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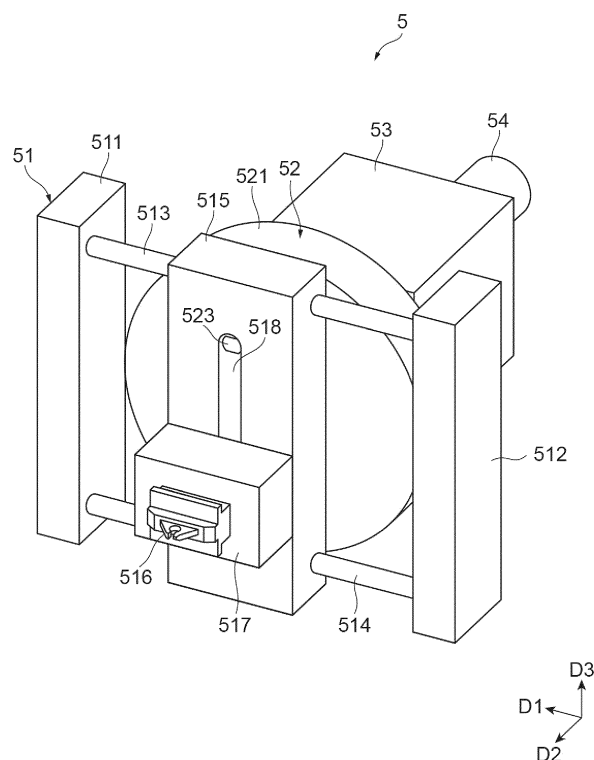
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(54) **YARN WINDING MACHINE**

(57) A traverse mechanism 4 of a yarn winding machine 1 includes a drive motor 53 which generates a rotation of a drive shaft 531, a crank disc 52 which converts the rotation of the drive shaft 531 of the drive motor 53 into a rotation of a circular orbit, and a reciprocating double slider crank portion 51 which converts the rotation of the circular orbit of the crank disc 52 into a reciprocating motion, the crank disc 52 includes a disc portion 521 which rotates while being connected to the drive shaft 531 and transmits power of the drive motor 53 and a crank pin 523 which transmits power to the reciprocating double slider crank portion 51, a distance between the disc portion 521 and the crank pin 523 is changeable, and the reciprocating double slider crank portion 51 includes a traverse guide 516 locking a yarn Y.

Fig.6



Description

TECHNICAL FIELD

[0001] The present invention relates to a yarn winding machine.

BACKGROUND

[0002] Patent Literature 1 (Japanese Unexamined Patent Publication No. 2009-234755) discloses a yarn winding machine including a roller which contacts a package during the formation of the package, a traverse device, and a free length changing member that is able to change a free length of a yarn between the roller and the traverse device during the formation of the package.

[0003] Patent Literature 2 (Japanese Unexamined Patent Publication No. 2010-163250) discloses a yarn winding machine including a bobbin holder which coaxially mounts and supports a plurality of winding bobbins and a plurality of traverse devices which have a yarn guide and reciprocates the yarn guide to twill each yarn for each winding bobbin. The traverse device of Patent Literature 2 is a belt type traverse device including an endless belt to which a yarn guide is attached, a pair of support units which support the endless belt so that at least a part of the endless belt is substantially parallel to the longitudinal direction of the bobbin holder, and a motor which drives the endless belt.

SUMMARY

[0004] In the yarn winding machine, the yarn traversed by the traverse device is wound to form a winding package. In the winding package, a so-called ear height (ear stand) phenomenon may occur in which the height of both ends is higher than that of the center due to the accumulation of yarns at both ends (folded yarns) of the package corresponding to the folded position of the yarn traverse. When the winding package in which the ear height phenomenon has occurred is unwound in a subsequent process, poor unwinding may occur. Therefore, in the yarn winding machine, it is required to suppress the occurrence of the ear height phenomenon. Then, it is necessary to change the traverse width and to control the change of the traverse width in order to suppress the occurrence of the ear height phenomenon.

[0005] In the yarn winding machine disclosed in Patent Literature 1, it is possible to change the traverse width without changing the reciprocating range of the traverse guide by changing the distance (free length) between the roller and the traverse device. However, the yarn winding machine becomes large due to the moving distance between the roller and the traverse device. Since a space in which the yarn winding machine can be installed is limited depending on a factory in which the yarn winding machine is installed, or the like, it is desired to save the space of the yarn winding machine.

[0006] In the belt type traverse device disclosed in Patent Literature 2, it is possible to change a traverse width or a traverse cycle by changing the forward/reverse rotation or rotation speed of the motor. Therefore, in the belt type traverse device, it is possible to suppress the occurrence of the ear height phenomenon by changing the traverse width during winding of the yarn and suppressing the difference in height between both ends and the center. However, the ability of the belt type traverse device depends on the performance of the motor. When the traverse width becomes narrow or the yarn winding speed becomes fast, it is necessary to shorten the cycle of switching between forward and reverse rotation (it is necessary to increase the switching frequency). Therefore, the current motor performance may not cope with the desired traverse cycle. As a result, in the belt type traverse device, there is concern that the occurrence of the ear height phenomenon cannot be effectively suppressed.

[0007] An object of an aspect of the present invention is to provide a yarn winding machine capable of saving a space and changing a traverse width to a desired value while coping with a desired traverse cycle regardless of performance of a motor.

[0008] Further, another object is to provide a yarn winding machine capable of suppressing an occurrence of an ear height phenomenon in a winding package by controlling a change to a desired traverse width.

[0009] A yarn winding machine according to an aspect of the present invention is a yarn winding machine for winding a yarn to form a package, including: a winding mechanism which winds the yarn; and a traverse mechanism which traverses the wound yarn, wherein the traverse mechanism includes: a drive unit which generates a rotation of a drive shaft, a crank portion which converts the rotation of the drive shaft of the drive unit into a rotation of a circular orbit, and a rotary reciprocating conversion portion which converts the rotation of the circular orbit of the crank portion into a reciprocating motion, wherein the crank portion includes: a first power transmission portion which rotates while being connected to the drive shaft and transmits power of the drive unit, and a second power transmission portion which transmits power to the rotary reciprocating conversion portion, wherein a distance between the first power transmission portion and the second power transmission portion is changeable, and wherein the rotary reciprocating conversion portion includes a traverse guide locking the yarn.

[0010] In the yarn winding machine according to an aspect of the present invention, the rotational motion of the crank portion is converted into the reciprocating motion in the rotary reciprocating conversion portion. Accordingly, in the yarn winding machine, it is not necessary to switch the forward/reverse rotation of the drive unit. Thus, in the yarn winding machine, it is possible to wind the yarn at a desired traverse cycle regardless of the performance of the motor.

[0011] Further, in the yarn winding machine, the dis-

tance between the first power transmission portion and the second power transmission portion is changeable. When the distance between the first power transmission portion and the second power transmission portion is changed, the rotation radius (rotation orbit) of the second power transmission portion is changed. Accordingly, the reciprocating range of the rotary reciprocating conversion portion, that is, the traverse width is changed. That is, the traverse width decreases when the rotation radius of the second power transmission portion is decreased and the traverse width increases when the rotation radius of the second power transmission portion is increased. Thus, in the yarn winding machine, it is possible to wind the yarn at a desired traverse width. Further, in the yarn winding machine, it is possible to change the traverse width even when the distance between the roller and the traverse device is not changed and hence to save a space.

[0012] In an embodiment, the yarn winding machine may further include a changing device which changes a distance between the first power transmission portion and the second power transmission portion and a control device which controls an operation of the changing device. In this configuration, it is possible to change a distance between the rotation axis of the first power transmission portion and the second power transmission portion at a desired timing by controlling the changing device using the control device. Therefore, in the yarn winding machine, it is possible to suppress the occurrence of the ear height phenomenon by controlling the changing device so that the traverse width is changed at a desired timing.

[0013] In an embodiment, the yarn winding machine may further include an elastic member that biases the second power transmission portion toward the first power transmission portion and a moving member that moves the second power transmission portion in a direction opposite to a biasing direction of the elastic member. In this configuration, since the second power transmission portion is biased toward the first power transmission portion by the elastic member, it is possible to shorten the distance between the second power transmission portion and the first power transmission portion, that is, the traverse width by the biasing force of the elastic member. Therefore, in the yarn winding machine, it is possible to promptly change the traverse width.

[0014] In an embodiment, the changing device may send a fluid to the moving member in a direction opposite to the biasing direction of the elastic member and may move the moving member by adjusting a pressure of the fluid. In this configuration, it is possible to accurately move the second power transmission portion.

[0015] In an embodiment, the second power transmission portion may be provided to be movable along a direction orthogonal to the rotation axis of the first power transmission portion. In this configuration, since the second power transmission portion is linearly moved along a direction orthogonal to the rotation axis of the first power

transmission portion, it is possible to change the traverse width. Therefore, in the yarn winding machine, it is possible to promptly change the traverse width. Thus, in the yarn winding machine, it is possible to cope with the change of the traverse width even when the yarn is wound at a high speed.

[0016] In an embodiment, the crank portion may have a circular shape when viewed from a direction along the first power transmission portion.

[0017] According to an aspect of the present invention, it is possible to save a space and to change a traverse width to a desired value while coping with a desired traverse cycle regardless of the performance of a motor.

[0018] Further, since the change of the traverse width is controlled, it is possible to suppress the occurrence of an ear height phenomenon in a winding package.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019]

FIG. 1 is a front view of a yarn winding machine according to a first embodiment.

FIG. 2 is a plan view of the yarn winding machine shown in FIG. 1.

FIG. 3 is a side view of the yarn winding machine shown in FIG. 1.

FIG. 4 is a partially enlarged view of the yarn winding machine.

FIG. 5 is a perspective view showing a traverse mechanism.

FIG. 6 is a perspective view showing a traverse device.

FIG. 7 is a view showing a cross-sectional configuration of the traverse device.

FIG. 8 is a rear view of a crank disc.

FIGS. 9(a) and 9(b) are views showing a motion of a crank pin.

FIG. 10 is a view showing a relationship between a traverse width and a position of the crank pin.

FIG. 11 is a view showing a relationship between the traverse width and the position of the crank pin.

FIG. 12 is a front view of a yarn winding machine according to a second embodiment.

FIG. 13 is a plan view of the yarn winding machine shown in FIG. 12.

FIG. 14 is a perspective view showing a traverse mechanism.

FIG. 15 is a perspective view showing a traverse device.

DETAILED DESCRIPTION

[0020] Hereinafter, preferred embodiments of the present invention will be described in detail with reference to the accompanying drawings. In the description of the drawings, the same or equivalent components are designated by the same reference numerals, and dupli-

cate description is omitted. In the following description, a first direction D1 (which is a right and left direction and in which an arrow side is a right side), a second direction D2 (which is a front and rear direction and in which an arrow side is a rear side), and a third direction D3 (which is an up and down direction and in which an arrow side is an upper side) specified in the drawings is used for description.

[First Embodiment]

[0021] A yarn winding machine 1 shown in FIG. 1 is applied to spinning equipment (not shown) including a spinning device (not shown) that simultaneously spins a plurality of yarns Y (see FIG. 4) such as spandex spinning. The yarn winding machine 1 winds the yarn Y spun from the above-described spinning device on a winding bobbin B to form a winding package P. In this embodiment, the yarn winding machine 1 can simultaneously form a plurality of (for example, ten) winding packages P.

[0022] As shown in FIG. 1, the yarn winding machine 1 includes a support mechanism 2, a winding mechanism 3, and a traverse mechanism 4.

[0023] The support mechanism 2 is disposed at one end portion in the first direction D1. The support mechanism 2 accommodates an air pressure adjusting device (changing device) 21 which adjusts an air pressure of air supplied from an air pressure supply device (not shown) disposed in a factory having the yarn winding machine 1 installed therein and supplies the air (fluid) to a traverse device 5 (rotary union 54), a drive motor which supplies power to each part, and the like. Further, the support mechanism 2 is provided with a control device 22. The control device 22 is a part that controls various operations of the yarn winding machine 1 and a processor having an integrated circuit mounted therein or a computer system having the same.

[0024] The winding mechanism 3 winds the yarn Y to form the winding package P. The winding mechanism 3 includes a touch roller 31, bobbin holders 32 and 33, and a turret 34.

[0025] The touch roller 31 is a roller which contacts the winding package P. The touch roller 31 is rotatably supported by a swing arm (not shown). As shown in FIG. 2, the touch roller 31 is disposed along the first direction D1. As shown in FIGS. 3 and 4, the touch roller 31 rotates while being in contact with the winding package P and sends the yarn Y traversed by the traverse device 5 to the outer periphery (outer layer) of the winding package P. The touch roller 31 is provided to be movable in a direction moving toward the winding package P (winding bobbin B) at the winding position or a direction moving away from the winding package P by swinging the swing arm.

[0026] As shown in FIGS. 1 and 3, the bobbin holders 32 and 33 support the winding bobbin B. The bobbin holders 32 and 33 rotationally drive the winding bobbin B to wind the yarn Y on the winding bobbin B. The bobbin

holders 32 and 33 are arranged along the first direction D1. The bobbin holders 32 and 33 are cantilevered by the turret 34. That is, one ends of the bobbin holders 32 and 33 are fixed to the turret 34. The bobbin holders 32 and 33 are arranged at positions symmetrical with respect to the rotation axis of the turret 34. The bobbin holders 32 and 33 are rotationally driven by a drive motor (not shown).

[0027] As shown in FIG. 3, the turret 34 is supported by the support mechanism 2. The turret 34 is rotatably provided in the support mechanism 2. The turret 34 is rotated around the rotation axis by a drive motor (not shown). The turret 34 supports the bobbin holders 32 and 33. The turret 34 switches the positions of the bobbin holders 32 and 33. By rotating the turret 34 itself half a turn, the positions of two bobbin holders 32 and 33 can be switched so that one of the bobbin holders 32 and 33 is located at the upper winding position and the other is located at the lower standby position.

[0028] The traverse mechanism 4 traverses the yarn Y. The traverse mechanism 4 is disposed on the upstream side of the touch roller 31 of the winding mechanism 3 in the running direction of the yarn Y. As shown in FIGS. 1, 2, and 5, in this embodiment, the traverse mechanism 4 includes a plurality of (for example, ten) traverse devices 5. The number of the traverse devices 5 corresponds to the number of the winding bobbins B (winding packages P). The plurality of traverse devices 5 are accommodated in a housing 6. The housing 6 is fixed to the support mechanism 2. The plurality of traverse devices 5 are arranged in the housing 6 at predetermined intervals in the first direction D1.

[0029] As shown in FIGS. 4, 6, and 7, the traverse device 5 includes a reciprocating double slider crank portion (rotary reciprocating conversion portion) 51, a crank disc (crank portion) 52, a drive motor (drive unit) 53, and a rotary union 54.

[0030] As shown in FIG. 6, the reciprocating double slider crank portion 51 includes guide supports 511 and 512, slider guides 513 and 514, a slider 515, a traverse guide 516, and a fixing portion 517. The reciprocating double slider crank portion 51 converts the rotational motion of the crank disc 52 into the reciprocating motion of the slider 515.

[0031] The guide supports 511 and 512 support the slider guides 513 and 514. The guide supports 511 and 512 have, for example, a rectangular parallelepiped shape. The guide supports 511 and 512 are fixed to the housing 6. The guide supports 511 and 512 are arranged along the third direction D3. The guide supports 511 and 512 are arranged to face each other at a predetermined interval in the first direction D1.

[0032] The slider guides 513 and 514 guide the slider 515 in a predetermined direction. The slider guides 513 and 514 have, for example, a bar shape. The slider guides 513 and 514 are supported by the guide supports 511 and 512. The slider guides 513 and 514 are arranged along the first direction D1. One ends of the slider guides

513 and 514 are fixed to the guide support 511 and the other ends of the slider guides 513 and 514 are fixed to the guide support 512. That is, the slider guides 513 and 514 are hung on the guide support 511 and the guide support 512. The slider guides 513 and 514 are arranged to face each other at a predetermined interval in the third direction D3.

[0033] The slider 515 moves the traverse guide 516 in a predetermined direction. The slider 515 has, for example, a rectangular parallelepiped shape. The slider 515 is provided in the slider guides 513 and 514 to be movable (slidable). The slider 515 is inserted into the slider guides 513 and 514. The slider 515 moves along the longitudinal direction of the slider guides 513 and 514, that is, the first direction D1. The slider 515 is disposed along the third direction D3 and is provided over the slider guide 513 and the slider guide 514.

[0034] The slider 515 is provided with an elongated hole 518. The elongated hole 518 is a through-hole which penetrates the slider 515 in the thickness direction (second direction D2). The elongated hole 518 is disposed along a direction in which the slider 515 is disposed, that is, the third direction D3. The width of the elongated hole 518 is equal to or larger than an outer diameter of a crank pin 523 to be described later and is substantially equal to the outer diameter of the crank pin 523.

[0035] The traverse guide 516 locks the yarn Y. The traverse guide 516 traverses the yarn Y sent in the downstream direction by reciprocating with the traverse width in the traverse direction (corresponding to the first direction D1) with the yarn Y locked. The traverse guide 516 is fixed to the slider 515 through the fixing portion 517. The fixing portion 517 has, for example, a rectangular parallelepiped shape. The traverse guide 516 moves in accordance with the movement of the slider 515.

[0036] The crank disc 52 includes a disc portion (first power transmission portion) 521, a connection portion (first power transmission portion) 522, a crank pin (second power transmission portion) 523, a piston (moving member) 524, and a spring (elastic member) 525. The crank disc 52 converts the rotation of a drive shaft 531 (to be described later) of the drive motor 53 into the rotation of a circular orbit.

[0037] The disc portion 521 has, for example, a disc shape. That is, the disc portion 521 has a circular shape when viewed from the direction along a rotation axis Ax of the disc portion 521 (see FIG. 8). The disc portion 521 rotates around the rotation axis Ax.

[0038] The connection portion 522 is connected to the drive shaft 531 of the drive motor 53. The connection portion 522 transmits the power of the drive motor 53. The connection portion 522 is provided integrally with the disc portion 521. When the connection portion 522 is rotationally driven by the drive motor 53, the disc portion 521 rotates.

[0039] The crank pin 523 has, for example, a pillar shape. The crank pin 523 transmits power to the reciprocating double slider crank portion 51. As shown in FIG.

7, the crank pin 523 is projected toward the rear side of the crank disc 52. The crank pin 523 is disposed at a position offset from the rotation axis Ax of the disc portion 521. A distance between the crank pin 523 and the connection portion 522 is changeable. In this embodiment, the rotation axis of the connection portion 522 matches the rotation axis Ax of the disc portion 521. That is, a distance between the crank pin 523 and the rotation axis Ax of the disc portion 521 is changeable.

[0040] A front end portion (a part) of the crank pin 523 is located inside the elongated hole 518 of the slider 515. The crank pin 523 is located in a crank pin guide 526 of the disc portion 521 and is provided to be movable along the crank pin guide 526. As shown in FIG. 8, the crank pin guide 526 is disposed between the outer edge and the rotation axis Ax of the disc portion 521 along the radial direction of the disc portion 521 (the direction orthogonal to the rotation axis of the connection portion 522).

[0041] The piston 524 is provided integrally with the crank pin 523. The piston 524 is disposed inside the hollow portion 527. The piston 524 has, for example, a columnar shape. The hollow portion 527 is disposed along the radial direction of the disc portion 521 and forms a space for accommodating the piston 524. The piston 524 moves inside the hollow portion 527 in accordance with the pressure of air supplied to the hollow portion 527.

[0042] The spring 525 is provided between the piston 524 and the upper surface of the hollow portion 527. The spring 525 biases the piston 524 toward the rotation axis Ax of the disc portion 521. As shown in FIGS. 9(a) and 9(b), the piston 524 is provided to be movable inside the hollow portion 527. The piston 524 moves inside the hollow portion 527 in accordance with the pressure of air supplied to the hollow portion 527. When air of a predetermined pressure is supplied to the hollow portion 527, the piston 524 moves in a direction against the biasing force of the spring 525, that is, toward the outer edge of the disc portion 521. When the supply of air to the hollow portion 527 is stopped (when the pressure of air decreases), the piston 524 moves toward the rotation axis Ax of the disc portion 521 by the biasing force of the spring 525.

[0043] As shown in FIG. 9(a), when air is supplied to the hollow portion 527 of the disc portion 521, the crank pin 523 moves in a direction moving away from the rotation axis Ax in accordance with the movement of the piston 524. The crank pin 523 moves up to a separation position. The separation position is a position in which the crank pin 523 is the farthest from the rotation axis Ax of the disc portion 521. As shown in FIG. 9(b), the crank pin 523 is located at an initial position in an initial state (a state in which no air is supplied). The initial position is a position in which the crank pin 523 is the closest to the rotation axis Ax of the disc portion 521. When the supply of air is stopped (the air pressure decreases), the crank pin 523 moves to the initial position by the biasing force of the spring 525.

[0044] The drive motor 53 rotationally drives the crank disc 52. The drive motor 53 is, for example, an induction

motor. The drive motor 53 generates the rotation of the drive shaft 531 (see FIG. 7). The operation of the drive motor 53 is controlled by the control device 22. As shown in FIG. 7, a shaft portion 543 described later of the rotary union 54 is inserted into the drive shaft 531 of the drive motor 53.

[0045] The rotary union 54 supplies air to the rotating crank disc 52. As shown in FIG. 7, the rotary union 54 includes a main body portion 541, a rotation portion 542, and a shaft portion 543. Air is supplied from the air pressure adjusting device 21 to the main body portion 541. The main body portion 541 is fixed to the housing 6. The rotation portion 542 is rotatably provided in the main body portion 541. The shaft portion 543 is connected to the rotation portion 542.

[0046] The shaft portion 543 is disposed along the second direction D2 and is inserted into the drive shaft 531 of the drive motor 53 and the front end (supply port) is located at the hollow portion 527 of the crank disc 52. The main body portion 541 includes a channel 544 through which air supplied from the air pressure adjusting device 21 flows. The shaft portion 543 includes a channel 545 which communicates with the channel 544 and supplies air to the hollow portion 527 of the crank disc 52 by allowing the air to flow. The air pressure adjusting device 21 is controlled by the control device 22 and supplies air of a predetermined pressure to the rotary union 54. The control device 22 controls the air pressure adjusting device 21 based on the setting contents to control the pressure of air supplied to the rotary union 54.

[0047] In the traverse device 5, the slider 515 moves in a reciprocating manner when the crank disc 52 rotates. Specifically, in the traverse device 5, when the crank disc 52 rotates, the crank pin 523 rotates in accordance with the rotation. The crank pin 523 moves in a reciprocating manner inside the elongated hole 518 while contacting the elongated hole 518 of the slider 515. Accordingly, the slider 515 moves in a reciprocating manner along the slider guides 513 and 514 and the traverse guide 516 moves in a reciprocating manner in the traverse width. In the traverse device 5, the moving direction of the slider 515 is switched at a cycle of half a rotation of the crank disc 52.

[0048] In the traverse device 5, it is possible to change the traverse width (the movement range of the traverse guide 516) by changing the position of the crank pin 523. That is, in the traverse device 5, it is possible to change the traverse width by changing the rotation radius of the crank pin 523. In the traverse device 5, the traverse width decreases when the rotation radius of the crank pin 523 is decreased (the distance from the rotation axis Ax is decreased) and the traverse width increases when the rotation radius of the crank pin 523 is increased (the distance from the rotation axis Ax is increased).

[0049] As shown in FIG. 10, in the traverse device 5, the traverse width becomes W1 by setting the position of the crank pin 523 to the separation position (FIG. 9(a)). The traverse width W1 is the largest width in the traverse

device 5. As shown in FIG. 11, in the traverse device 5, the traverse width becomes W2 by setting the position of the crank pin 523 to the initial position (FIG. 9(b)). The traverse width W2 is the smallest width in the traverse device 5 ($W1 > W2$). In the traverse device 5, it is possible to change the traverse width in the range between the traverse width W1 and the traverse width W2 by changing (adjusting) the position of the crank pin 523.

[0050] In the yarn winding machine 1, the position of the crank pin 523 is set in accordance with the traverse width corresponding to the winding package P. The control device 22 controls the air pressure adjusting device 21 so that the position of the crank pin 523 becomes a position corresponding to the traverse width. In the yarn winding machine 1, the traverse width is changed at a desired timing by changing the position of the crank pin 523 at a desired timing during the formation of the winding package P. Specifically, the control device 22 controls the pressure of air supplied to the traverse device 5 (rotary union 54) by controlling the air pressure adjusting device 21. Accordingly, the traverse device 5 changes the traverse width at a desired timing. The traverse device 5 decreases the traverse width, for example, at a cycle of once every four round trips.

[0051] As described above, in the yarn winding machine 1 according to this embodiment, the rotation of the crank disc 52 is converted into the reciprocating motion. Accordingly, in the yarn winding machine 1, it is not necessary to switch between forward rotation and reverse rotation in the drive motor 53. Further, in the yarn winding machine 1, it is possible to increase the traverse speed in the traverse device 5 by increasing the rotation speed of the drive motor 53. Thus, in the yarn winding machine 1, it is possible to wind the yarn at a desired traverse cycle regardless of the performance of the drive motor 53. Thus, in the yarn winding machine 1, it is possible to decrease the traverse width by changing the position of the crank pin 523.

[0052] Further, in the yarn winding machine 1, it is possible to change a distance between the crank pin 523 and the rotation axis Ax of the disc portion 521 of the traverse device 5. When the position of the crank pin 523 is changed, the rotation radius (rotation orbit) of the crank pin 523 is changed. Accordingly, the reciprocating range of the slider 515, that is, the traverse width is changed. That is, in the yarn winding machine 1, the traverse width decreases when the rotation radius of the crank pin 523 is decreased and the traverse width increases when the rotation radius of the crank pin 523 is increased. Thus, in the yarn winding machine 1, it is possible to wind the yarn at a desired traverse width. Further, it is possible to change the traverse width even when the distance between the touch roller 31 and the traverse device 5 is not changed and hence to save a space.

[0053] The yarn winding machine 1 according to this embodiment includes the changing device which changes a distance between the crank pin 523 and the rotation axis Ax of the disc portion 521 and the control device 22

which controls the operation of the changing device. In this configuration, it is possible to change a distance between the crank pin 523 and the rotation axis Ax of the disc portion 521 at a desired timing by controlling the changing device using the control device 22. Therefore, in the yarn winding machine 1, it is possible to suppress the occurrence of an ear height phenomenon by controlling the changing device so that the traverse width is changed at a desired timing.

[0054] The yarn winding machine 1 according to this embodiment includes the spring 525 which biases the crank pin 523 toward the rotation axis Ax of the disc portion 521 and the piston 524 which moves the crank pin 523 in a direction opposite to the biasing direction of the spring 525. In this configuration, since the crank pin 523 is biased toward the rotation axis Ax of the disc portion 521 by the spring 525, it is possible to shorten a distance between the crank pin 523 and the rotation axis Ax of the disc portion 521, that is, the traverse width by the biasing force of the spring 525. Therefore, in the yarn winding machine 1, it is possible to promptly change the traverse width.

[0055] In the yarn winding machine 1 according to this embodiment, the changing device sends a fluid to the piston 524 in a direction opposite to the biasing direction of the spring 525 and moves the piston 524 by adjusting the pressure of the fluid. In this configuration, it is possible to accurately move the crank pin 523.

[0056] In the yarn winding machine 1 according to this embodiment, the crank pin 523 is provided to be movable along the radial direction of the disc portion 521. In this configuration, it is possible to change the traverse width by linearly moving the crank pin 523 along the radial direction. Therefore, in the yarn winding machine 1, it is possible to promptly change the traverse width. Thus, in the yarn winding machine 1, it is possible to cope with the change of the traverse width even when the yarn Y is wound at a high speed.

[Second Embodiment]

[0057] Next, a second embodiment will be described. As shown in FIGS. 12 and 13, a yarn winding machine 1A includes a support mechanism 2, a winding mechanism 3, and a traverse mechanism 4A.

[0058] In this embodiment, the traverse mechanism 4A includes one traverse device 5A. The traverse device 5A is disposed at the center portion of the housing 6 in the first direction D1.

[0059] As shown in FIG. 15, the traverse device 5A includes a reciprocating double slider crank portion 51A, a crank disc 52, a drive motor 53, and a rotary union 54.

[0060] As shown in FIGS. 14 and 15, the reciprocating double slider crank portion 51A includes a fixing portion 517A. The fixing portion 517A is fixed to a slider 515. As shown in FIG. 14, the fixing portion 517A is disposed along the first direction D1. A plurality of (for example, ten) traverse guides 516 are arranged in the fixing portion

517A. The traverse guides 516 are arranged at predetermined intervals in the direction (first direction D1) in which the fixing portion 517A is disposed. That is, the traverse guide 516 is disposed to correspond to the position of the winding bobbin B. The plurality of traverse guides 516 fixed to the fixing portion 517A move in accordance with the movement of the slider 515.

[0061] In the traverse device 5A, the slider 515 moves in a reciprocating manner when the crank disc 52 rotates. Specifically, in the traverse device 5A, when the crank disc 52 rotates, the crank pin 523 rotates in accordance with the rotation. The crank pin 523 moves inside an elongated hole 518 while contacting the elongated hole 518 of the slider 515. Accordingly, the slider 515 moves in a reciprocating manner along the slider guides 513 and 514 and the plurality of traverse guides 516 move in a reciprocating manner together in the traverse range. In the traverse device 5A, the moving direction of the slider 515 is switched at a cycle of half a rotation of the crank disc 52.

[0062] As described above, in the yarn winding machine 1A according to this embodiment, it is possible to suppress the occurrence of an ear height phenomenon in the winding package, to save a space, and to increase a yarn winding speed. Further, only one traverse device 5A is provided in the yarn winding machine 1A. In the traverse device 5A, the plurality of traverse guides 516 are driven at one time. Accordingly, it is possible to reduce the manufacturing cost and running cost of the yarn winding machine 1.

[0063] As described above, the embodiments of the present invention have been described, but the present invention is not essentially limited to the above-described embodiments and can be modified into various forms in the scope not departing from the spirit.

[0064] In the above-described embodiments, a mode in which the crank disc 52 has a circular shape when viewed from the direction along the rotation axis Ax has been described as an example. However, the shape of the crank disc 52 is not limited thereto and may be, for example, a rectangular shape, a polygonal shape, or the like. It is preferable that the crank disc 52 has a circular shape when the crank disc rotates at a high speed.

[0065] In the above-described embodiments, a mode in which the elongated hole 518 is the through-hole has been described as an example. However, the elongated hole 518 may not be the through-hole, but may be, for example, a recess such as a concave portion, or the like.

[0066] In the above-described embodiments, a mode in which the piston 524 provided integrally with the crank pin 523 is moved by an air pressure has been described as an example. However, the means for changing the position of the crank pin 523 is not limited thereto. For example, the position of the crank pin 523 may be changed by a hydraulic pressure and the position may be changed by a solenoid valve or the like.

[0067] In the above-described embodiments, a mode in which the first power transmission portion includes the

disc portion 521 and the connection portion 522 has been described as an example. However, the first power transmission portion may include only the connection portion 522. In this configuration, the connection portion 522 and the crank pin 523 may be connected to each other by a connection member or the like.

REFERENCE SIGNS LIST

[0068] 1, 1A: yarn winding machine, 3: winding mechanism, 4, 4A: traverse mechanism, 21: air pressure adjusting device (changing device), 22: control device, 51: reciprocating double slider crank portion (rotary reciprocating conversion portion), 52: crank disc (crank portion), 53: drive motor (drive unit), 516: traverse guide, 521: disc portion (first power transmission portion), 523: crank pin (second power transmission portion), 524: piston (moving member), 525: spring (elastic member), Ax: rotation axis, Y: yarn.

Claims

1. A yarn winding machine (1, 1A) for winding a yarn (Y) to form a package (P), comprising:

a winding mechanism (3) which winds the yarn (Y); and
a traverse mechanism (4, 4A) which traverses the wound yarn (Y),
wherein the traverse mechanism (4, 4A) includes:

a drive unit (53) which generates a rotation of a drive shaft (531),
a crank portion (52) which converts the rotation of the drive shaft (531) of the drive unit (53) into a rotation of a circular orbit, and
a rotary reciprocating conversion portion (51) which converts the rotation of the circular orbit of the crank portion (52) into a reciprocating motion,

wherein the crank portion (52) includes:

a first power transmission portion (521) which rotates while being connected to the drive shaft (531) and transmits power of the drive unit (53), and
a second power transmission portion (523) which transmits power to the rotary reciprocating conversion portion (51),

wherein a distance between the first power transmission portion (521) and the second power transmission portion (523) is changeable, and
wherein the rotary reciprocating conversion portion (51) includes a traverse guide (516) locking

the yarn (Y).

2. The yarn winding machine (1, 1A) according to claim 1, further comprising:

a changing device (21) which changes a distance between the first power transmission portion (521) and the second power transmission portion (523); and
a control device (22) which controls an operation of the changing device (21).

3. The yarn winding machine (1, 1A) according to claim 2, further comprising:

an elastic member (525) that biases the second power transmission portion (523) toward the first power transmission portion (521); and
a moving member (524) that moves the second power transmission portion (523) in a direction opposite to a biasing direction of the elastic member (525).

4. The yarn winding machine (1, 1A) according to claim 3,

wherein the changing device (21) sends a fluid to the moving member (524) in a direction opposite to the biasing direction of the elastic member (525), and
wherein the moving member (524) is moved by adjusting a pressure of the fluid.

5. The yarn winding machine (1, 1A) according to any one of claims 1 to 4,
wherein the second power transmission portion (523) is provided to be movable along a direction orthogonal to a rotation axis (Ax) of the first power transmission portion (521).

6. The yarn winding machine (1, 1A) according to any one of claims 1 to 5,
wherein the crank portion (52) has a circular shape when viewed from a direction along the first power transmission portion (521).

Fig.1

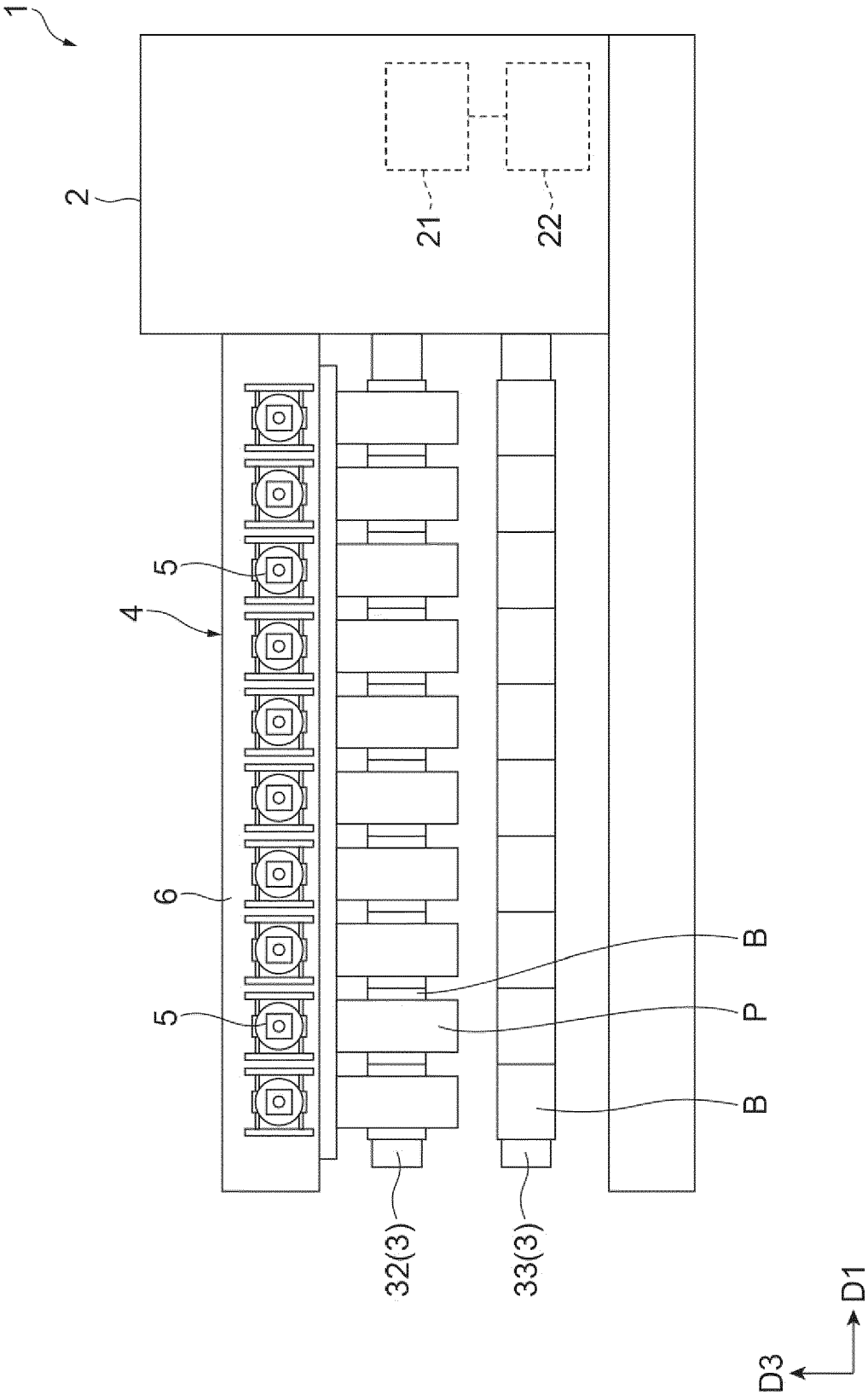


Fig. 2

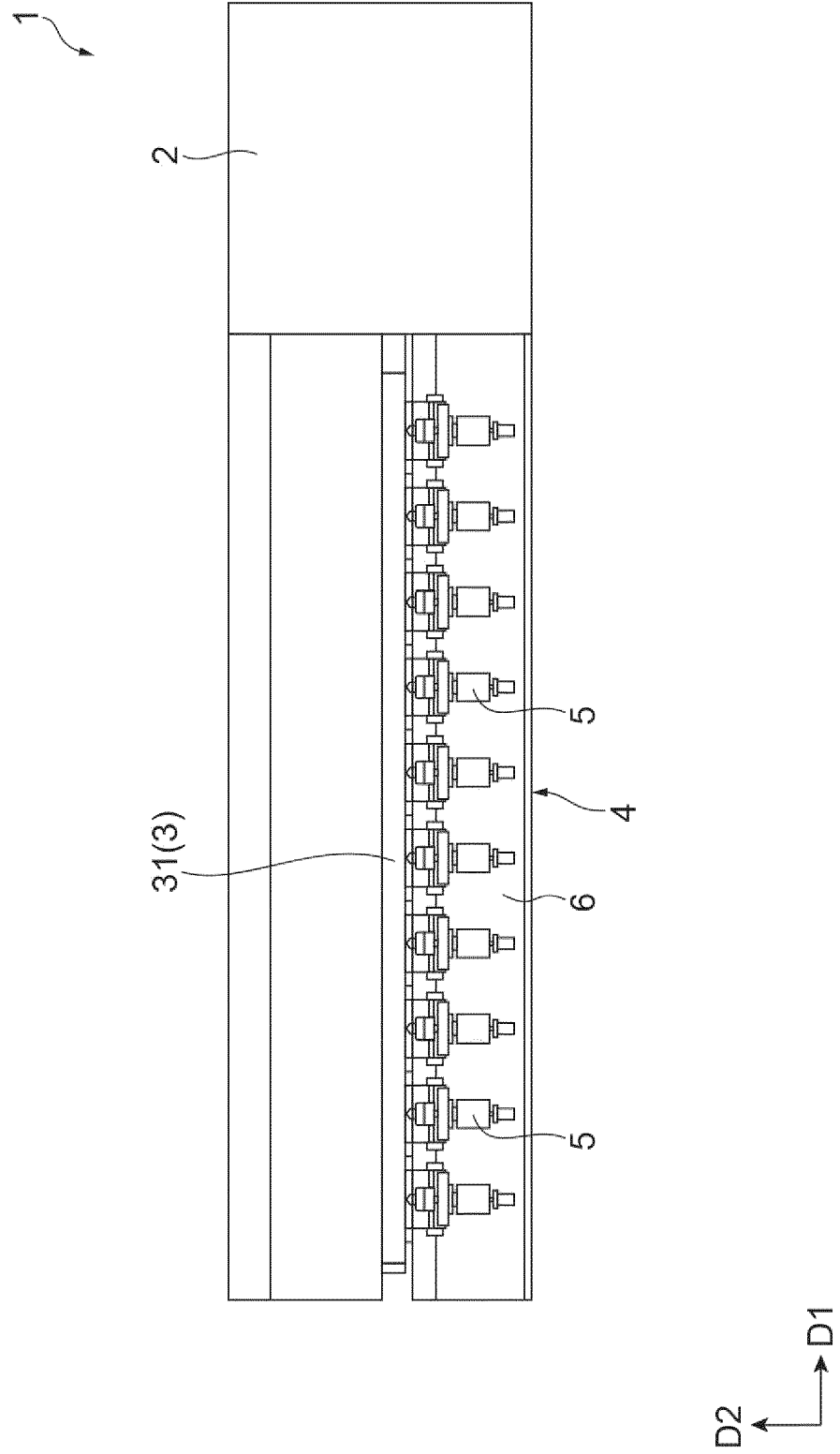


Fig.3

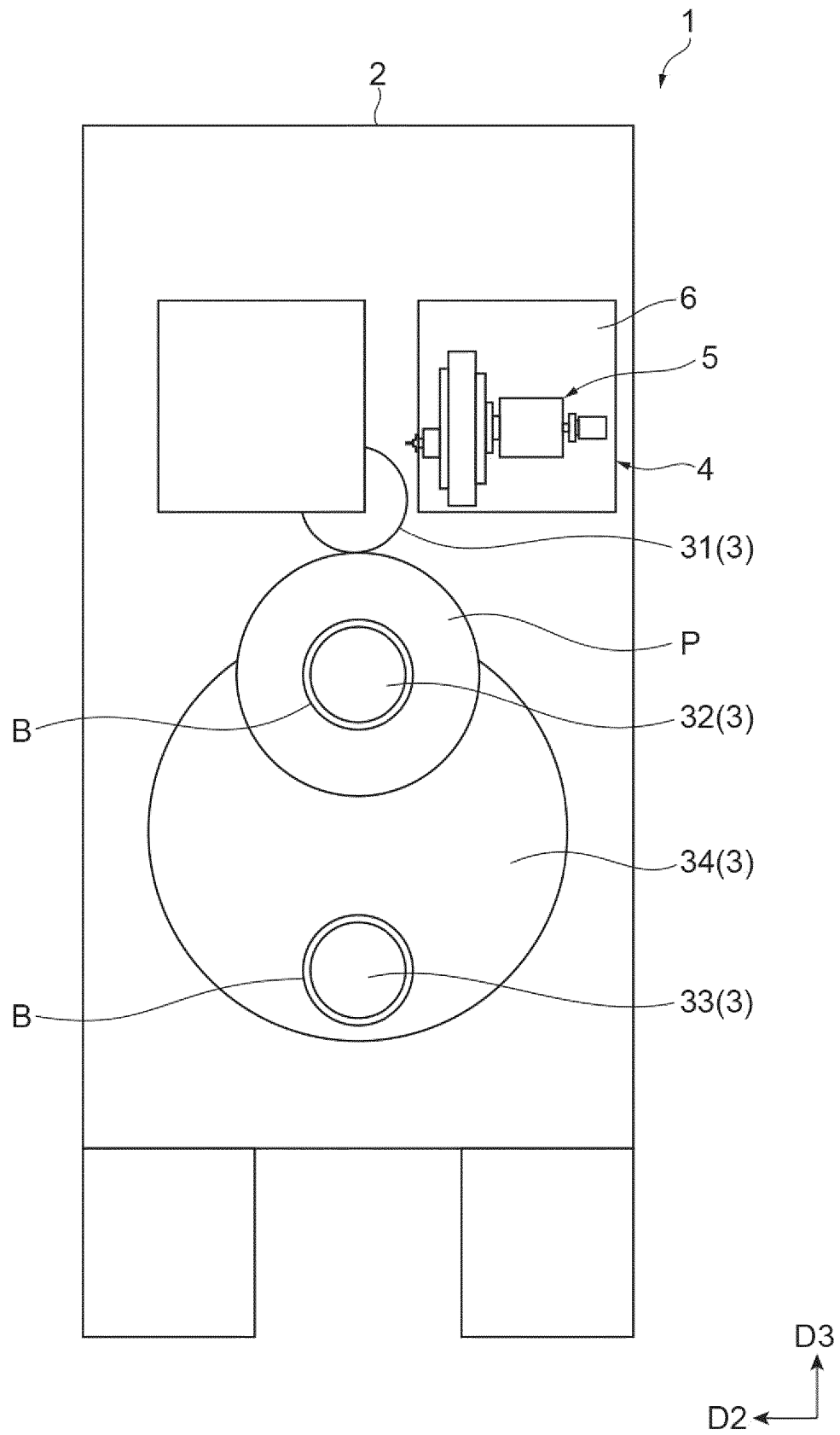


Fig.4

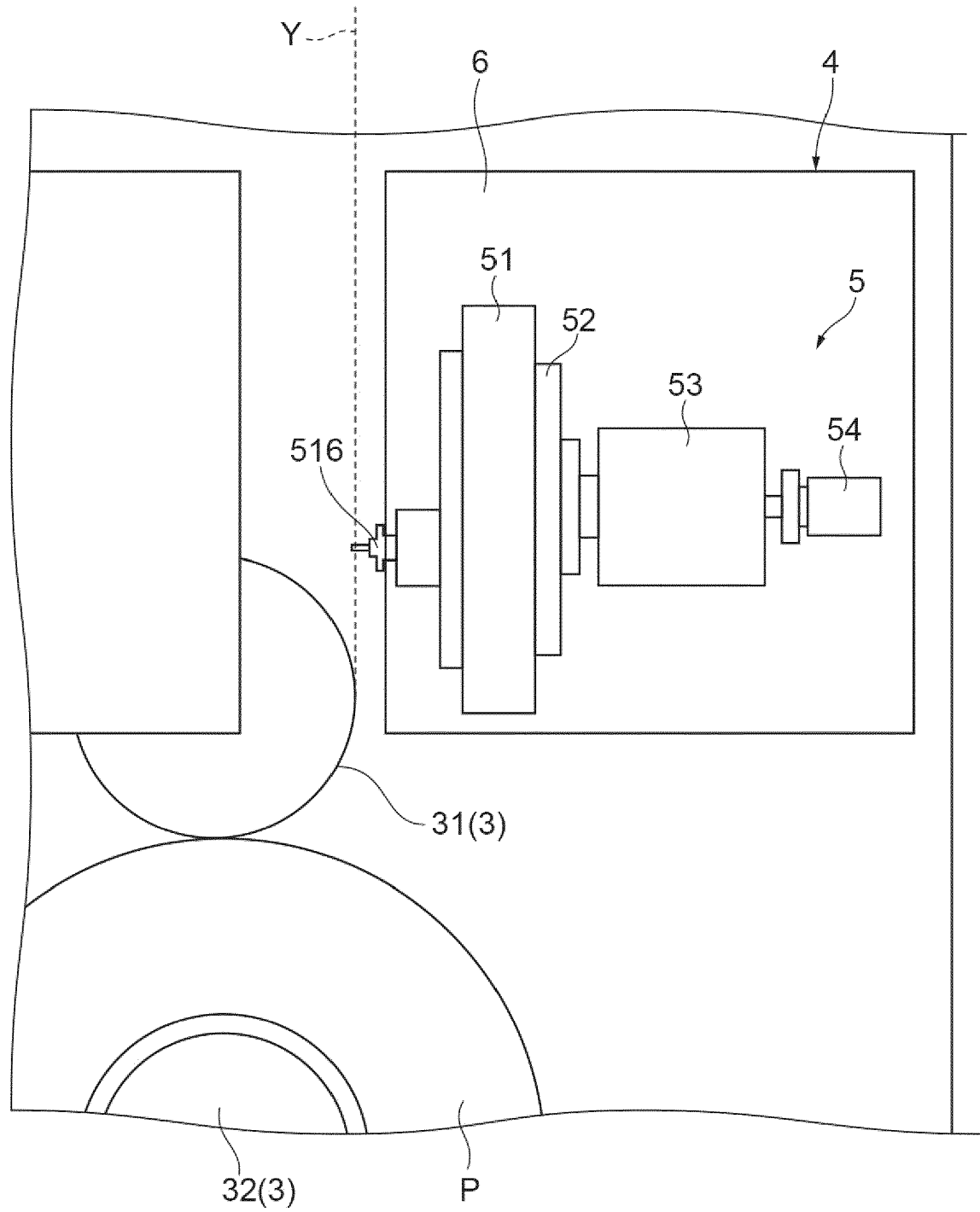


Fig. 5

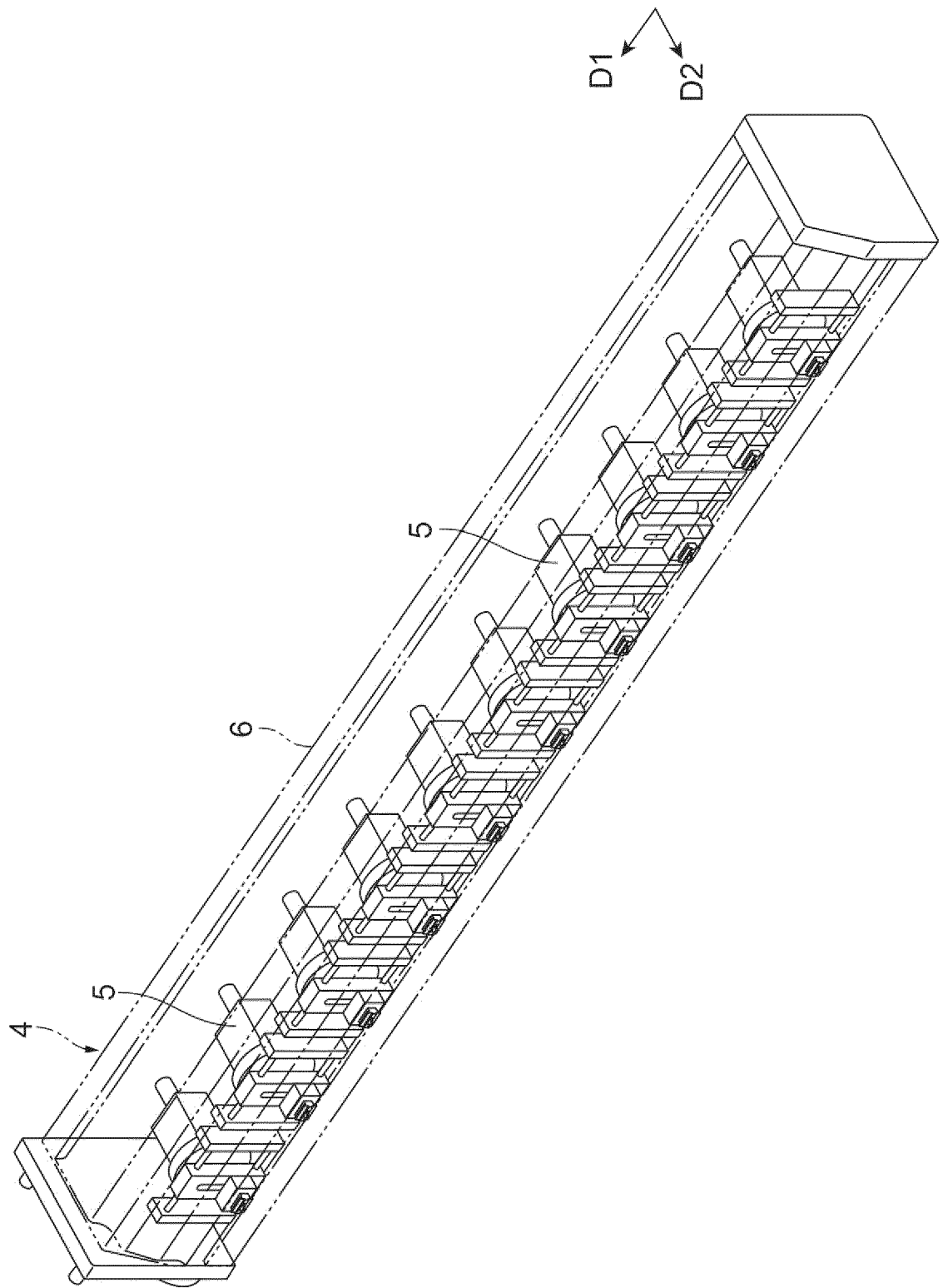


Fig.6

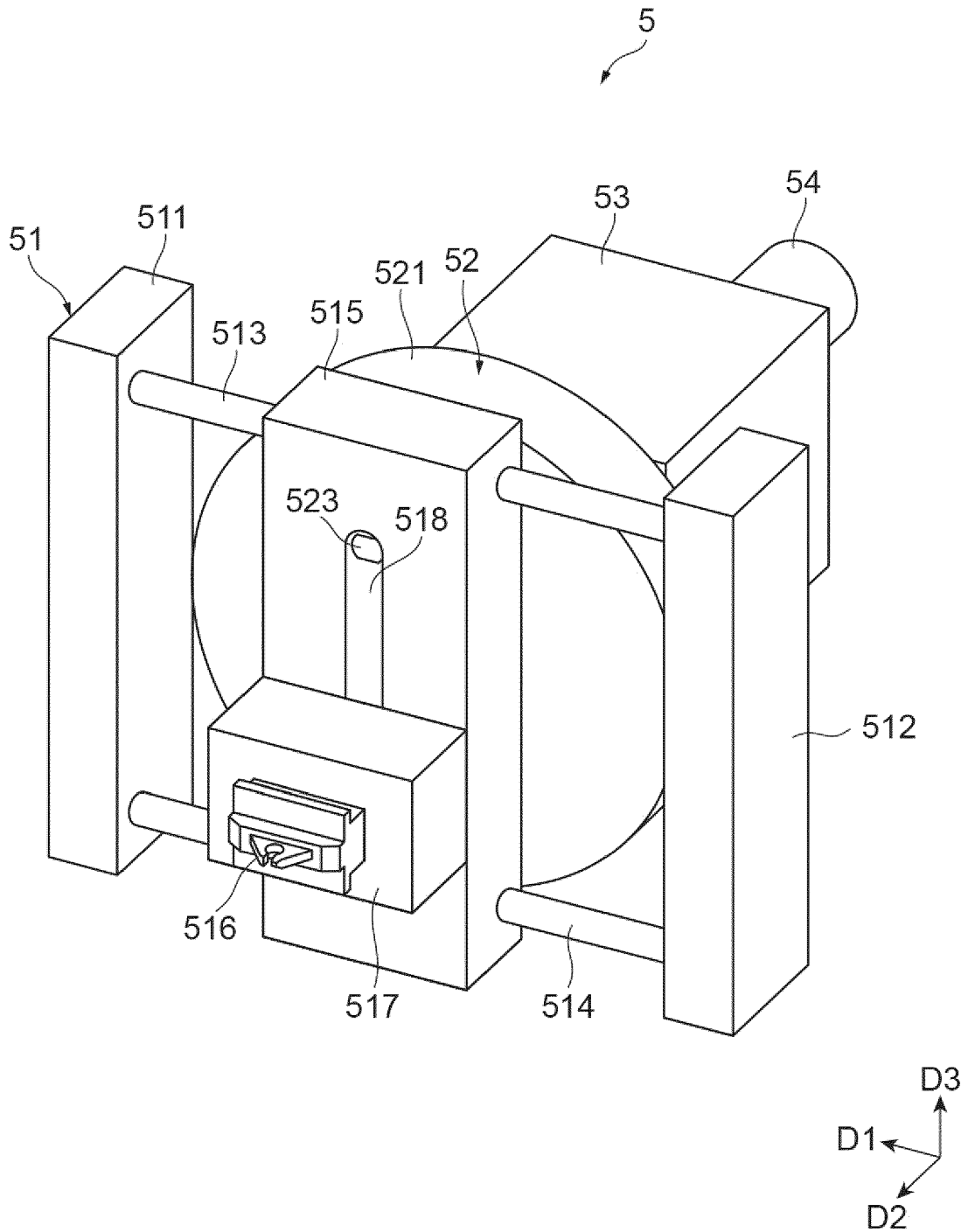


Fig.7

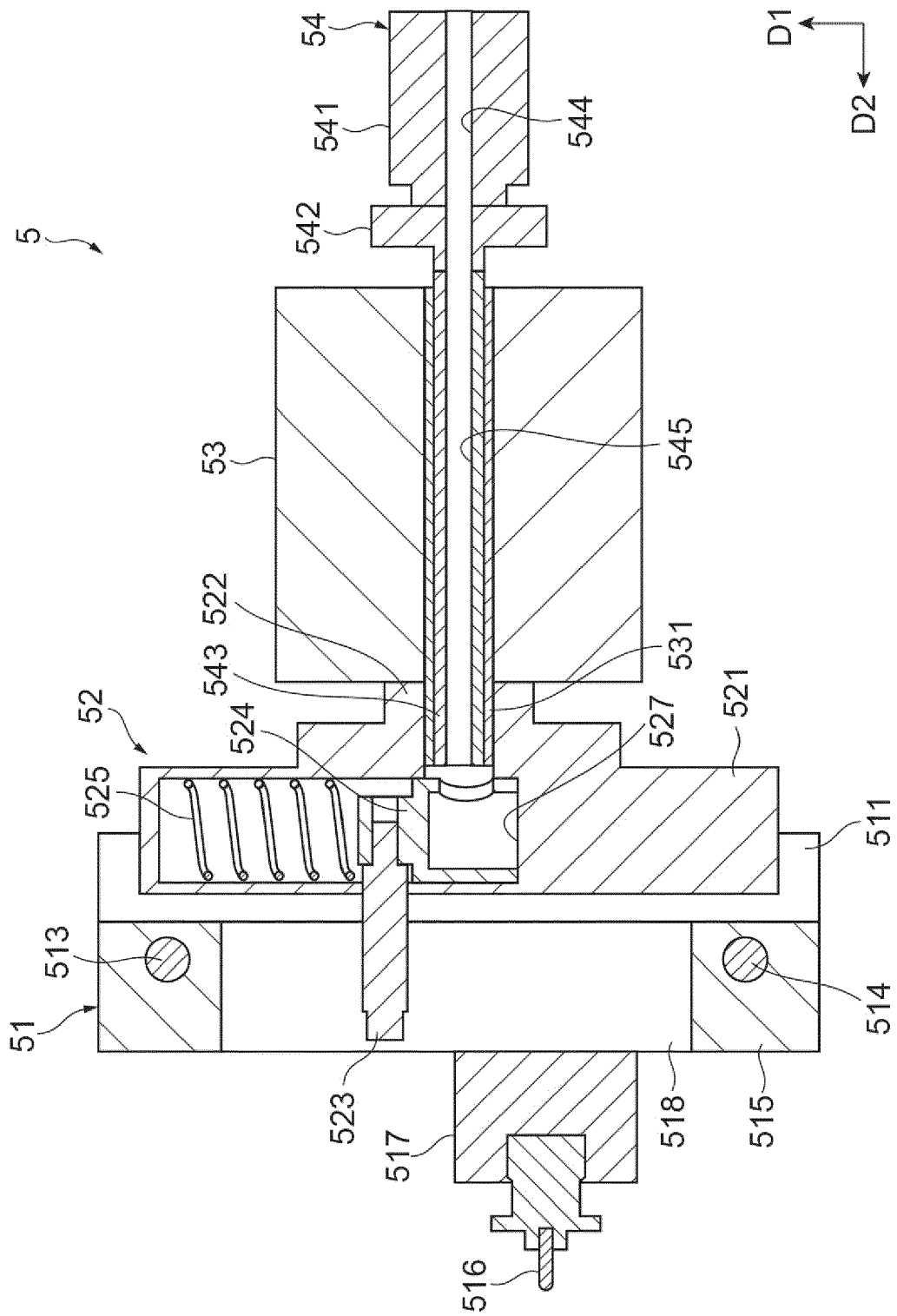


Fig.8

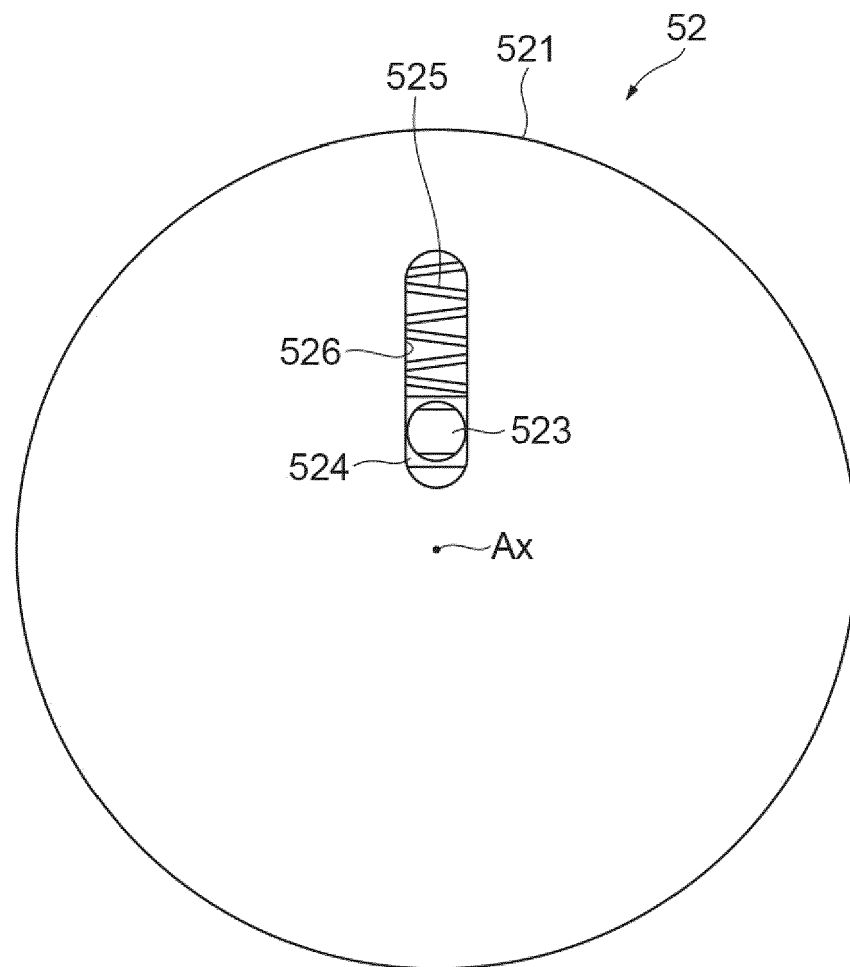


Fig.9

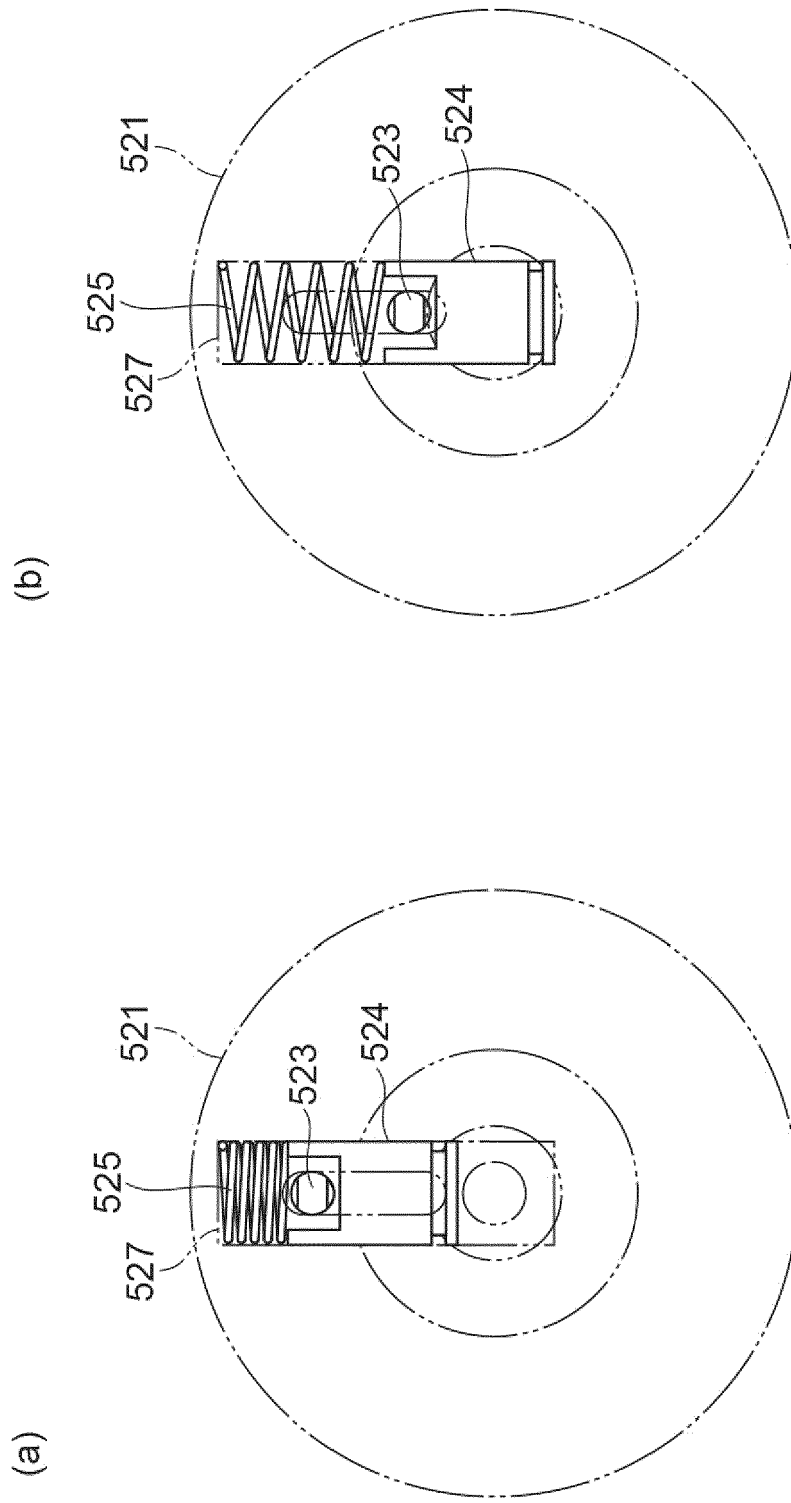


Fig.10

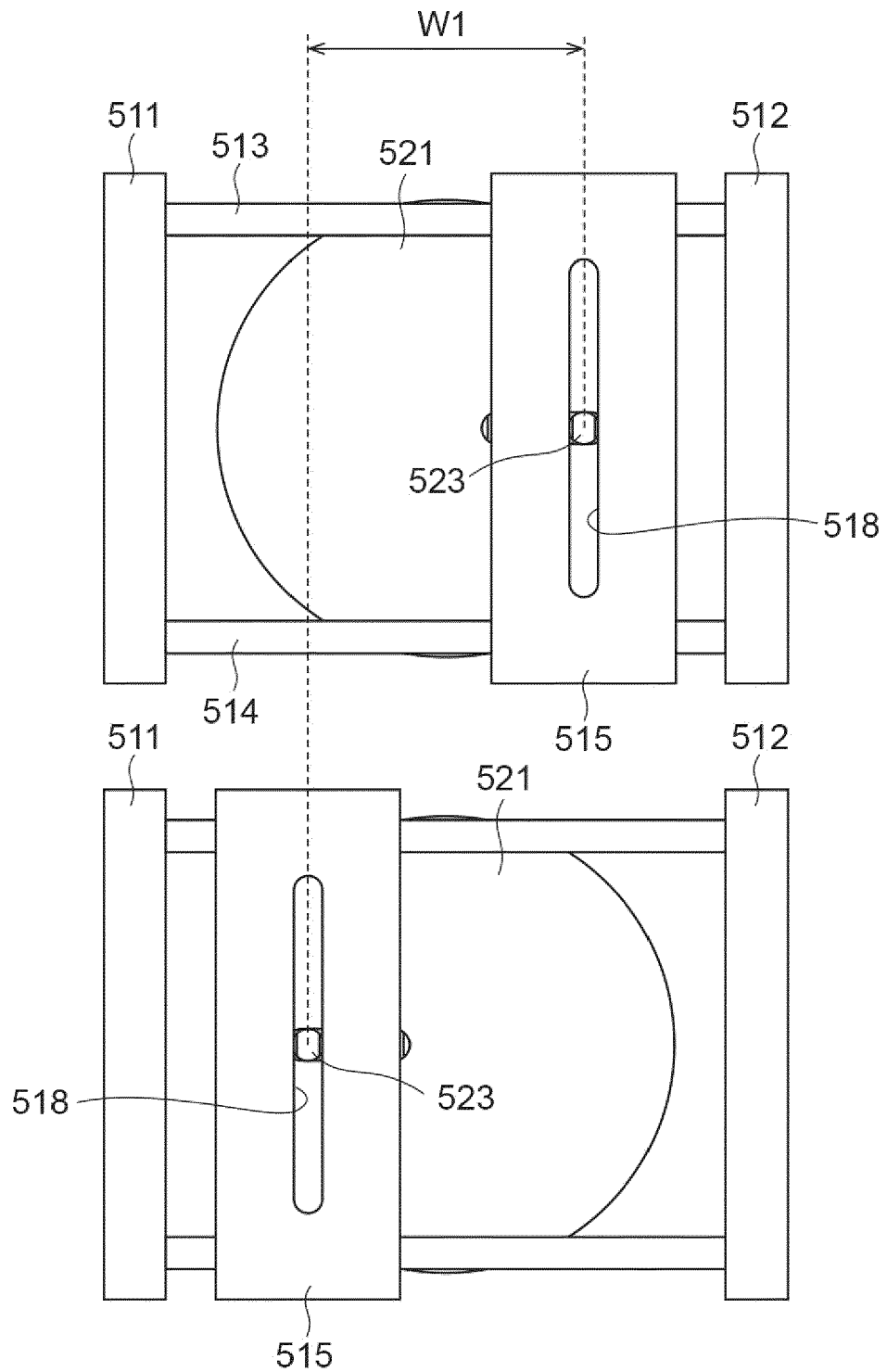


Fig.11

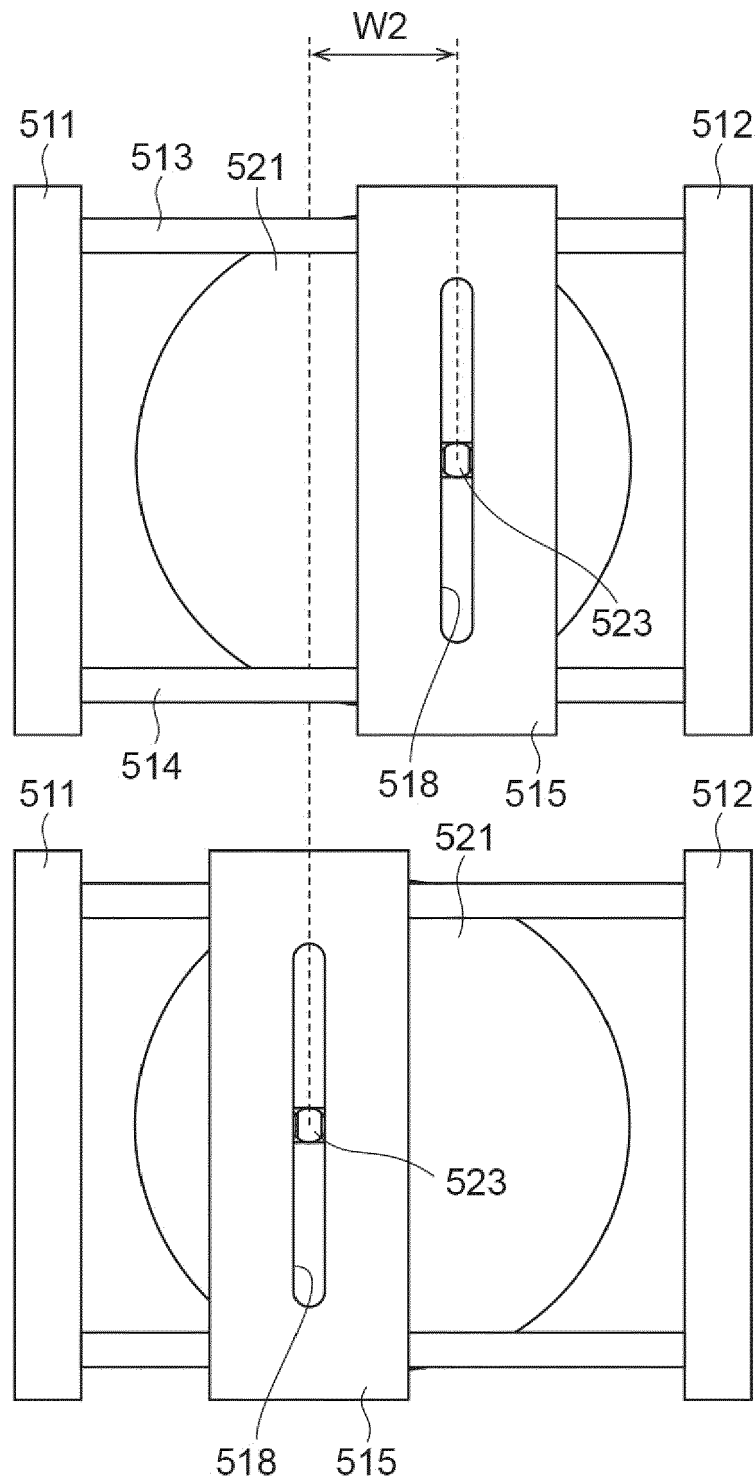


Fig.12

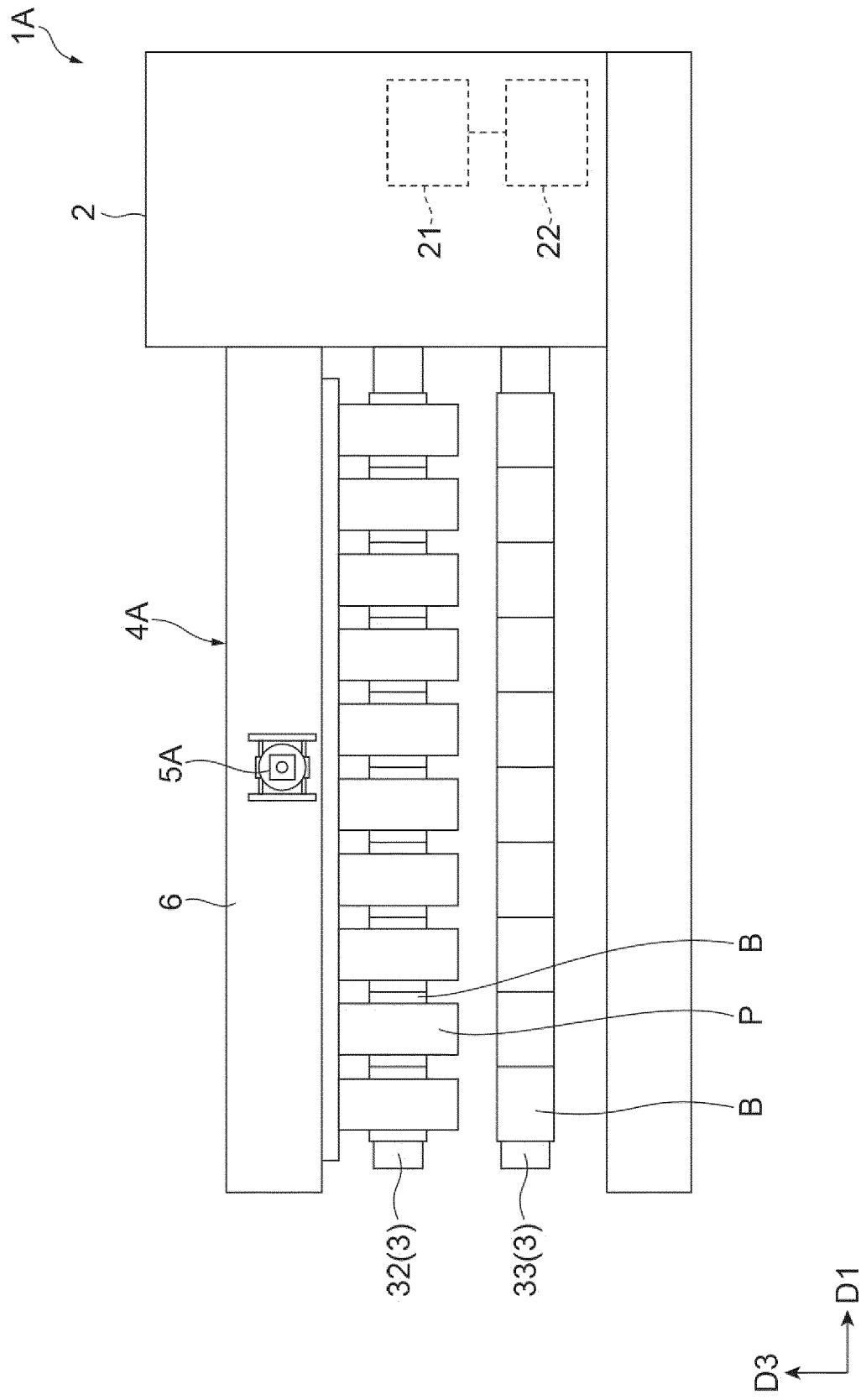


Fig. 13

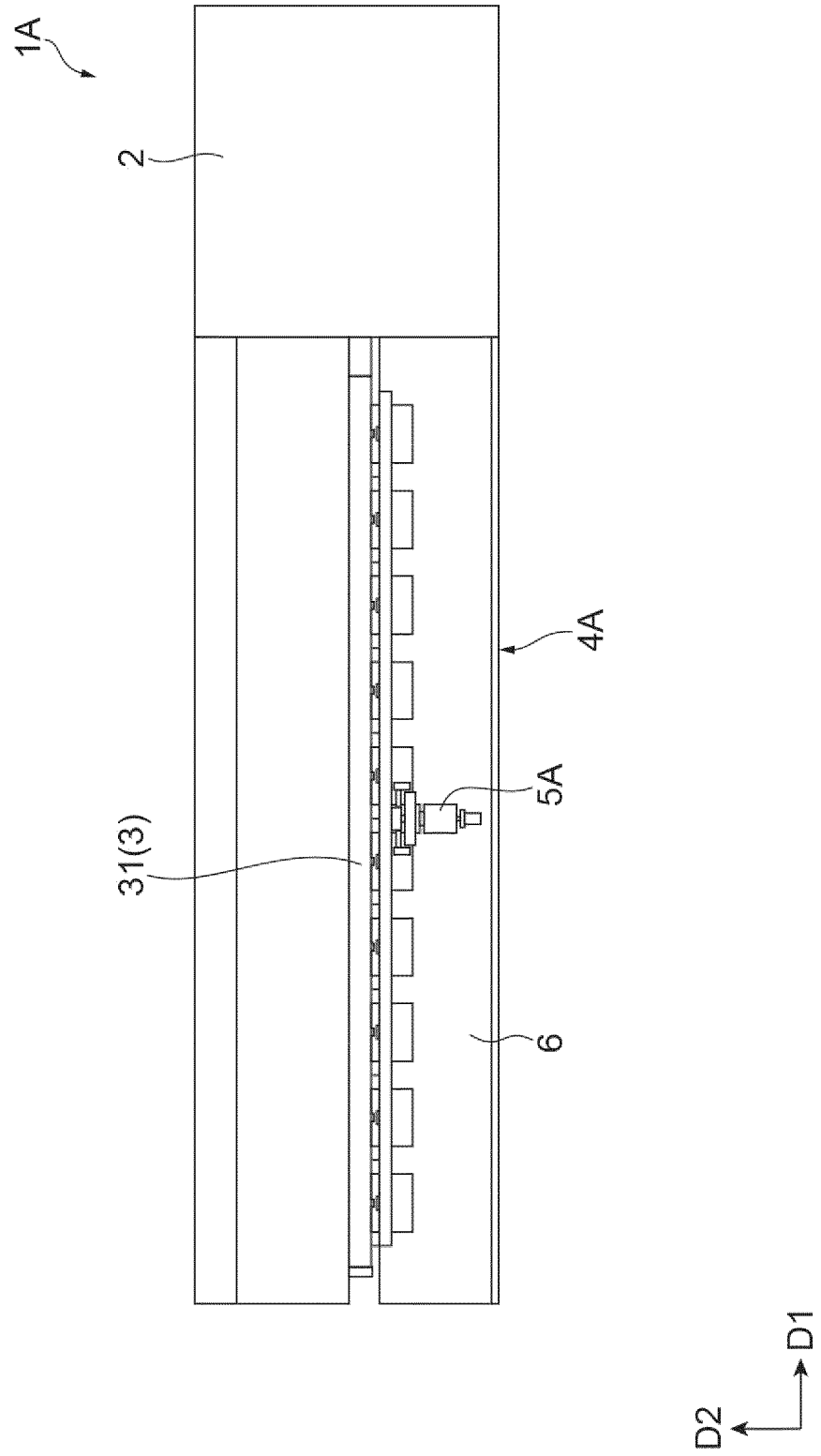


Fig. 14

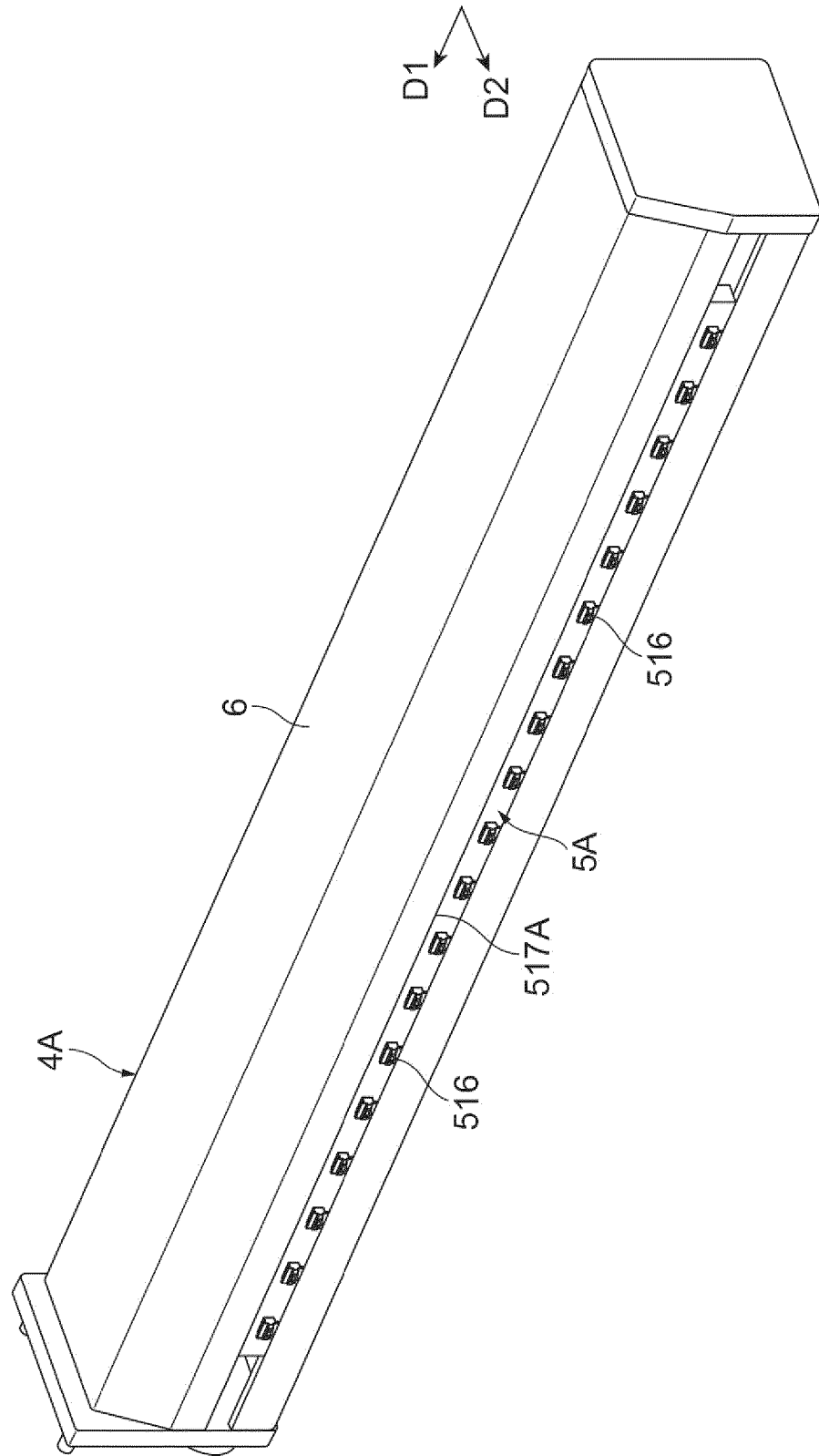
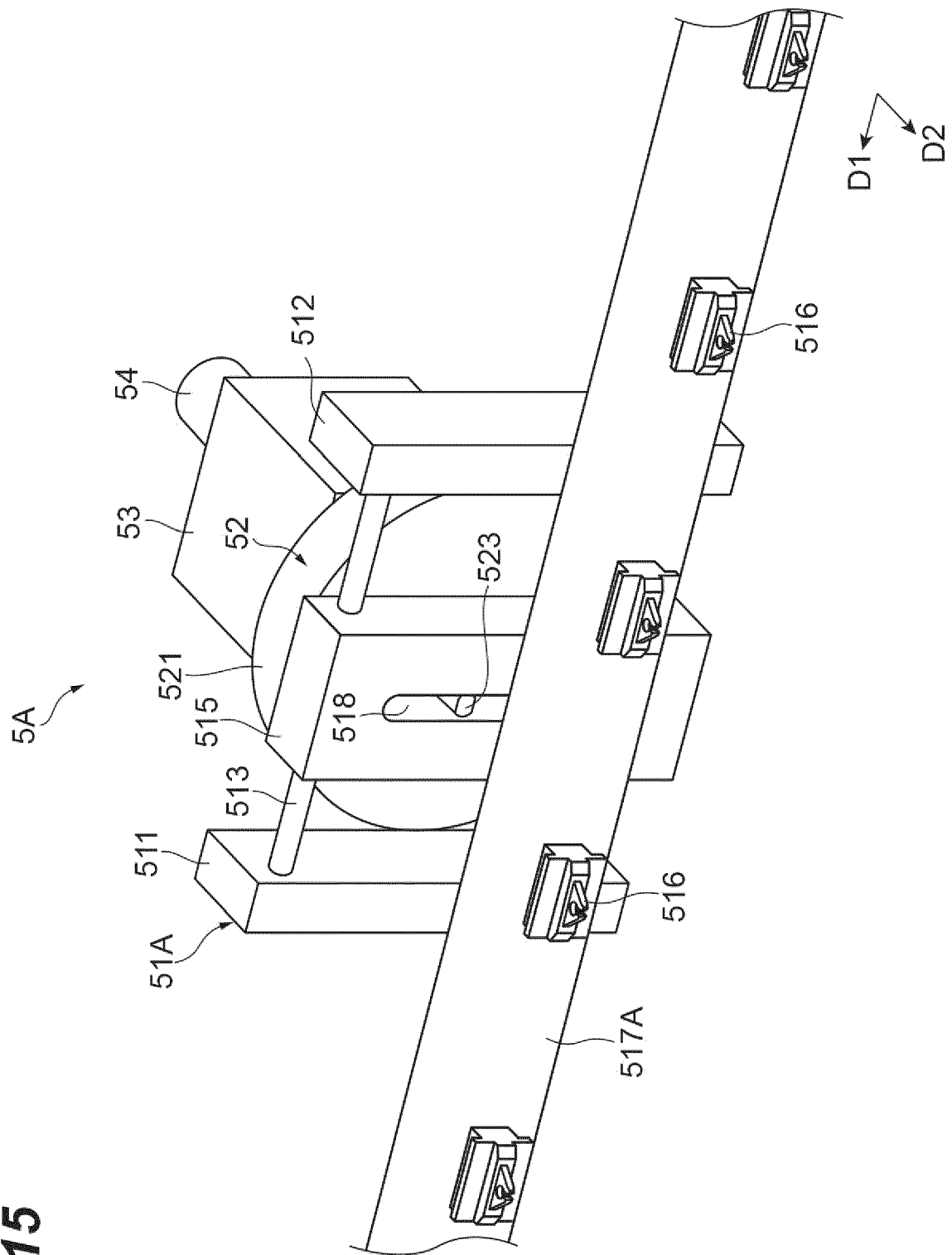


Fig.15





EUROPEAN SEARCH REPORT

Application Number

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Y	* page 2, lines 8-47; figure 1 * -----	6	
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A	* page 1, line 42 - page 2, line 6; figure 1 * -----	3, 4	
Y	EP 3 476 787 A1 (RIETER AG MASCHF [CH]) 1 May 2019 (2019-05-01) * paragraphs [0034] - [0038]; figure 2 * -----	6	
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			B65H
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 12 January 2022	Examiner Pussemier, Bart
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

**ANNEX TO THE EUROPEAN SEARCH REPORT
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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12-01-2022

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