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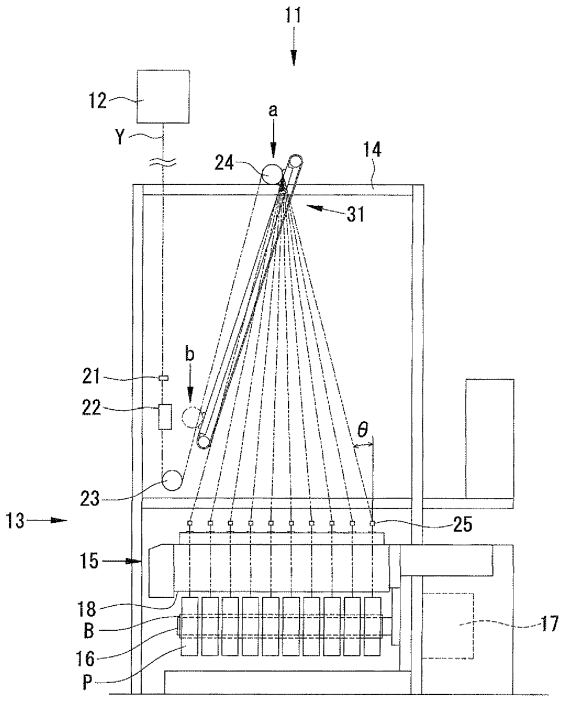
(54) Filament yarn winding apparatus

(57) Object of the invention is providing a filament yarn winding apparatus which is good for introducing each yarn to position of each bobbin and has good durability.

A filament yarn winding apparatus (11) includes a spinning machine (12) and a winder (13). The winder (13) includes a first roller (23), a bobbin holder (16), a second roller (24), and a traverse support point guide (25). The first roller (23) receives a plurality of yarns (Y) from the spinning machine (12), The bobbin holder (16) holds a plurality of bobbins (B) configured to wind up the yarns Y from the spinning machine (12). The second roller (24) is orthogonal to an axis of the bobbin holder (16) and distributes the yarns Y sent from the first roller (23) to the bobbins (B). The traverse support point guide (25) serves as a support point of traverse for the yarns (Y) sent from the second roller (24) onto the bobbins. The second roller (24) is movable between a winding operation position (a) that is a normal position for yarn paths of the yarns (Y) during a winding operation and a threading operation position (b) that is lower than the winding operation position.

FIG. 1



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Description

BACKGROUND OF THE INVENTION

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

Background Art

[0002] Spun yarn winding apparatuses spin a plurality of yarns and wind the spun yarns around packages. The filament yarn winding apparatuses each include a multiplicity of rollers and yarn path guides to regulate yarn paths. A spinning machine supplies a plurality of yarns that are then threaded onto the rollers and the yarn path guides from the upstream side toward the downstream side in the travel direction of the yarns. This threading operation needs to be carried out one after another before a winder starts winding the plurality of yarns.

[0003] In the threading operation to the rollers and the yarn path guides, a suction gun is used to collectively handle the plurality of yarns. An operator uses the suction gun to collectively suck the plurality of yarns and then feeds the plurality of yarns onto the rollers and the yarn path guides with appropriate positioning and orientation of the suction gun. This manual threading operation is carried out one after another.

[0004] Incidentally, the winder includes a package formation unit, and the package formation unit includes a bobbin holder. The bobbin holder holds a plurality of bobbins around which to wind a plurality of yarns. A roller is disposed above the package formation unit to send the plurality of yarns to the package formation unit. Between the roller and the package formation unit, a yarn path guide is disposed to distribute the plurality of yarns in the directions of the respective bobbins, and a traverse support point guide is disposed that is another yarn path guide serving as a support point during traverse of the plurality of yarns for the respective bobbins.

[0005] On these yarn path guides, the plurality of yarns are bent to change their directions. If the bending angle of each of the plurality of yarns exceeds a predetermined angle (hereinafter referred to as "maximum possible bending angle", which is 15 degrees, for example), the quality of the plurality of yarns is undermined. In view of this in an attempt to keep the bending angles of the plurality of yarns at the yarn path guides equal to or lower than the maximum possible bending angle, the above-described roller that sends the plurality of yarns to the package formation unit is disposed at a high position.

[0006] As a result, the suction gun held by the operator at low position cannot reach the roller at high position, which necessitates another operator to be at high position to carry out the threading operation to the roller at high position. Thus, the threading operation cannot be carried out by a single operator.

[0007] This is addressed by a filament yarn winding apparatus disclosed in Japanese Patent No. 4204548, where rollers and yarn path guides are disposed at a low position. Japanese Patent No. 4204548 realizes the lowered position of the rollers and the yarn path guides using a withdrawal godet 8 orthogonal to package spindles (bobbin holders) 12.1-12.2 and using distributor rolls 18, 1- 18.4, instead of yarn path guides, to guide a plurality of yarns distributed by the withdrawal godet 8 to respective winding positions (bobbin positions) 11.1-11.4. The directions of the plurality of yarns can be changed without bending the plurality of yarns on the distributor rolls 18.1-18.4. This ensures that deflecting the directions of the plurality of yarns by nearly 90 degrees has no influence on yarn quality. This enables a single operator to carry out the threading operation.

[0008] The contents of Japanese Patent No. 4204548 are herein incorporated by reference in their entirety,in particular with regard to those features which are described above with reference to the mentioned document.

[Object of the Invention]

[0009] Unfortunately, the distributor rolls 18.1-18.4 used in Japanese Patent No. 4204548 are freely rotatable idler rollers. A large rotational resistance of an idler roller undermines the quality of a yarn that is in contact with the idler roller. Minimizing the rotational resistance of an idler roller requires a meticulous structure of a rotational support portion, Meanwhile, a filament yarn winding apparatus winds yarns at high speed, and accordingly the distributor rolls 18.1-18.4 rotate at high speed. Use of idler rollers as the distributor rolls 18.1-18.4 involves high speed rotation of the meticulously structured idler rollers. This leads to the problem of degraded durability of the distributor rolls 18.1-18.4, failing to provide a long period of service.

[0010] To address the problem, use of motored drive rollers as the distributor rolls 18.1-18.4 is contemplated. Although this eliminates the durability problem, a large number of motors are used, leading to another problem of increased costs. Thus, problems occur due to use of rollers, whether idler rollers or drive rollers, to guide the plurality of yarns to the respective winding positions of the winder.

[0011] The present invention has been made in view of the above-described problems. It is an object of the present invention to provide a filament yarn winding apparatus with satisfactory threading operability and high durability without using a roller to guide yarns to respective bobbin positions. It is another object of the present invention to provide a low-floor filament yarn winding apparatus with a winder lowered in height.

[The means for solving a problem]

[0012] The problems to be solved by the present invention have been described hereinabove, and subsequently, means of solving the problems are described.

SUMMARY OF THE INVENTION

[0013] According to one aspect of the present invention, a filament yarn winding apparatus includes a spinning machine and a winder. The winder includes a first roller, a bobbin holder, a second roller, and traverse support point guides. The first roller is configured to receive a plurality of yarns from the spinning machine. The bobbin holder holds a plurality of bobbins each configured to wind up a corresponding one of the plurality of yarns from the spinning machine. The second roller is orthogonal to an axis of the bobbin holder. The second roller is configured to distribute the plurality of yarns sent from the first roller to the plurality of bobbins. The traverse support point guides serves as a support point of traverse for the plurality of yarns sent from the second roller onto the plurality of bobbins. The second roller is movable between a winding operation position and a threading operation position. The winding operation position is a normal position for yarn paths of the plurality of yarns during a winding operation. The threading operation position is lower than the winding operation position.

[0014] In the foregoing aspect of the present invention, the filament yarn winding apparatus may further include at least one yarn path guide between the second roller and the traverse support point guides. The at least one yarn path guide is configured to bend the plurality of yarns distributed to the plurality of bobbins at equal to or lower than a predetermined angle. The yarn path guide and the traverse support point guide are configured to bend each of the plurality of yarns in multiple phases.

[0015] In the foregoing aspect of the present invention, the yarn path guide may be disposed such that a total angle of bending by the traverse support point guide and the yarn path guide is approximately equal among the plurality of yarns.

[The effect of invention]

[0016] The embodiments of the present invention provide the following advantageous effects.

[0017] With the foregoing aspect of the present invention, the second roller is movable between a winding operation position and a threading operation position. The winding operation position is a normal position for yarn paths of the plurality of yarns during a winding operation. The threading operation position is lower than the winding operation position. The second roller is threaded yarns at the threading operation position and then moved to the winding operation position so that the threading operation to the second roller can be carried out at a low position. Additionally, yarns do not need to be deflected by large bending angles, which eliminates the need for rollers to guide the yarns to the respective bobbin positions. This ensures a filament yarn winding apparatus with satisfactory threading operability and high durability.

[0018] With the foregoing aspect of the present invention, the traverse support point guide and the yarn path guide bend each of the plurality of yarns in multiple phases. This keeps the height of the second roller low and thus ensures a low-floor filament yarn winding apparatus with the winder lowered in height.

[0019] With the foregoing aspect of the present invention, the yarn path guide is disposed such that a total angle of bending by the traverse support point guide and the yarn path guide is approximately equal among the plurality of yarns. This ensures uniform quality among the plurality of yarns.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] A more complete appreciation of the invention and many of the attendant advantages thereof will be readily obtained as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings, wherein:

FIG. 1 is a front view of a filament yarn winding apparatus 11 according to embodiment

FIGs. 2A and 2B are enlarged views of a second roller 24 of an elevating device 31;

FIG. 3 is a diagram illustrating a threading operation in the filament yarn winding apparatus I according to embodiment 1;

FIG. 4 is a diagram illustrating the threading operation in the filament yarn winding apparatus 11 according to embodiment 1;

FIG. 5 is a front view of a filament yarn winding apparatus 11 according to embodiment 2; and

FIGS. 6A and 6B are diagrams illustrating parts of the yarn paths of the filament yarn winding apparatus 11 according to embodiment 2;

DESCRIPTION OF THE EMBODIMENTS

[0021] The embodiments will now be described with reference to the accompanying drawings, wherein like reference numerals designate corresponding or identical elements throughout the various drawings.

Embodiment 1

[0022] A filament yarn winding apparatus 11 according to embodiment 1 of the present invention will be described by referring to FIGs. 1 to 4. FIG. 1 is a front view of the filament yarn winding apparatus 11 according to embodiment 1. Referring to FIG. 1, the general arrangement of the filament yarn winding apparatus 11 according to this embodiment will be described. The filament yarn winding apparatus 11 mainly includes a spinning machine 12 and a winder 13. The filament yarn winding apparatus 11 melts thermoplastic resin (polymer) at high temperatures and extrudes the melted polymer through fine nozzles, and then cools the extruded polymer and winds up it into yarn Y. Generally, filament yarn winding

apparatuses are classified into two types; namely, POY-dedicated filament yarn winding apparatuses to wind POY (Partially Oriented Yarn) and FDY-dedicated filament yarn winding apparatuses to wind FDY (Fully Drawn Yarn). The filament yarn winding apparatus 11 according to the embodiment of the present invention is a POY-dedicated. filament yarn winding apparatus.

[0023] The spinning machine 12 spins a plurality of filaments and supplies the spun filaments from the upward direction toward the downward direction. The spinning machine 12 receives a synthetic material (a raw material of the filaments), pumps the synthetic material through an extruder, and spins the synthetic material through a plurality of spinnerettes disposed at a spinning head (not shown). A predetermined number of filaments, among the plurality of filaments spun through the spinnerettes of the spinning head, are bundled together into one of a plurality of yarns Y to be guided to the winder 13. That is, each of the plurality of yarns Y is made of a bundle of a predetermined number of filaments. The plurality of yarns Y are guided to the winder 13.

[0024] The winder 13 winds up the plurality of yarns Y from the spinning machine 12 around a plurality of bobbins B to form a plurality of packages P. In order from the upstream side along the travel direction of the plurality of yarns Y, the winder 13 includes a first yarn path guide 21, an interlace 22, a first roller 23, a second roller 24, a traverse support point guide 25, and a package formation unit 15.

[0025] The first yarn path guide 21 regulates the yarn paths of the plurality of yarns Y from the spinning machine 12 to guide the plurality of yarns Y to the interlace 22 on the downstream side. The interlace 22 uses a fluidic injection nozzle to interlace the filaments constituting the plurality of yarns Y and thus to impart collectability, that is, to inhibit expansion and separation of fibers.

[0026] The first roller 23 receives the plurality of yarns Y from the spinning machine 12. The second roller 24 is disposed on the downstream side of the first roller 23. The second roller 24 forwards the plurality of yarns Y toward the package formation unit 15. An elevating device 31 makes the second roller 24 movable between a winding operation position "a" and a threading operation position "b". The winding operation position "a" is a normal position for the yarn paths of the plurality of yarns Y during the winding operation. The threading operation position "b" is lower than the winding operation position "a" and is where the threading operation is easier to operate. The elevating device 31 will be described in detail later.

[0027] The plurality of yarns Y forwarded from the second roller 24 through a corresponding traverse support point guide 25 are wound around the respective bobbins B by the package formation unit 15. The package formation unit 15 includes the plurality of bobbins B that rotate to wind up the plurality of yarns Y, a bobbin holder 16 that holds the plurality of bobbins B, a traverse device 18 that traverses the plurality of yarns Y to be wound around the plurality of bobbins B, a touch roller (not shown) that is in pressure contact with the plurality of bobbins B and with the plurality of packages P formed over the plurality of bobbins B, and a driving device 17 that drives the traverse device 18 and the touch roller.

[0028] The second roller 24 is disposed orthogonal to the axis of the bobbin holder 16. The second roller 24 distributes the plurality of yarns Y sent from the first roller 23 to the plurality of bobbins B. Specifically, the second roller 24 distributes the plurality of yarns Y in a tangential direction of the second roller 24. Thus, the plurality of yarns Y are not bent on the second roller 24. Each of the plurality of yarns Y distributed in the direction of the package formation unit 15 from the second roller 24 is traversed by the traverse device 18 in the lateral direction (the axial direction of the bobbin holder 16) by way of a corresponding traverse support point guide 25 serving as a support point, and wound around a corresponding rotating bobbin B. The plurality of yarns Y wound around the plurality of bobbins B form the packages P over the plurality of bobbins B.

[0029] The elevating device 31 will be described in detail. As shown in FIG. 1, the elevating device 31 is secured to the body frame 14 and moves the second roller 24 between the winding operation position "a" and the threading operation position "b". The winding operation position "a" is a normal position for the yarn paths of the plurality of yarns Y during the winding operation. The threading operation position "b" is lower than the winding operation position "a" and is where the threading operation is easier to operate for the operator at a low position. The winding operation position "a" of the second roller 24 is set to ensure that the bending angles of the plurality of yarns Y at the respective traverse support point guides 25 are equal to or lower than a maximum possible bending angle (for example, 15 degrees), within which the quality of the plurality of yarns Y will not be undermined. Specifically, the bending angles of the plurality of yarns Y at the respective traverse support point guides 25 are mutually different, and the maximum is a bending angle θ of yarns Y on traverse support point guides 25 that correspond to the ends of the bobbin holder 16. The winding operation position "a" of the second roller 24 is set to ensure that the bending angle θ of the yarns Y on the traverse support point guides 25 corresponding to the ends of the bobbin holder 16 is equal to or lower than the maximum possible bending angle.

[0030] FIG. 2A is a front view of the elevating device 31, and FIG. 2B is a cross-sectional view of the elevating device 31 taken along the line B-B shown in FIG. 2A. The elevating device 31 includes pulleys 32 and 33, a belt 34, and a track 35. The pulley 32 is disposed further upward than the winding operation position "a" of the second roller 24, while the pulley 33 is disposed further downward than the threading operation position "b" of the second roller 24. The belt 34 is an endless belt wound across the pulleys 32 and 33. The belt 34 may be made of a chain or like material. The pulley 32 is attached with a

motor 36 as a driving source. The elevating device 31 includes at its lower end an operation switch (not shown) that switches between start and end of the driving of the motor 36 and switches between the driving directions of the motor 36. The motor 36 may be attached to the pulley 33.

[0031] A joint member 37 is secured to the belt 34. A motor 24a, which is a driving source of the second roller 24, is secured to the joint member 37. This causes the second roller 24 to move in conjunction with the driving of the belt 34. The track 35 is disposed in the direction from the winding operation position "a" to the threading operation position "b". The track 35 has an approximately C cross-section, and a guide roller 38 disposed on the joint member 37 is guided through the track 35. Thus, when the belt 34 is driven upward or downward, the second roller 24 moves along the track 35. A holding member 39 is disposed adjacent to the upper end of the track 35. The holding member 39 is brought into contact with the joint member 37 to stop the second roller 24 at the winding operation position "a" and to hold the joint member 37 so as to keep the second roller 24 stationary at the winding operation position "a" even when power supply to the motor 36 is stopped. A stopper 40 is disposed adjacent to the lower end of the track 35. The stopper 40 is brought into contact with the joint member 37 to stop the second roller 24 at the threading operation position "b".

[0032] Subsequently, description will be given by referring to FIG. 3 and FIG. 4 with respect to a procedure for threading to the second roller 24 by an operator using the elevating device 31. FIG. 3 is an enlarged front view of the elevating device 31 with the second roller 24 at the threading operation position "b". FIG. 4 is an enlarged front view of the elevating device 31 with the second roller 24 at the winding operation position "a". It is assumed that the plurality of yarns Y spun at the spinning machine 12 are threaded onto the first roller 23 using a suction gun 51. It is also assumed that the second roller 24 is moved to the threading operation position "b" before the threading operation to the second roller 24 starts. When the second roller 24 is not at the threading operation position "b", the operator operates the operation switch to drive the motor 36 to move the second roller 24 to the threading operation position "b".

[0033] As shown in FIG. 3, the operator operates the suction gun 51 to thread up a plurality of yarns Y onto the second roller 24 located at the threading operation position "b". Since the second roller 24 is located at the low threading operation position "b", the operator is able to thread up the plurality of yarns Y onto the second roller 24 by operating the suction gun 51 at the same height as the height at which the operator has threaded the plurality of yarns Y onto the first yarn path guide 21, the interlace 22, and the first roller 23.

[0034] After threading the plurality of yarns Y onto the second roller 24, the operator then operates the operation switch to drive the motor 36 to move the second roller 24 to the winding operation position "a", as shown in FIG. 4. In the meantime, the operator orients the suction gun 51 toward the second roller 24. While the second roller 24 is being moved to the winding operation position "a", a balance is maintained among the running speed of the plurality of yarns Y supplied from the spinning machine 12, the speed of the plurality of yarns Y sucked into the suction gun 51, and the moving speed of the second roller 24. This prevents an excessive change in tension of the plurality of yarns Y. This in turn secures that the second roller 24 moves to the winding operation position "a" without cutting the plurality of yarns Y.

[0035] When the second roller 24 arrives at the winding operation position "a", the joint member 37 comes into contact with the holding member 39 to stop the second roller 24 at the winding operation position "a". Even when power supply to the motor 36 is stopped while the holding member 39 holds the joint member 37, holding the joint member 37 by the holding member 39 ensures that the second roller 24 is kept stationary at the winding operation position "a" with the plurality of yarns Y threaded around the second roller 24. Thus, the threading operation to the second roller 24 is complete.

[0036] The filament yarn winding apparatus 11 according to embodiment 1 described hereinbefore provides the following advantageous effects.

[0037] The elevating device 31 enables the second roller 24 to move between the winding operation position "a" and the threading operation position "b". The winding operation position "a" is a normal position for the yarn paths of the plurality of yarns Y during the winding operation. The threading operation position "b" is lower than the winding operation position "a". The second roller 24 are threaded the plurality of yarns Y at the threading operation position "b" and then moves to the winding operation position "a". This ensures that the threading operation to the second roller 24 is carried out at a low position. Additionally, use of the second roller 24 to distribute the plurality of yarns Y eliminates the need for deflecting the plurality of yarns Y by large bending angles. This in turn eliminates the need for rollers to guide the plurality of yarns Y to the respective bobbin positions. This ensures a filament yarn winding apparatus with satisfactory threading operability and high durability.

Embodiment 2

[0038] The filament yarn winding apparatus 11 according to embodiment 2 of the present invention will be described by referring to FIG. 5 and FIG. 6. In this embodiment, a second yarn path guide 26 is a major difference from embodiment 1.

[0039] FIG. 5 is a front view of the filament yarn winding apparatus 11 according to embodiment 2. The filament yarn winding apparatus 11 of embodiment 2 also includes an elevating device 31 to enable the second roller 24 to move between the winding operation position "a" and the threading operation position "b". The winding operation position "a" is a normal position for the yarn paths of the

plurality of yarns Y during the winding operation. The threading operation position "b" is lower than the winding operation position "a" and is where the threading operation is easier to operate. The elevating device 31 has a similar configuration to that of embodiment 1, and therefore detailed description will be omitted.

[0040] As described in embodiment 1, the winding operation position "a" of the second roller 24 is set to ensure that the bending angles of the plurality of yarns Y are equal to or lower than the maximum possible bending angle (see FIG. 1). In embodiment 1, the maximum angle of bending of the plurality of yarns Y is at the traverse support point guides 25 corresponding to the ends of the bobbin holder 16. In view of this, the winding operation position "a" of the second roller 24 is set to ensure that the bending angles of the yarns Y at these traverse support point guide 25 are equal to or lower than the maximum possible bending angle. This makes it impossible to lower the winding operation position "a" of the second roller 24 below a certain height, which in turn makes it impossible to lower the winder 13 in height.

[0041] In this embodiment, the second yarn path guide 26 is disposed between the second roller 24 and the traverse support point guide 25. The second yarn path guides 26 bend the respective yarns Y distributed from the second roller 24 toward the respective bobbins by angles equal to or lower than the maximum possible bending angle. Use of not only the traverse support point guides 25 but also the second yarn path guides 26 to bend the plurality of yarns Y involves two-phase bending of the plurality of yarns Y. This makes the resulting total bending angle of the plurality of yarns Y larger than the total bending angle of the case of using the traverse support point guides 25 alone. This ensures that the winding operation position "a" of the second roller 24 is set at a low position, thereby lowering the winder in height.

[0042] The second roller 24 is disposed orthogonal to the axis of the bobbin holder 16. In distributing the plurality of yarns Y sent from the first roller 23 to the respective bobbins B, the second roller 24 distributes the plurality of yarns Y in a tangential direction of the second roller 24. This ensures that the plurality of yarns Y are not bent on the second roller 24, which in turn eliminates the need for considering a bending angle on the second roller 24 in the attempt to set the winding operation position "a'' of the second roller 24 at a low position.

[0043] As described in embodiment 1, the bending angles of the plurality of yarns Y at the traverse support point guides 25 are mutually different. The differences in bending angle among the plurality of yarns Y lead to differences in tension among the plurality of yarns Y. This results in somewhat different qualities of the plurality of yarns Y. In view of this, in this embodiment, the second yarn path guide 26 is disposed such that the total angle of bending of each of the plurality of yarns Y by the second yarn path guide 26 and the traverse support point guide 25 is approximately equal among the plurality of yarns Y.

[0044] FIG. 6A is a side view of the yarn paths of the plurality of yarns Y extending from the second roller 24 to the traverse support point guide 25, and FIG. 6B is a downward perspective view of the yarn paths of the plurality of yarns Y extending from the second roller 24 to the traverse support point guides 25. As shown in FIG. 6A and FIG. 6B, the second yarn path guides 26 are disposed on a common curved line, rather than a straight line. Meanwhile, the traverse support point guides 25 are disposed on a common straight line, since the traverse support point guides 25 serves as a support point for the plurality of yarns Y when. guided by the traverse device 18. In this respect, each of the plurality of yarns Y at the corresponding second yarn path guide 26 is bent on a different plane. Hence, the bending angles of the plurality of yarns Y at the second yarn path guides 26 are not the angles formed by the plurality of yarns Y as seen from the front in FIG. 5. Instead, as shown in FIG. 6B, the actual bending angles of the plurality of yarns Y at the second yarn path guides 26 are three-dimensional bending angles $\theta 11, \theta 12, ..., \theta 110$. Likewise, the actual bending angles of the plurality of yarns Y at the traverse support point guides 25 are three-dimensional bending angles $\theta 21, \theta 22, ..., \theta 210$.

[0045] In this embodiment, the position of the second yarn path guide 26 is set to ensure that the total angle of bending $\theta 11+\theta 21, \theta 12+\theta 22, ..., \theta 110+\theta 210$) of each of the plurality of yarns Y is approximately equal among the plurality of yarns Y, and that the total angle of bending ($\theta 11+\theta 21, \theta 12+\theta 22, ...,\theta 110+\theta 210$) of each of the plurality of yarns Y is larger than the maximum possible bending angle. It should be noted, however, that the position of the second yarn path guide 26 is set to secure that each of the bending angles, $\theta 11, \theta 12, ..., \theta 110$, of the plurality of yarns Y at the corresponding second yarn path guide 26 and each of the bending angles, $\theta 21, \theta 22, ..., \theta 210$, of the plurality of yarns Y at the corresponding traverse support point guide 25 are equal to or lower than the maximum possible bending angle.

[0046] The filament yarn winding apparatus 11 according to embodiment 2 described hereinbefore provides the following advantageous effects.

[0047] The traverse support point guide 25 and the yarn path guide bend the plurality of yarns Y in multiple phases to make the total angle of bending ($\theta 11+\theta 21, \theta 12+\theta 22, ..., 110+\theta 210$) larger than the maximum possible bending angle. This ensures a lowered height of the second roller 24 and thus ensures a low-floor filament yarn winding apparatus 11 with the winder 13 lowered in height.

[0048] The second yarn path guide 26 is disposed such that the total angle of bending by the traverse support point guide 25 and the second yarn path guide 26 is approximately equal among the plurality of yarns Y. This ensures approximately equal tension among the plurality of yarns Y and thus ensures uniform quality among the plurality of yarns Y.

[0049] While the present invention has been described with reference to embodiments, this description is not

intended to be construed in a limiting sense. It is possible to make numerous modifications and variations. For example, while in the embodiments the elevating device 31 drives the pulley 32 using the motor 36, the pulley 33 may be rotated manually. Additionally, the second roller 24 may be moved by telescopic driving of an air cylinder, or the second roller 24 may be moved manually using a stick-shaped member.

[0050] Obviously, numerous modifications and variations of the present invention are possible in light of the above teachings. It is therefore to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described herein.

Claims

1. A filament yarn winding apparatus comprising:

a spinning machine; and
a winder, the winder comprising:

a first roller configured to receive a plurality of yarns from the spinning machine;
a bobbin holder holding a plurality of bobbins each configured to wind up a corresponding one of the plurality of yarns from the spinning machine;
a second roller orthogonal to an axis of the bobbin holder, the second roller being configured to distribute the plurality of yarns sent from the first roller to the plurality of bobbins; and
traverse support point guides serving as a support point of traverse for the plurality of yarns sent from the second roller onto the plurality of bobbins,
wherein the second roller is movable between a winding operation position and a threading operation position, the winding operation position being a normal position for yarn paths of the plurality of yarns during a winding operation, the threading operation position being lower than the winding operation position.

2. The filament yarn winding apparatus according to claim 1, further comprising at least one yarn path guide between the second roller and the traverse support point guides, the at least one yarn path guide being configured to bend the plurality of yarns distributed to the plurality of bobbins at equal to or lower than a predetermined angle, the yarn path guide and the traverse support point guide being configured to bend each of the plurality of yarns in multiple phases.

3. The filament yarn winding apparatus according to claim 2, wherein the yarn path guide is disposed such that a total angle of bending by the traverse support point guide and the yarn path guide is approximately equal among the plurality of yarns.

FIG. 1

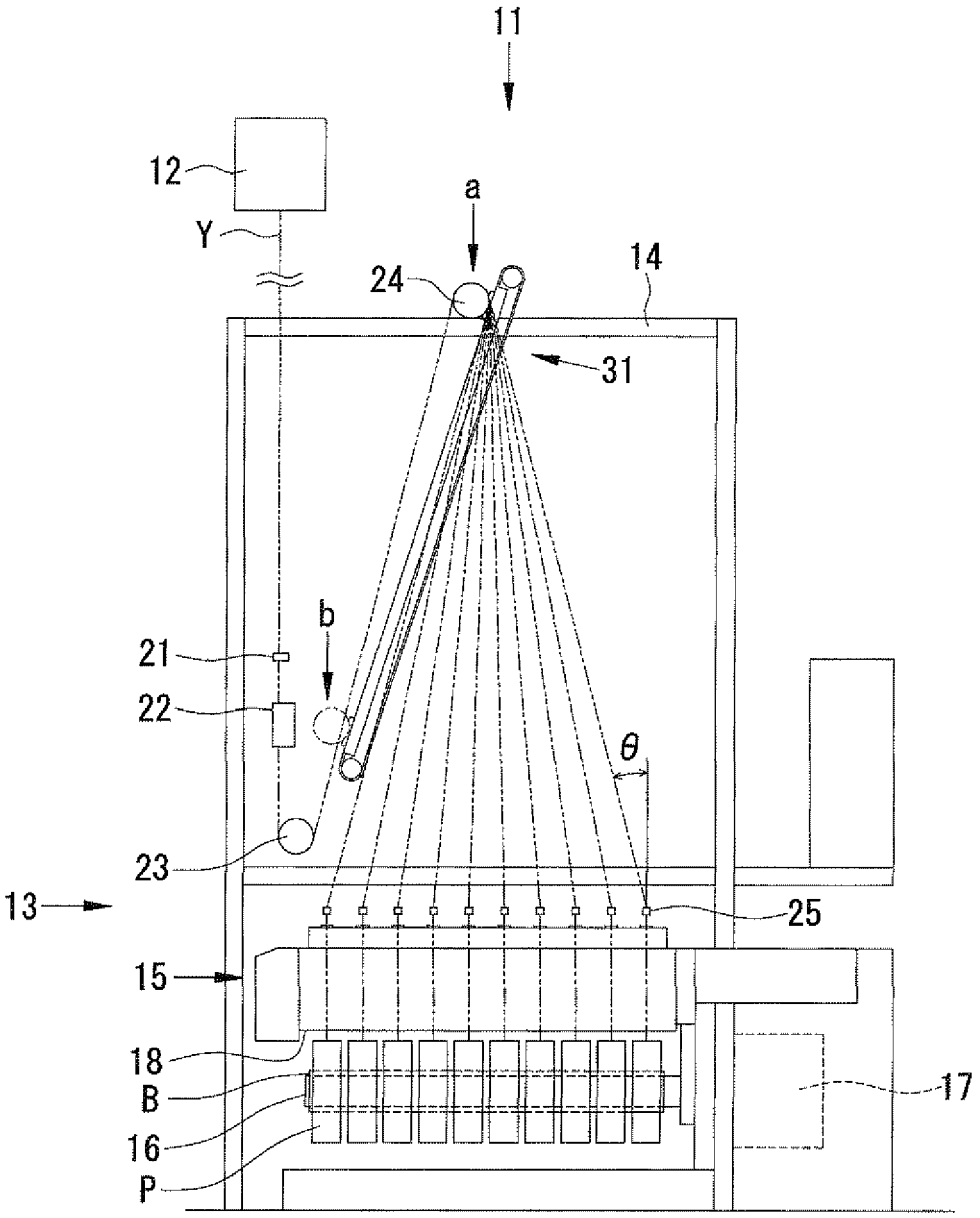
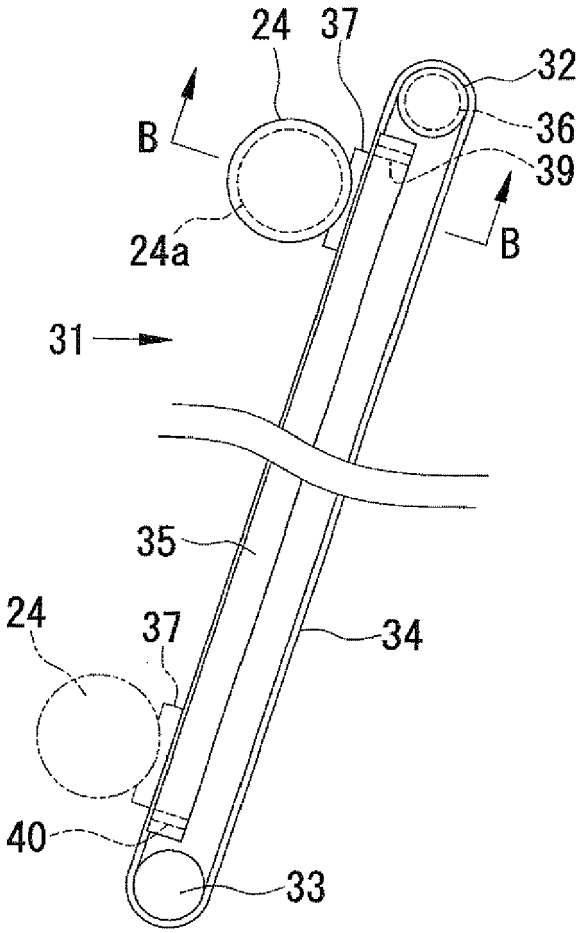


FIG. 2A


24
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24a
B
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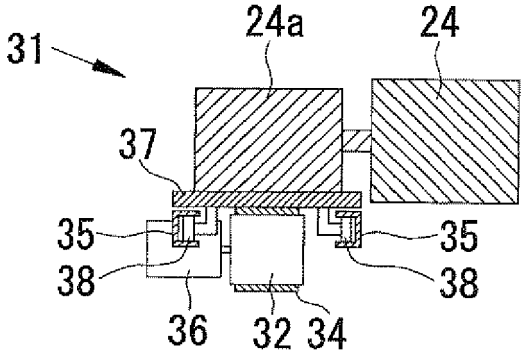
33

FIG. 2B


31
24a
24
37
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35
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32
34

FIG. 3

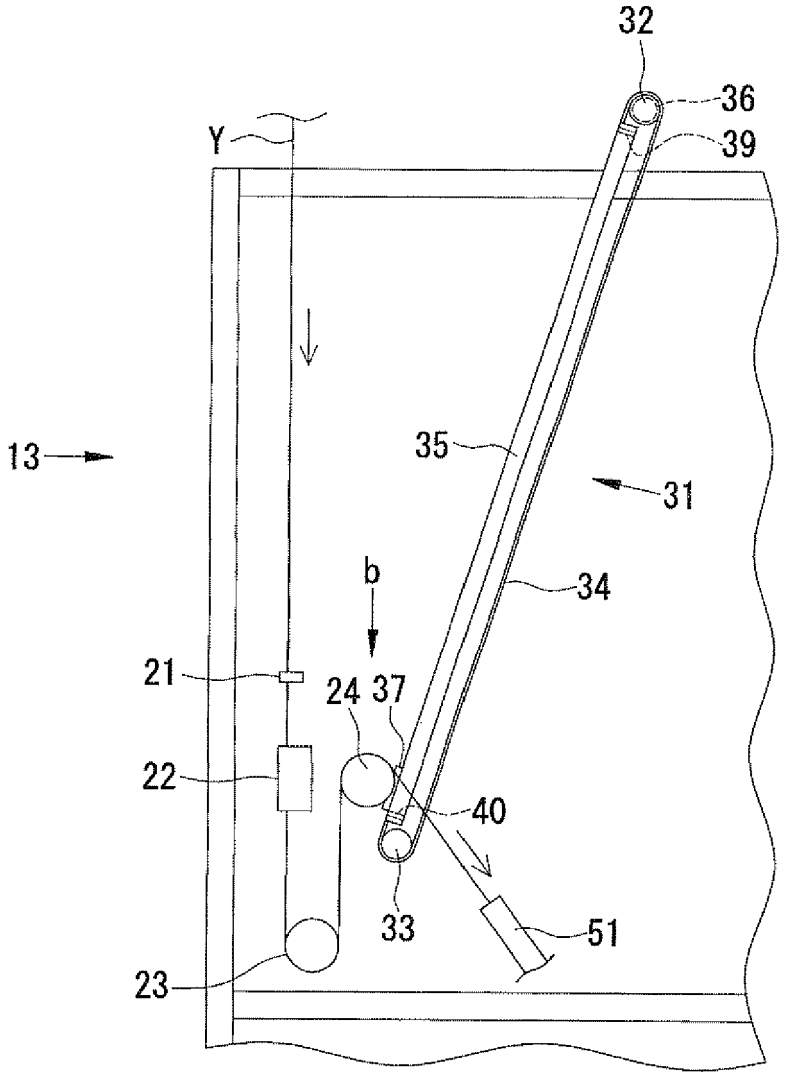


FIG. 4

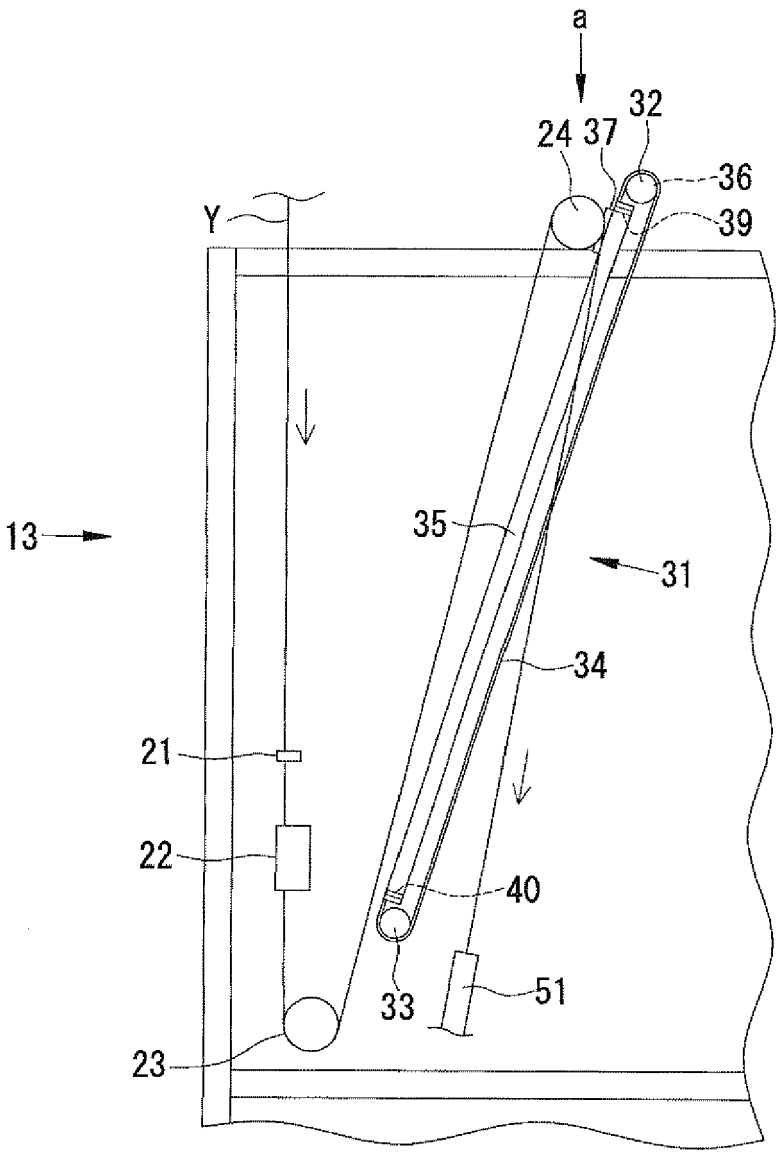
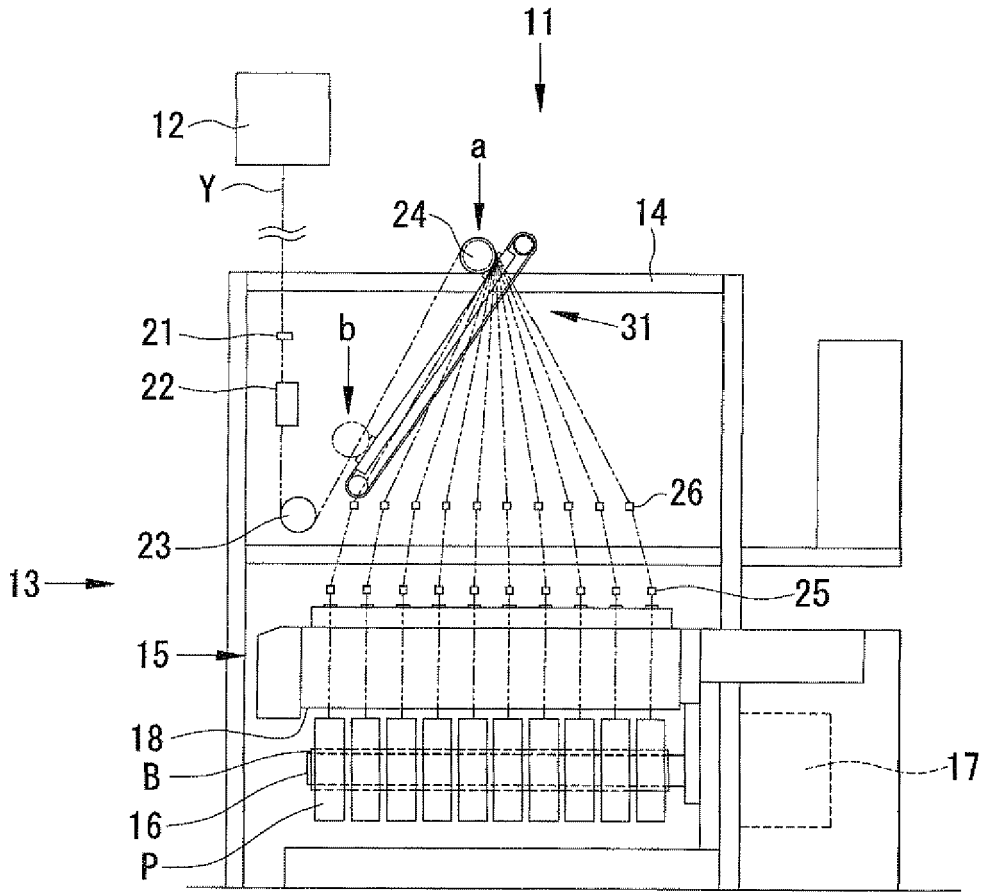


FIG. 5



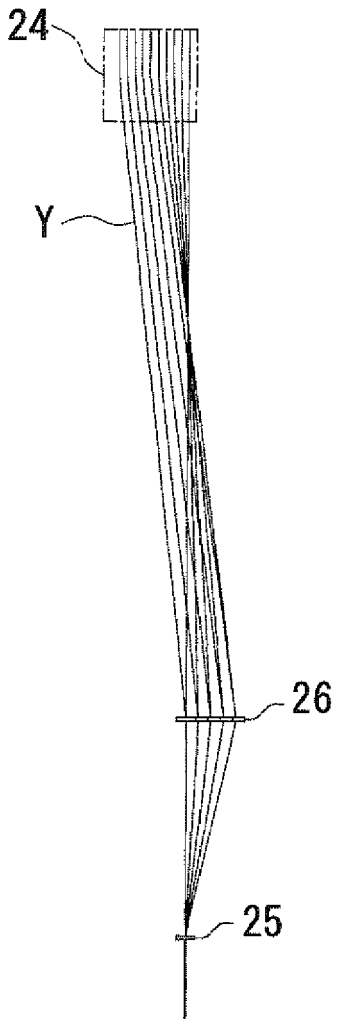


FIG. 6A

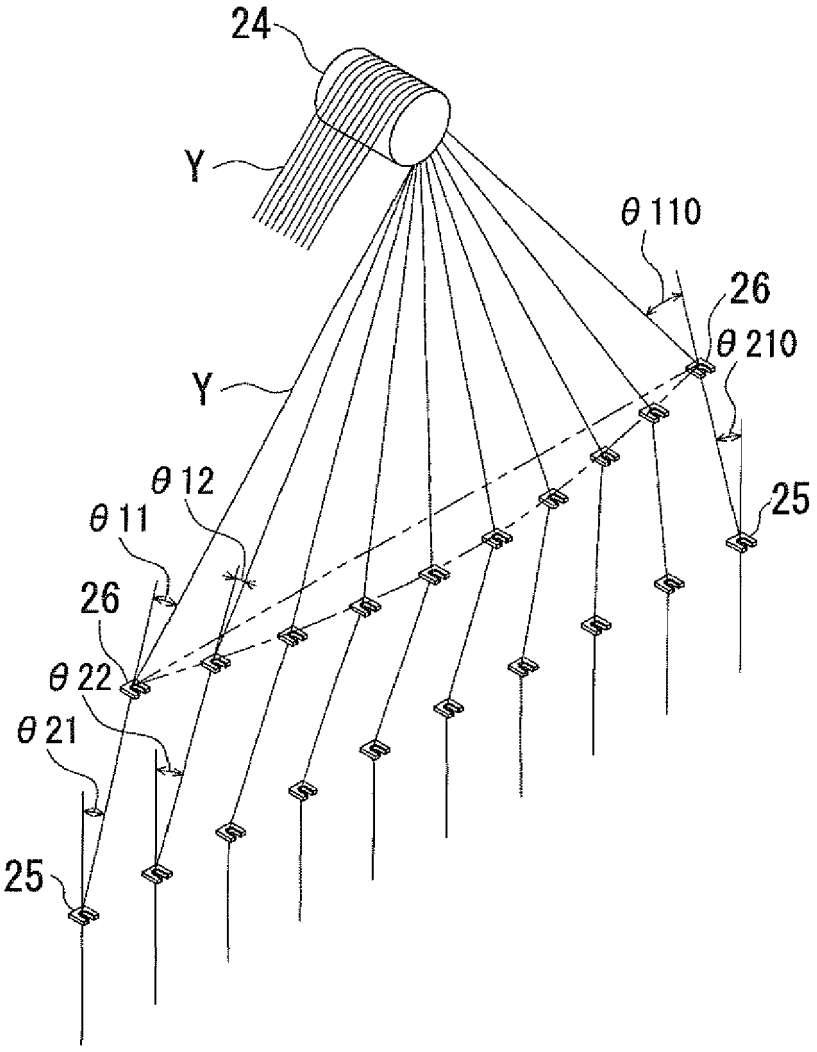


FIG. 6B

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 4204548 B **[0007] [0008] [0009]**