 to 8, wherein:

a motion for increasing the accumulation amount of the exit-side buffer mechanism and a motion for decreasing the accumulation amount of the entering-side buffer mechanism performed upon releasing the halt of the work are achieved by making a carry speed at which the work is carried between the entering-side buffer mechanism and the exit-side buffer mechanism faster than both
a carry speed at which the work is carried on a side upstream from the entering-side buffer mechanism and
a carry speed at which the work having been processed is carried on a side downstream from the exit-side buffer mechanism.

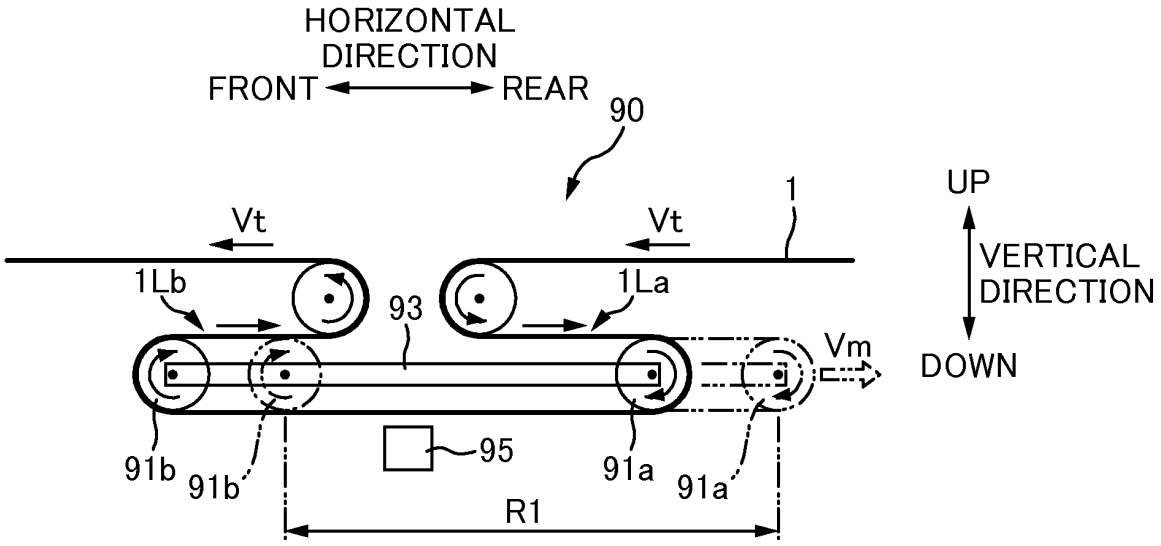

HORIZONTAL
DIRECTION
FRONT
REAR
90
1
UP
VERTICAL
DIRECTION
DOWN
Vt
Vt
1Lb
1La
93
Vm
95
91b
91b
91a
91a
R1

FIG. 1

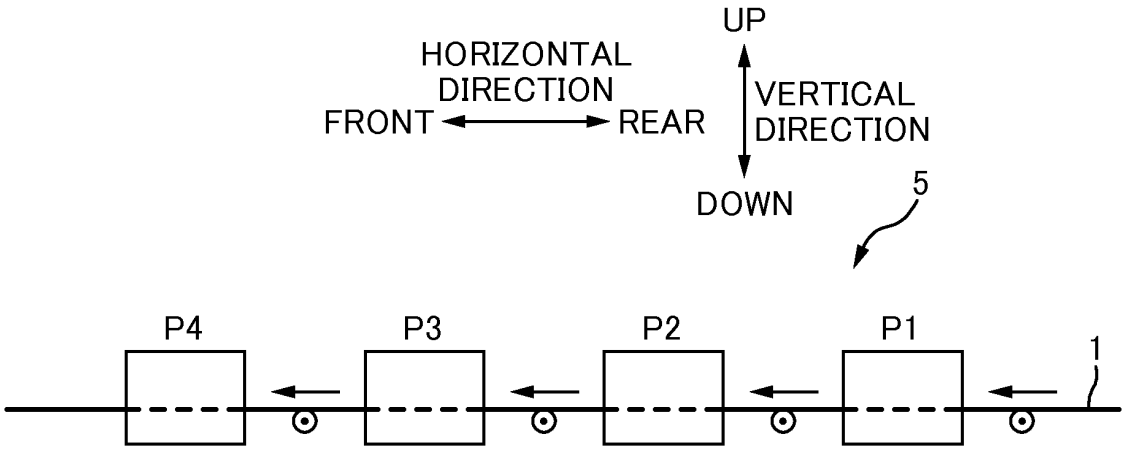

UP
HORIZONTAL
DIRECTION
FRONT
REAR
VERTICAL
DIRECTION
DOWN
5
P4
P3
P2
P1
1

FIG. 2

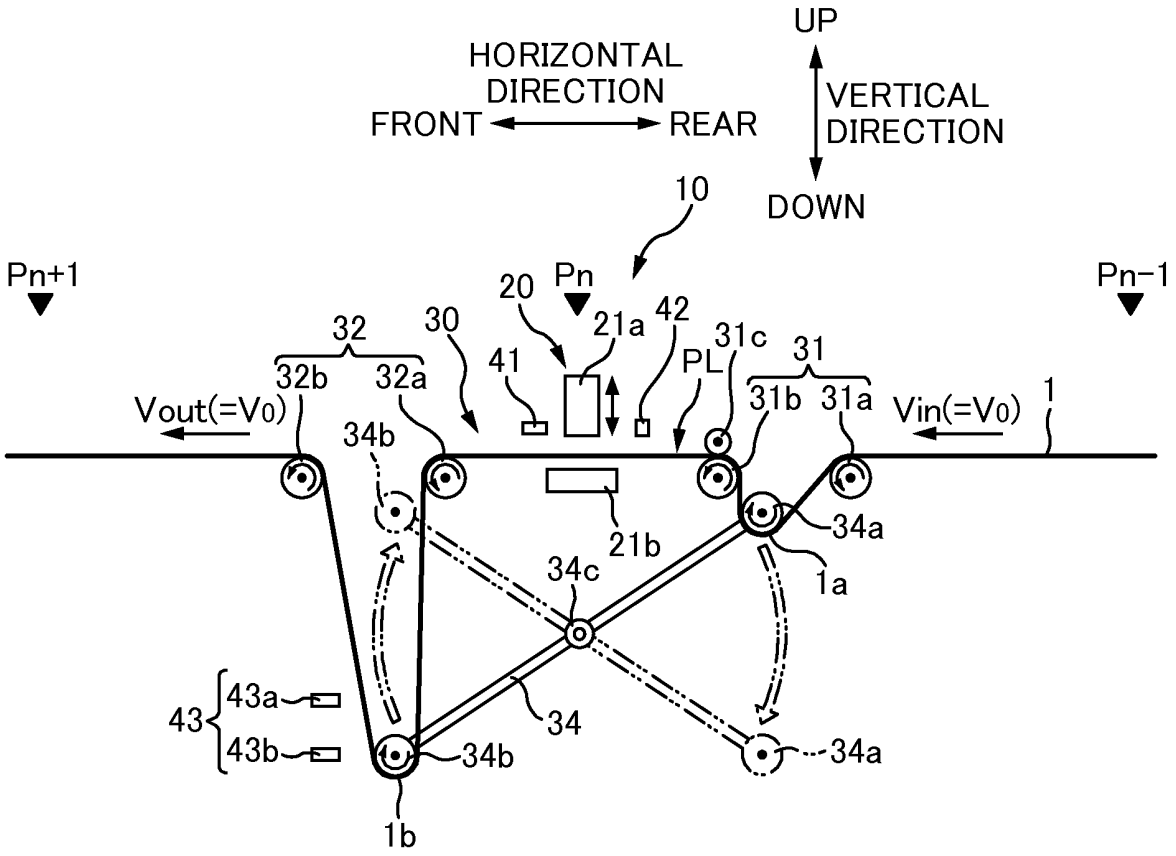

UP
HORIZONTAL DIRECTION
FRONT
REAR
VERTICAL DIRECTION
DOWN
10
Pn+1
Pn
Pn−1
20
32
30
21a
42
31c
31
41
PL
32b
32a
31b
31a
Vout(=V0)
Vin(=V0)
1
34b
21b
34a
34c
1a
43
43a
43b
34
34b
34a
1b

FIG. 3

FIG. 4A

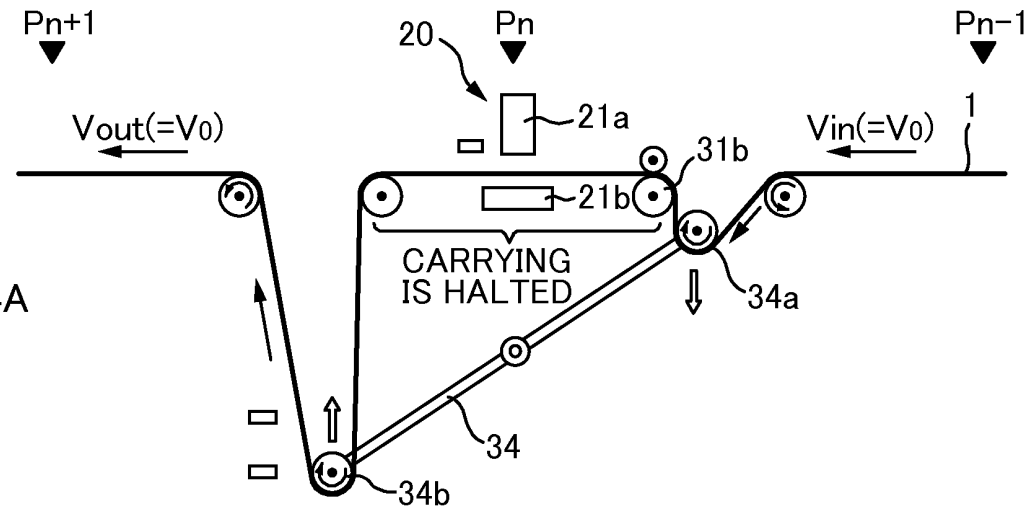


FIG. 4B

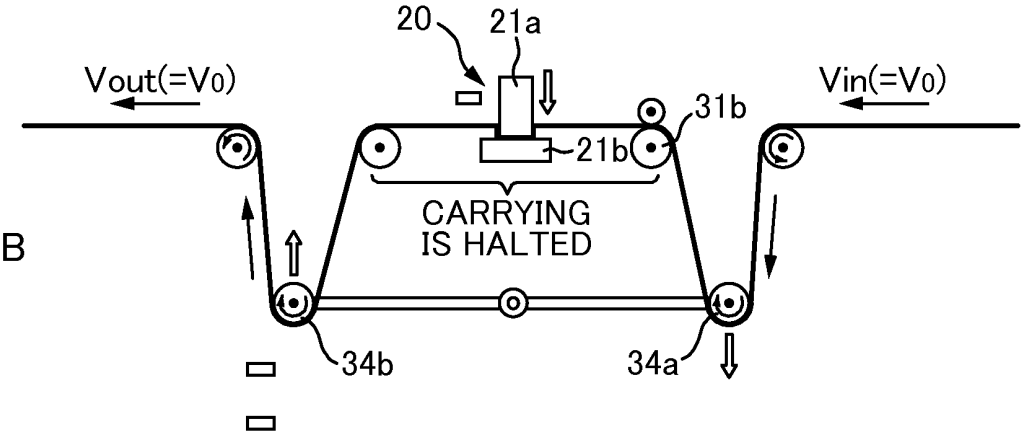


FIG. 4C

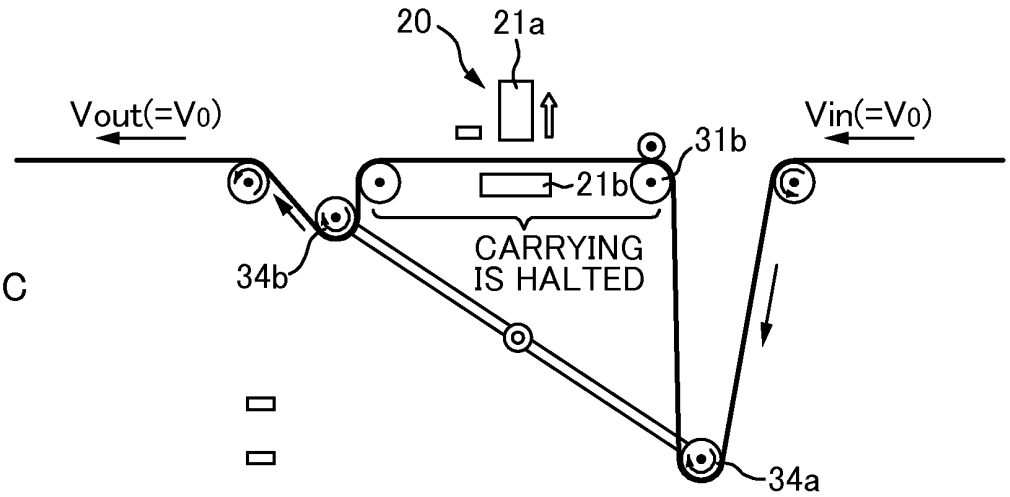


FIG. 5A

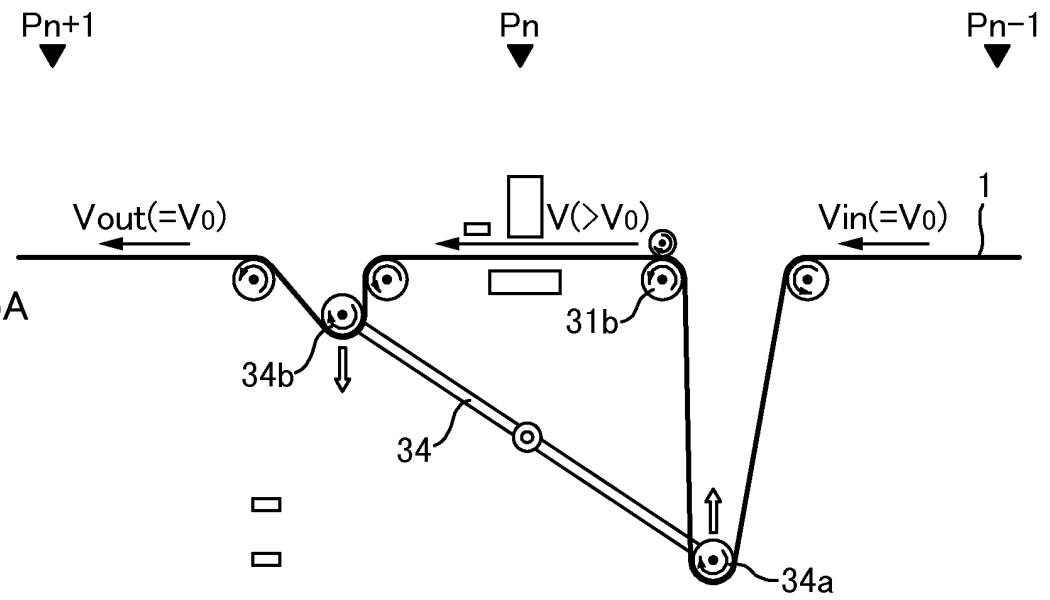


FIG. 5B

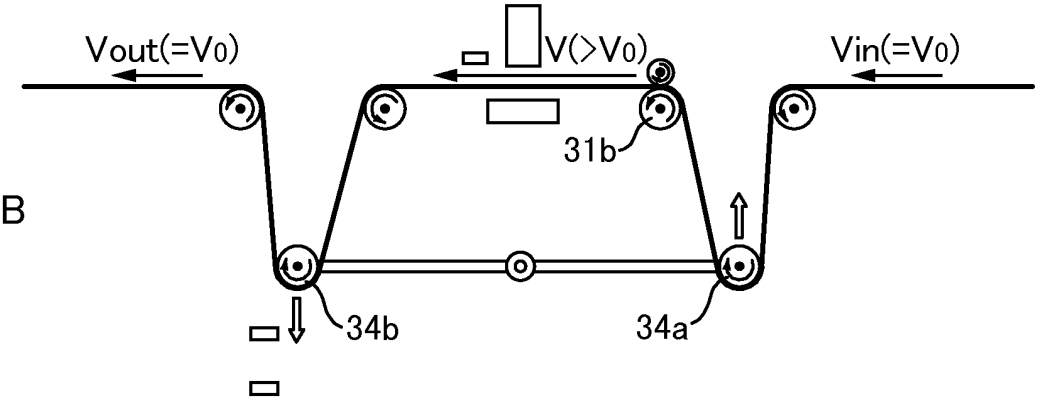
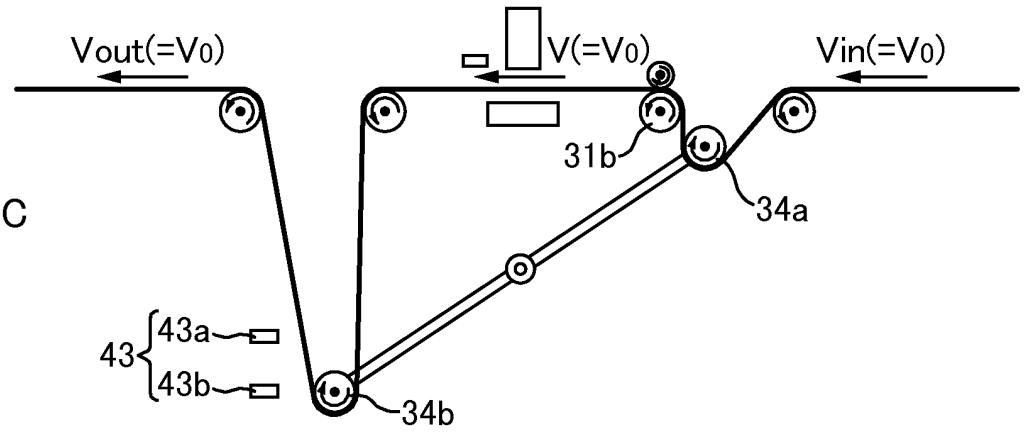


FIG. 5C



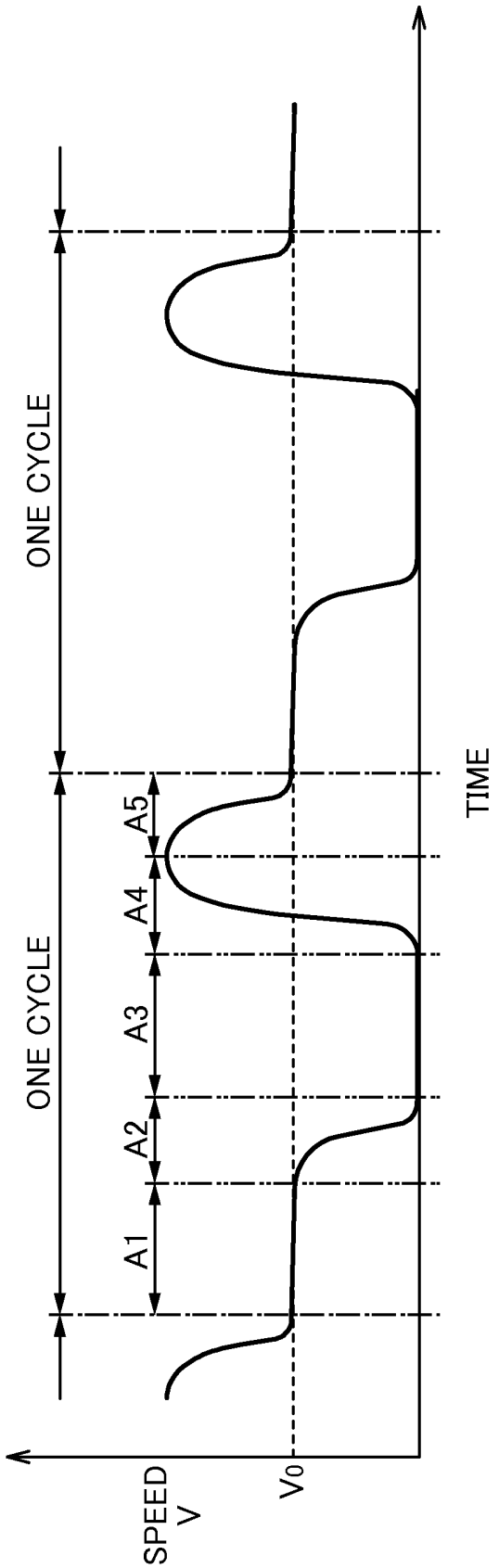


FIG. 6

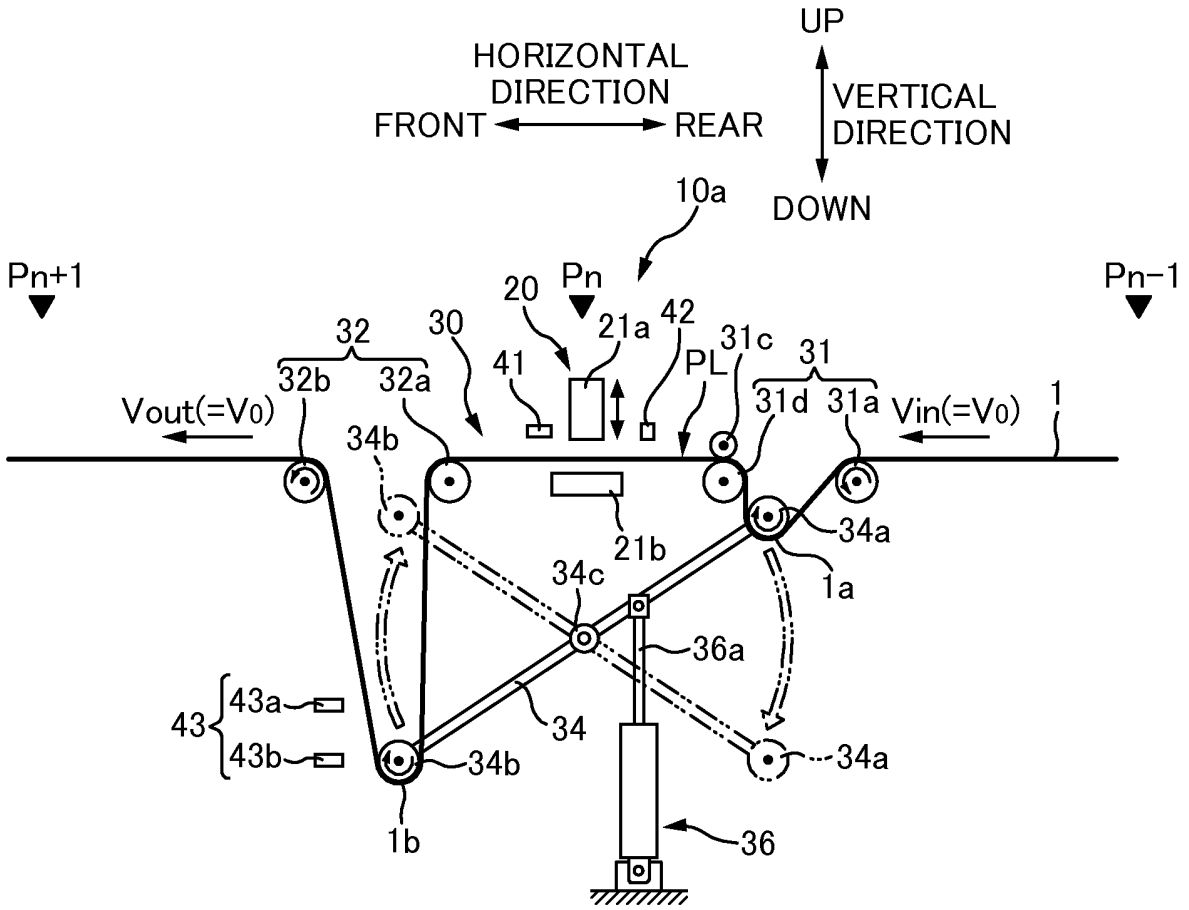

UP
HORIZONTAL DIRECTION
FRONT
REAR
VERTICAL DIRECTION
DOWN
10a
Pn+1
Pn
Pn−1
20
32
30
21a
42
31c
31
41
PL
32b
32a
31d
31a
Vout(=V0)
Vin(=V0)
1
34b
21b
34a
34c
1a
36a
43
43a
43b
34
34b
34a
1b
36

FIG. 7

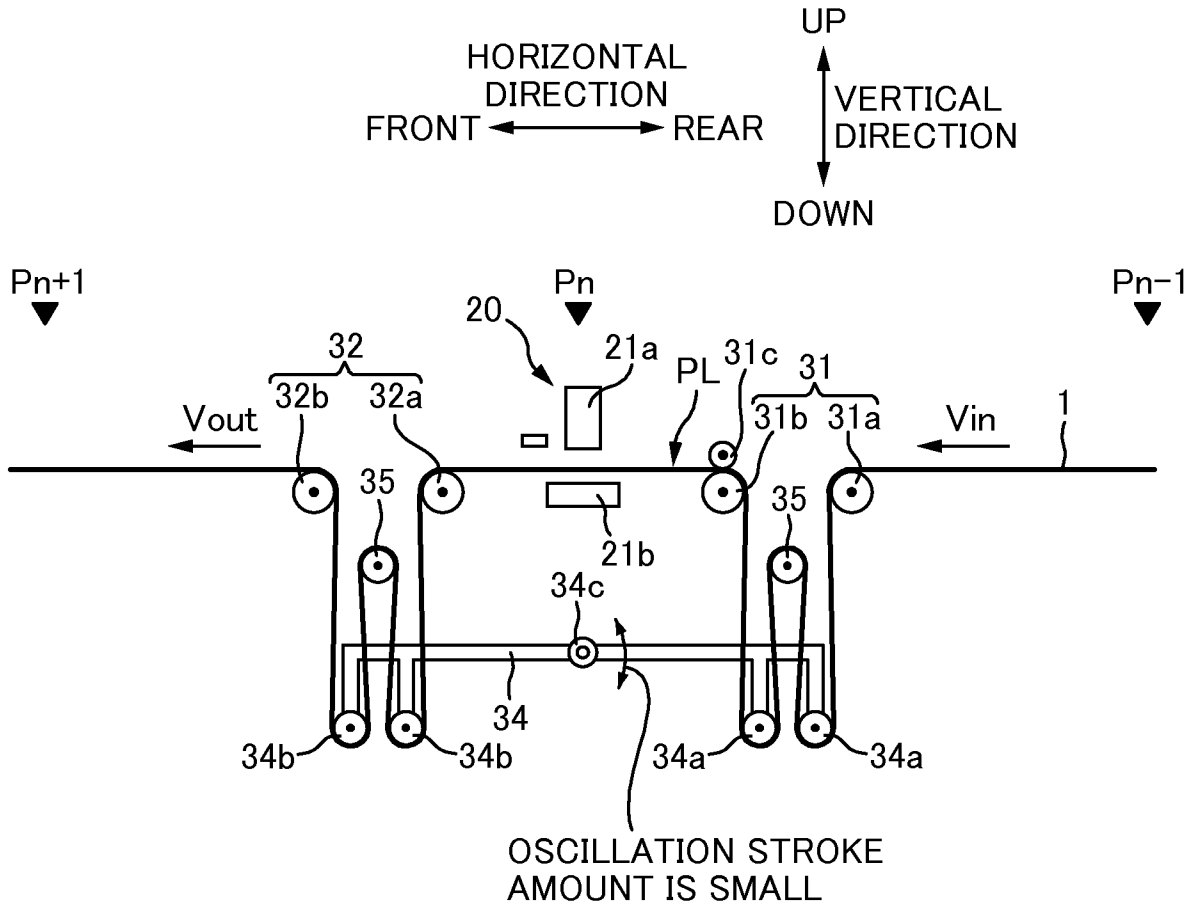

UP
HORIZONTAL DIRECTION
FRONT
REAR
VERTICAL DIRECTION
DOWN
Pn+1
Pn
Pn-1
20
32
32b
32a
21a
PL
31c
31
31b
31a
Vout
Vin
1
35
35
21b
34c
34
34b
34b
34a
34a
OSCILLATION STROKE AMOUNT IS SMALL

FIG. 8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2008/070994

A. CLASSIFICATION OF SUBJECT MATTER
B65H23/18(2006.01)i, *A61F5/44*(2006.01)i, *B65H20/04*(2006.01)i, *B65H20/24*(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)
B65H23/18-23/198, A61F5/44, B65H20/00-20/40

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 1996-2008
Kokai Jitsuyo Shinan Koho 1971-2008 Toroku Jitsuyo Shinan Koho 1994-2008

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.
X Y	JP 54-111553 A (Aichi Plastics Industry Co., Ltd.), 31 August, 1979 (31.08.79), Page 2, lower left column, line 16 to page 4, upper left column, line 12; Figs. 1 to 2 (Family: none)	1-7,9 8
Y A	JP 3452577 B2 (The Procter & Gamble Co.), 18 July, 2003 (18.07.03), Column 10, line 30 to column 14, line 26; Figs. 1 to 4 & US 5693165 A & EP 652175 A1 & WO 1995/012491 A1	8 1-7,9

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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"E" earlier application or patent but published on or after the international filing date
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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" 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
"X" 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
"Y" 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	Date of mailing of the international search report
11 December, 2008 (11.12.08)	06 January, 2009 (06.01.09)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (April 2007)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2008/070994

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2004-352386 A (Kao Corp.), 16 December, 2004 (16.12.04), Column 5, line 20 to column 7, line 6; Figs. 1 to 7 (Family: none)	1-9
A	US 3322604 A (Gloucester Engineering Co., Inc.), 30 May, 1967 (30.05.67), Column 8, lines 1 to 42; Fig. 14 & GB 1058882 A & GB 1058883 A	1-9
A	JP 60-12443 A (Sumitomo Light Metal Industries, Ltd.), 22 January, 1985 (22.01.85), Page 1, lower right column, line 18 to page 3, upper left column, line 5; Figs. 1 to 2 (Family: none)	1-9

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 3452577 B **[0004] [0008]**