



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
01.11.2023 Bulletin 2023/44

(51) International Patent Classification (IPC):
B65H 54/88 (2006.01) B65H 54/71 (2006.01)

(21) Application number: **23170266.3**

(52) Cooperative Patent Classification (CPC):
B65H 54/88; B65H 54/71; B65H 2701/3132

(22) Date of filing: **27.04.2023**

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL
NO PL PT RO RS SE SI SK SM TR**
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

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(30) Priority: **28.04.2022 JP 2022074580**

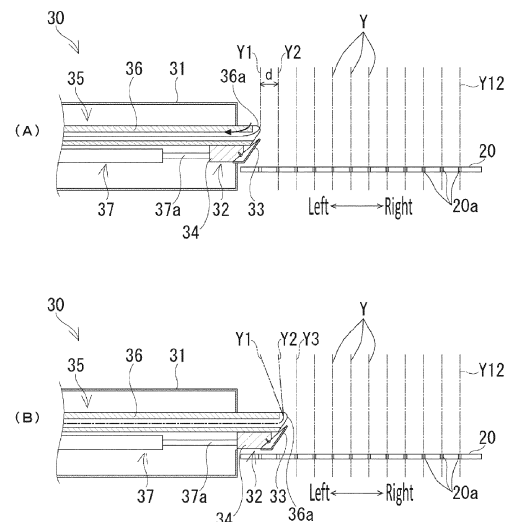
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(54) **SPUN YARN TAKE-UP APPARATUS**

(57) To provide a spun yarn take-up apparatus capable of cutting a yarn reliably with a yarn cutting-suctioning unit. The spun yarn take-up apparatus includes a yarn cutting-suctioning unit (30) having a cutter (32) for cutting a plurality of yarns (Y) aligned along an alignment direction each traveling and a suctioning unit (35) for suctioning the yarns (Y) cut by the cutter (32), a godet roller arranged downstream from the yarn cutting-suctioning unit (30) in a yarn traveling direction so as to feed the traveling yarns (Y) in the yarn traveling direction, and a controller configured to perform control to stop the godet roller when the yarn (Y) is cut and suctioned by the yarn cutting-suctioning unit (30). The plurality of yarns (Y) and the cutter (32) and suctioning unit (35) are caused to move closer to each other, whereby the plurality of yarns (Y) can be sequentially cut and suctioned. The controller stops the godet roller when at least a plurality of yarns Y (Y) are in a state of being cut.

FIG. 5



Description**BACKGROUND OF THE INVENTION****FIELD OF THE INVENTION**

[0001] The present invention relates to a spun yarn take-up apparatus provided with a yarn cutting-suctioning unit.

DESCRIPTION OF THE BACKGROUND ART

[0002] Conventionally, there has been known a spun yarn take-up apparatus configured to feed spun yarns through a godet roller and wind the spun yarns by a spooling unit. In such a spun yarn take-up apparatus, yarns continue being spun even upon interruption of the spooling unit's winding of the yarns, and for this reason, there is a need for the continuously spun yarns to be cut and suctioned by the yarn cutting-suctioning unit.

[0003] There is disclosed, in e.g. Patent Document 1, a yarn cutting-suctioning unit including a cutter movable along an alignment direction of aligned yarns for cutting a yarn of the aligned yarns traveling, and a suctioning unit connected with a suction source for suctioning the yarn cut by the cutter. In the yarn cutting-suctioning unit disclosed in Patent Document 1, a connection of the suctioning unit with the suction source is cut off during the winding of the yarns (see, e.g., paragraph 0031 of Patent Document 1).

(Prior Art Documents)

(Patent Documents)

[0004] Patent Document 1: Japanese Patent Application Publication No. 2012-180610

(Problems to be Solved)

[0005] In such a yarn cutting-suctioning unit as disclosed in Patent Document 1, upon interruption of the winding of yarns, the suctioning unit having been cut off from the suction source is connected with the suction source so as to suction the yarns cut by the cutter. In the interrupted winding of yarns, however, the tension of traveling yarns is lowered, and for this reason, there has been a probability that it would be difficult to cut such traveling lower-tension yarns. Further, if the yarns are thick, there has also been a probability that it would be difficult to cut such traveling thicker yarns.

SUMMARY OF THE INVENTION

[0006] The present invention has been made in view of the above-described technical problems, and an object thereof is to provide a spun yarn take-up apparatus having a yarn cutting-suctioning unit capable of cutting yarns

with reliability.

(Means for Solving Problems)

5 **[0007]** A first aspect of the present invention is a spun yarn take-up apparatus comprising:

a yarn cutting-suctioning unit including a cutter for cutting a plurality of yarns aligned along an alignment direction to travel and a suctioning unit for suctioning a yarn cut by the cutter;

a roller arranged downstream side from the yarn cutting-suctioning unit in a yarn traveling direction so as to feed the plurality of yarns traveling in the yarn traveling direction; and

a controller configured to perform control to stop the roller when a yarn is cut and suctioned by the yarn cutting-suctioning unit, wherein

as a result of causing the plurality of yarns and the cutter and suctioning unit to be closer to each other, the plurality of yarns can be sequentially cut and suctioned, and

the controller is further configured to perform control not to decelerate rotation of the roller even in a case where one of the plurality of yarns is in a state of being cut, and perform control to stop the roller based upon a case where at least a plurality of yarns are in a state of being cut.

30 **[0008]** According to the above-described first aspect of the spun yarn take-up apparatus, the rotation of the roller is not decelerated even in a case where merely one yarn out of the plurality of yarns is in a state of being cut; and no control to stop the roller is performed until a case where at least a plurality of yarns are in a state of being cut. As a result, it is possible to suppress a decrease in tension of the uncut yarns until a plurality of yarns are cut. As a consequence, yarns traveling in a yarn traveling direction can be reliably cut. It is to be noted that "not to decelerate rotation of the roller" includes a case where it is sufficient that at least the rotation of the roller is maintained such that the tension of the yarns on a downstream side from the yarn cutting-suctioning unit in a yarn traveling direction does not decrease, and also includes a case where the rotation of the roller is accelerated.

45 **[0009]** A second aspect of the present invention is the spun yarn take-up apparatus in the above-described first aspect, wherein

the cutter and suctioning unit are caused to move closer to the plurality of yarns in a state of traveling in the yarn traveling direction.

50 **[0010]** According to the above-described second aspect of the spun yarn take-up apparatus, as a result of bringing the cutter and the suctioning unit closer to a plurality of yarns stably traveling, yarns can be reliably cut, and entanglement of the cut yarns can be suppressed.

[0011] A third aspect of the present invention is the spun yarn take-up apparatus in the above-described first

aspect, wherein

the plurality of yarns are caused to move closer to the cutter and suctioning unit at rest so that the plurality of yarns and the cutter and suctioning unit are closer to each other.

[0012] According to the above-described third aspect of the spun yarn take-up apparatus, yarns can be cut while the cutter and the suctioning unit are in a state of being fixed, and therefore, the yarns can be cut in a stable state without any influence from the vibration or the like caused by the movement of the cutter and the suctioning unit.

[0013] A fourth aspect of the present invention is the spun yarn take-up apparatus in the above-described first aspect, wherein

both the plurality of yarns and the cutter and suctioning unit are caused to move closer to each other so that the plurality of yarns and the cutter and suctioning unit are closer to each other.

[0014] According to the above-described fourth aspect of the spun yarn take-up apparatus, the plurality of yarns as well as the cutter and suctioning unit are caused to move so that both are closer to each other. As a result, all of the plurality of yarns can be sequentially cut and suctioned one by one while capable of suppressing each amount of movement of the plurality of yarns and the cutter and suctioning unit, thereby to suppress an increase in size of the apparatus.

[0015] A fifth aspect of the present invention is the spun yarn take-up apparatus in any one of the above-described first to fourth aspects, wherein alignment is made such that

an interval between yarns adjacent to each other of the plurality of yarns aligned along the alignment direction is the same between:

before causing the plurality of yarns and the cutter and suctioning unit to be closer to each other; and
after having caused the plurality of yarns and the cutter and suctioning unit to be closer to each other.

[0016] According to the above-described fifth aspect of the spun yarn take-up apparatus, the interval between mutually adjacent yarns of the plurality of yarns is the same before the plurality of yarns and the cutter and suctioning unit both are closer to each other and after both having been closer to each other, and thereby, all of the plurality of yarns aligned along the alignment direction can be reliably cut and suctioned one by one.

[0017] A sixth aspect of the present invention is the spun yarn take-up apparatus in any one of the above-described first to fifth aspects, wherein,

when sequentially cutting and suctioning the plurality of yarns,
at least one of: the plurality of yarns; and the cutter and suctioning unit is caused to move in a relationship of $v \leq 5d$, where d denotes an interval between

a first yarn of the plurality of yarns and a second yarn adjacent to the first yarn aligned along the alignment direction, and where v denotes a relative velocity of the cutter and suctioning unit with respect to the plurality of yarns,
so that the plurality of yarns and the cutter and suctioning unit are closer to each other.

[0018] According to the above-described sixth aspect of the spun yarn take-up apparatus, the plurality of yarns and the cutter and suctioning unit are caused to move closer to each other at a relative velocity: $v \leq 5d$, and thereby, the yarns traveling in a yarn traveling direction can be sequentially cut one by one. As a result, traveling yarns can be reliably cut one by one while suppressing the occurrence of breakage of the blade of the cutter in a short period of time.

[0019] A seventh aspect of the present invention is the spun yarn take-up apparatus in any one of the above-described first to sixth aspects, wherein
the controller performs control not to decelerate rotation of the roller until a case where all of the plurality of yarns aligned along the alignment direction to travel are in a state of being cut, and performs control to stop the roller based upon a case where all of the plurality of yarns are in a state of being cut.

[0020] According to the above-described seventh aspect of the spun yarn take-up apparatus, it is possible to reliably cut all of the plurality of yarns traveling in a yarn traveling direction while a decrease in tension of the plurality of yarns is suppressed.

[0021] In the spun yarn take-up apparatus described above in the first to seventh aspects, it is to be noted that the term "state of being cut" is intended to include not only a state where the yarn is actually cut but also a state where the yarn is regarded as being cut.

[0022] Further, the spun yarn take-up apparatus according to the present invention does not necessarily include all of the above-described first to seventh aspects. The invention in the above-described first aspect e.g. does not need to encompass all of the above-described second to seventh aspects. Further, the present invention may be obtained by arbitrarily combining the above-described first aspect and any of the above-described second to seventh aspects to such an extent that consistency can be achieved.

(Advantageous Effects of the Invention)

[0023] According to the present invention, it is possible to provide a spun yarn take-up apparatus having a yarn cutting-suctioning unit capable of cutting yarns with reliability.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024]

FIG. 1 is a view showing schematically a structural example of a spun yarn take-up apparatus according to an embodiment of the present invention.

FIG. 2 is a view showing schematically an example of a yarn regulating guide and a yarn cutting-suctioning unit according to an embodiment of the present invention.

FIG. 3 is a block diagram of a functional example as an electrical configuration of a spun yarn take-up apparatus according to an embodiment of the present invention.

FIG. 4 is a flow showing an example of processing of stop operation according to an embodiment of the present invention.

FIG. 5 is an explanatory view of operation of cutting and suctioning a plurality of yarns by a yarn cutting-suctioning unit according to an embodiment of the present invention, in which: (A) the yarn cutting-suctioning unit cuts and suction a yarn closest to one side only out of the plurality of yarns; and (B) the yarn cutting-suctioning unit cuts and suction both a yarn closest to one side and a yarn adjacent thereto on the other side only out of the plurality of yarns.

FIG. 6 is a view showing schematically an example of a yarn regulating guide and a yarn cutting-suctioning unit according to a first modified embodiment of the present invention.

FIG. 7 is a view showing schematically an example of a yarn regulating guide and a yarn cutting-suctioning unit according to a second modified embodiment of the present invention.

DESCRIPTIONS OF EMBODIMENTS OF THE INVENTION

[0025] Hereinafter, embodiments of the present invention will be described with reference to the drawings. For the convenience of description, an up-and-down direction, a left-and-right direction, and a forward-and-backward direction are as shown in their respective drawings to be described later.

[1. Outline of Spun Yarn Take-up Apparatus]

[0026] First, an outline of a spun yarn take-up apparatus 1 according to an embodiment of the present invention (hereinafter referred to as "a present embodiment") will be described with reference to FIG. 1. FIG. 1 is a view showing schematically a structural example of a spun yarn take-up apparatus according to an embodiment.

[0027] The spun yarn take-up apparatus 1 mainly includes, e.g., a spinning apparatus 2, an oil supply guide 3, a yarn regulating guide 20, a yarn cutting-suctioning unit 30, two godet rollers (a first godet roller 4a, a second godet roller 4b) for drawing a yarn Y, a yarn spooling unit 10 for winding a drawn yarn Y, and a controller 50 (see FIG. 3 to be described later).

[0028] The spinning apparatus 2 having a plurality of

spinnerets 2a is configured such that high-temperature liquid-like molten polymer (yarn material) is continuously extruded from each spinneret 2a. The yarn material extruded from each spinneret 2a is cooled to be solidified, and spun as a single yarn Y composed of a plurality of filaments F. In such a manner, a plurality of yarns Y are spun from the plurality of spinnerets 2a. The plurality of filaments F are made of molten fibrous material such as e.g. polyester.

[0029] The oil supply guide 3 arranged below the spinning apparatus 2 is configured to apply oil agent to a plurality of yarns Y spun from the spinnerets 2a of the spinning apparatus 2. The oil supply guide 3 is configured to regulate a plurality of yarns Y such that the adjacently-aligned yarns Y have a constant interval therebetween in a left-and-right direction (alignment direction of the present invention).

[0030] The yarn regulating guide 20 is arranged below the oil supply guide 3 and above the first godet roller 4a.

[0031] The yarn cutting-suctioning unit 30 is a device configured to cut and suction a plurality of yarns Y spun from the spinnerets 2a of the spinning apparatus 2, and such a device is arranged downstream from the oil supply guide 3 in a yarn traveling direction. For a plurality of yarns Y continuously spun from the spinnerets 2a of the spinning apparatus 2 in spite of interruption of processing, the yarn cutting-suctioning unit 30 is capable of cutting and suctioning such a plurality of yarns Y continuously spun while processing performed downstream from the yarn cutting-suctioning unit is interrupted. Details of the yarn cutting-suctioning unit 30 will be described later.

[0032] The two godet rollers 4a, 4b are configured to take up a yarn Y applied with oil agent from the oil supply guide 3, and feed it to the yarn spooling unit 10 arranged below the two godet rollers 4a, 4b. The second godet roller 4b is arranged downstream from the first godet roller 4a in a yarn traveling direction and also arranged above the first godet roller 4a and backward from the first godet roller 4a. The first godet roller 4a and the second godet roller 4b are driven by a first driving motor 5a and a second driving motor 5b, respectively (see FIG. 3 to be described later). It is to be noted that the number of godet rollers is not limited to two.

[0033] The yarn spooling unit 10 is a device configured to wind a plurality of yarns Y fed from two godet rollers 4a, 4b, mainly including, e.g., a fulcrum guide 11, a traverse guide 12, a winding shaft 13, a turret 14, a main body frame 15, and a contact roller 16.

[0034] The fulcrum guide 11 having a plurality of fulcrum guides 11 corresponding to a plurality of yarns Y, respectively, is configured to distribute the corresponding yarns Y fed from the second godet roller 4b. The traverse guide 12 having a plurality of traverse guides 12 corresponding to a plurality of yarns Y, respectively, is configured to traverse the corresponding yarns Y distributed by the corresponding fulcrum guides 11. The winding shaft 13 has, e.g., two winding shafts 13 having the same

axial direction as each other, and a plurality of bobbins B are mounted in series along an axis of each winding shaft 13. The turret 14 is a rotatable disk for supporting one end of each of the two winding shafts 13. The main body frame 15 is configured to rotatably support the turret 14. The contact roller 16 movable in an up-and-down direction with respect to the main body frame 15 is configured to move toward and away from the bobbin B mounted on the winding shaft 13.

[2. Yarn Cutting-suctioning Unit]

[0035] FIG. 2 is a view showing schematically an example of the yarn regulating guide 20 and the yarn cutting-suctioning unit 30 according to a present embodiment.

[0036] As shown in FIG. 2, the yarn cutting-suctioning unit 30 is arranged on a left side with respect to a plurality of yarns Y traveling aligned in a left-and-right direction, and further arranged immediately upstream from the yarn regulating guide 20 in a yarn traveling direction of a plurality of yarns Y. The number of yarns Y is, e.g., twelve, but the number of yarns Y is not limited thereto. Further, in FIG. 2, all of a plurality of yarns Y should be labeled with reference numerals; however, for the sake of convenience, only three yarns Y are labeled with reference numerals (the same applies to FIGS. 5 to 7).

[0037] The yarn regulating guide 20 is in a comb-teeth shape having a plurality of grooves 20a arranged in a left-and-right direction corresponding to a plurality of yarns Y, respectively. A plurality of yarns Y are allowed to pass through the plurality of grooves 20a, respectively. The yarn regulating guide 20 regulates a plurality of yarns Y wound around the godet rollers 4a, 4b such that an interval between mutually adjacent ones of a plurality of yarns Y aligned along a left-and-right direction is constant through an interval among the plurality of grooves 20a formed therein in a left-and-right direction. In FIG. 2, all of the plurality of grooves 20a should be labeled with reference numerals; however, for the sake of convenience, only three grooves 20a are labeled with reference numerals (the same applies to FIGS. 5 to 7).

[0038] The yarn cutting-suctioning unit 30 mainly includes, e.g., a holder 31 serving as a base, a cutter 32 for cutting a yarn Y of a plurality of yarns Y, a suctioning unit 35 for suctioning the yarn Y cut by the cutter 32, and an air cylinder 37 for moving pneumatically the cutter 32 along an alignment direction (in a left-and-right direction in FIG. 2) of a plurality of yarns Y.

[0039] The cutter 32 includes a blade portion 33 capable of cutting a plurality of yarns Y one by one or a plurality of yarns Y at once, and a blade holding member 34 for holding the blade portion 33.

[0040] The suctioning unit 35 is configured to suction a plurality of yarns Y cut by the blade portion 33 of the cutter 32. The suctioning unit 35 includes a suction source (not shown) and a cylindrical member 36 connected with the suction source through an electromag-

netic valve 42 (see FIG. 3 to be described later). The blade holding member 34 is attached to a lower surface of the cylindrical member 36. With the blade holding member 34 attached to the lower surface of the cylindrical member 36, the blade portion 33 is positioned near a suction port 36a at a right tip of the cylindrical member 36. A suction force for suctioning the cut yarn Y is generated at the suction port 36a. The yarn Y cut by the cutter 32 is suctioned from the suction port 36a.

[0041] The air cylinder 37 causes the cutter 32 and the suctioning unit 35 to move (more specifically, the cylindrical member 36 is caused to move) with respect to a plurality of yarns Y. The air cylinder 37 having a cylinder rod 37a is arranged inside the holder 31 as a base. The cylinder rod 37a is connected with the cylindrical member 36 through the cutter 32 (more specifically, the blade holding member 34). When the air cylinder 37 is actuated, the cylinder rod 37a is expanded and contracted in a left-and-right direction, and as a result, the cutter 32 and the suctioning unit 35 advance and retract in a left-and-right direction. It is to be noted that the holder 31 does not move even when the cylinder rod 37a is expanded or contracted.

[0042] The cylinder rod 37a shown in FIG. 2 is in a contracted state. When the cylinder rod 37a is in a contracted state, the cutter 32 is in a retracting position where none of the yarns Y can be cut. When the cylinder rod 37a is caused to move from a contracted state to an expanded state (toward a right side in FIG. 2), the cutter 32 and the cylindrical member 36 advance to the right (i.e., toward a side closer to a plurality of yarns Y in a left-and-right direction), and the yarn Y can be cut by the blade portion 33. In a present embodiment, a left side in a left-and-right direction is defined as corresponding to one side along an alignment direction in the present invention, and a right side in a left-and-right direction is defined as corresponding to the other side along an alignment direction in the present invention.

[0043] In a present embodiment, the cutter 32 and the suctioning unit 35 are caused to move along an alignment direction by actuating the cylinder rod 37a. The present invention is however not limited thereto, and the cutter 32 and the suctioning unit 35 may be caused to move by energizing a motor to rotate gears engaged with the cutter 32 and the suctioning unit 35.

[3. Controller]

[0044] FIG. 3 is a block diagram of a functional example as an electrical configuration of a spun yarn take-up apparatus 1 according to a present embodiment.

[0045] As shown in FIG. 3, the controller 50 is configured to receive at least a signal to stop operation and a signal to start operation. The signal to stop operation and the signal to start operation are generated based on e.g. the operator's operation. The signal to stop operation is also generated upon detection of cutting of yarn Y, i.e., upon receipt of a signal indicative of cutting of yarn.

[0046] The controller 50 is electrically connected with at least a first electromagnetic valve 42, a second electromagnetic valve 38, a first driving motor 5a, a second driving motor 5b, and a yarn spooling unit driving source 17.

[0047] The first electromagnetic valve 42 switches a connection state between the suction source (not shown) and the cylindrical member 36 (see FIG. 2). When the spun yarn take-up apparatus 1 is e.g. in operation, a connection between the suction source 40 and the cylindrical member 36 is cut off, and no suction force for suctioning the cut yarn Y is generated at the suction port 36a. Upon receipt of the controller 50 of the signal to stop operation, the first electromagnetic valve 42 is operated thereby to connect between the suction source 40 and the cylindrical member 36, and as a result, a suction force for suctioning the cut yarn Y is generated at the suction port 36a.

[0048] The second electromagnetic valve 38 is connected with the air cylinder 37, and switches an expanded/contracted state of the cylinder rod 37a (see FIG. 2). For example, when the second electromagnetic valve 38 moves to a first position, compressed air is supplied to the air cylinder 37 so that the cylinder rod 37a is caused to move in an expanding direction. When the second electromagnetic valve 38 moves to a second position, compressed air is supplied to the air cylinder 37 so that the cylinder rod 37a is caused to move in a contracting direction. When the second electromagnetic valve 38 is at a neutral position, the cylinder rod 37a is held at said neutral position. During the operation of the spun yarn take-up apparatus 1, the cylinder rod 37a is held in a contracted state.

[0049] The first driving motor 5a is a driving source for rotating the first godet roller 4a. The second driving motor 5b is a driving source for rotating the second godet roller 4b.

[0050] The yarn spooling unit driving source 17 is a driving source for driving the yarn spooling unit 10. The yarn spooling unit driving source 17 corresponds to, e.g., a motor (not shown) for rotating the turret 14 and a motor (not shown) for rotating each of the two winding shafts 13.

[4. Processing Of Stop Operation]

[0051] Next, processing of stop operation to be executed by the controller 50 when stopping the operation of the spun yarn take-up apparatus 1 (see FIG. 1), and operation of the yarn cutting-suctioning unit 30 in the processing of stop operation will be described with reference to FIGS. 4 and 5.

[0052] FIG. 4 is a flow showing an example of processing of stop operation out of various sorts of processing to be executed by the controller 50 according to a present embodiment. The flow shown in FIG. 4 is one for convenience of explanation of a present embodiment. FIG. 5 is an explanatory view of operation of cutting and suctioning a plurality of yarns Y by the yarn cutting-suctioning unit 30 according to a present embodiment. In (A), an

example is shown in a state where the yarn cutting-suctioning unit 30 cuts and suctions a yarn Y1 closest to one side only along an alignment direction out of a plurality of yarns Y1 to Y12, and in (B), an example is shown in a state where the yarn cutting-suctioning unit 30 cuts and suctions both the yarn Y1 and a yarn Y2 adjacent to the yarn Y1 on the other side only along an alignment direction out of a plurality of yarns Y1 to Y12.

[0053] During the operation of the spun yarn take-up apparatus 1 (see FIG. 1), the cutter 32 and the cylindrical member 36 are at a retracting position (a position shown in FIG. 2). At this time, a connection between the suction source (not shown) and the cylindrical member 36 is cut off, and no suction force is generated from the suction port 36a. Further, the cylinder rod 37a is in a contracted state. Still further, although needless to say, during the operation of the spun yarn take-up apparatus 1, a motor (not shown) for rotating the first driving motor 5a, the second driving motor 5b, and at least one winding shaft 13 of the two winding shafts 13 is rotating.

[0054] As shown in FIG. 4, upon receipt of the controller 50 of a signal to stop operation (Yes in S1 of FIG. 4), processing proceeds to S2. On the other hand, without receipt of the controller 50 of any signal to stop operation (No in S1 of FIG. 4), a series of processing from S1 to S7 shown in FIG. 4 are not executed.

[0055] In S2, the controller 50 performs control to connect the suction source (not shown) and the cylindrical member 36 with each other. More specifically, the controller 50 operates the first electromagnetic valve 42 so that the suction source and the cylindrical member 36 are connected with each other. When the suction source and the cylindrical member 36 are connected with each other, a yarn Y can be suctioned from the suction port 36a in a direction of the arrow shown in (A) of FIG. 5. After processing in S2, the controller 50 executes processing in S3.

[0056] In S3, the controller 50 performs control to cause the cutter 32 and the suctioning unit 35 to start moving toward a plurality of yarns Y, i.e., from one side to the other side along an alignment direction. More specifically, the controller 50 operates the second electromagnetic valve 38 to a first position. When the second electromagnetic valve 38 moves to a first position, compressed air is supplied to the air cylinder 37 so that the cylinder rod 37a is caused to move in an expanding direction (toward a right side in FIG. 5). When the cylinder rod 37a operates in an expanding direction, both the cutter 32 and the suctioning unit 35 are caused to move from one side to the other side (toward a right side in FIG. 5) along an alignment direction. In other words, the yarn regulating guide 20 is not caused to move while the yarn cutting-suctioning unit 30 is caused to move so that a plurality of yarns Y and the yarn cutting-suctioning unit 30 are closer to each other.

[0057] Incidentally, when each yarn Y is thick, it may be difficult for the blade portion 33 to cut a plurality of yarns Y at once. When the blade portion 33 cuts a plurality

of yarns Y at once, an excessive shearing force due to a yarn Y traveling in a yarn traveling direction (toward a downward side in an up-and-down direction in FIG. 5) acts on the blade portion 33, and blade breakage may occur.

[0058] In a present embodiment, therefore, the cutter 32 and the suctioning unit 35 are caused to move at a low velocity from one side to the other side (toward a right side in FIG. 5) along an alignment direction so that a plurality of yarns Y traveling in a yarn traveling direction can be sequentially cut one by one. The moving velocity of the cutter 32 and the suctioning unit 35 from one side to the other side along an alignment direction is, e.g., 20 mm/s in a present embodiment, which is approximately 1/3 of a conventional moving velocity 57 mm/s. The moving velocity of the cutter 32 and the suctioning unit 35 from one side to the other side along an alignment direction can be reduced by, e.g., reducing the operating velocity of the cylinder rod 37a that operates in an expanding direction.

[0059] As shown in (A) in FIG. 5, an interval between a yarn Y1 closest to one side along an alignment direction out of twelve yarns Y1 to Y12 aligned along an alignment direction and a yarn Y2 adjacent to the yarn Y1 on the other side along an alignment direction is defined as d. Further, a time from when a yarn Y1 is cut to when a yarn Y2 is cut is defined as t, and the moving velocity of the cutter 32 and the suctioning unit 35 moving from one side to the other along an alignment direction is defined as v. At this time, the cutter 32 and the suctioning unit 35 move from one side to the other side along an alignment direction at a moving velocity satisfying a relationship of " $v \leq d/t$ ". As a result, after a yarn Y1 is reliably cut and suctioned as shown in (A) in FIG. 5, a yarn Y2 is cut and suctioned as shown in (B) in FIG. 5. In a present embodiment, the interval d is 4 mm. Further, as described above, the moving velocity v of the cutter 32 and the suctioning unit 35 is 20 mm/s. Since there is a proportional relationship between the interval d and the moving velocity v of the cutter 32 and the suctioning unit 35, the time t is approximately 5 s. In other words, it is preferable to cause the cutter 32 and the suctioning unit 35 to move from one side to the other side along an alignment direction at the moving velocity satisfying a relationship of " $v \leq 5d$ ".

[0060] In the meantime, according to the results of an experiment conducted by the inventor with the moving velocity v of the cutter 32 and the suctioning unit 35 set to 20 mm/s and the interval d between a yarn Y1 and a yarn Y2 set to 4 mm, the yarns Y could be cut one by one with the probability of 100% regardless of the yarn thickness, i.e., even when the yarn is thick. Further, according to the results of an experiment conducted with the moving velocity v of the cutter 32 and the suctioning unit 35 set to 20 mm/s, and the interval d between a yarn Y1 and a yarn Y2 set to 6 mm, the yarns Y could be cut one by one with probability of 100% regardless of the yarn thickness. When the moving velocity v of the cutter 32 and the suctioning unit 35 was set to 57 mm/s as in

a conventional case, however, the yarns Y could only be cut with probability of approximately 20% even when the interval d between a yarn Y1 and a yarn Y2 was 4 mm or 6 mm.

[0061] After executing processing in S3, the controller 50 proceeds to processing in S4. Incidentally, when the yarn Y traveling in a yarn traveling direction is cut by the cutter 32, if the tension of the yarn Y traveling in the yarn traveling direction decreases, the yarn Y may not be cut satisfactorily. If the yarn Y traveling in a yarn traveling direction could not be cut satisfactorily, the yarn Y could not be suctioned satisfactorily from the suction port 36a, and the cut yarn Y may get entangled under the cutter 32.

[0062] The controller 50 does not therefore immediately stop the rotating winding shaft 13 upon receipt of a signal to stop operation, but the controller 50 determines whether all of the plurality of yarns Y are cut (S4) and stops the first driving motor 5a and the second driving motor 5b (S5). In other words, when the number of yarns Y is twelve, e.g., the rotation of the first godet roller 4a and the second godet roller 4b is stopped after all of the twelve yarns Y (Y1 to Y12) are cut. The rotation of the first godet roller 4a and the second godet roller 4b therefore continues unless it is determined that all of the twelve yarns Y (Y1 to Y12) are cut (unless Yes is obtained in S4). As a result, it is possible to reliably cut all of the plurality of yarns Y (Y1 to Y12) traveling in a yarn traveling direction in a state where a decrease in tension is suppressed.

[0063] "All of the plurality of yarns Y (Y1 to Y12) are in a state of being cut" means not only a state where all of the plurality of yarns Y (Y1 to Y12) are actually cut but also a state where all of the plurality of yarns Y (Y1 to Y12) are regarded as being cut. When a plurality of sensors configured to detect the plurality of yarns Y, respectively, provided downstream from the yarn regulating guide 20, e.g., cannot detect the yarn Y, it can be determined that all of the plurality of yarns Y1 to Y12 are cut.

[0064] When the blade portion 33 or the suction port 36a reaches a position where all of the plurality of yarns Y (Y1 to Y12) are cut, it can be said that it is in a state where all of the plurality of yarns Y (Y1 to Y12) are regarded as being cut although it is not directly detected that all of the plurality of yarns Y (Y1 to Y12) are cut. In a similar manner, if all of the plurality of yarns Y (Y1 to Y12) are cut when the cylinder rod 37a is operated in an expanding direction to an operating limit, such a state where the cylinder rod 37a is operated in the expanding direction to the operating limit can be said to be a state where all of the plurality of yarns Y (Y1 to Y12) are regarded as being cut.

[0065] After executing processing in S5, the controller 50 proceeds to processing in S6. In S6, the controller 50 stops the yarn spooling unit driving source (more specifically, the motor for causing the rotating winding shaft 13 to rotate). In such a manner, instead of immediately stopping the rotating winding shaft 13 after the controller 50 receives a signal to stop operation, the rotation velocity

of the winding shaft 13 is maintained at least until all of the twelve yarns Y (Y1 to Y12) are cut. As a result, it is possible to suppress a decrease in tension of at least the uncut yarns Y on a downstream side of the yarn cutting-suctioning unit 30.

[0066] After all of the twelve yarns Y (Y1 to Y12) are cut and suctioned by the suctioning unit 35, the operator brings a suction gun (not shown) closer to the suction port 36a in a state where the movement of the cutter 32 and the suctioning unit 35 is stopped. After the plurality of yarns Y are cut by a cutter (not shown) at a tip of the suction gun, the plurality of yarns Y are suctioned and held by the suction gun.

[0067] After that, in S7, *e.g.*, in response to the operator's operation, the controller 50 performs control to cause the cutter 32 and the suctioning unit to start moving toward a retracting position (a position shown in FIG. 2), *i.e.*, from the other side to one side along the alignment direction. More specifically, the controller 50 operates the second electromagnetic valve 38 to a second position. When the second electromagnetic valve 38 moves to a second position, compressed air is supplied to the air cylinder 37 so that the cylinder rod 37a moves in a contracting direction (toward the left side in FIG. 5). When the cylinder rod 37a operates in a contracting direction, both the cutter 32 and the suctioning unit 35 are caused to move from the other side to one side along the alignment direction.

[5. Effects]

[0068] According to a present embodiment described above, the cutter 32 and the suctioning unit 35 caused to move at a low velocity in relation to a plurality of yarns Y traveling stably so that the plurality of yarns Y aligned along an alignment direction can be sequentially cut and suctioned one by one. It is therefore possible to suppress the occurrence of breakage of the blade portion 33 in a short period of time and the yarn Y cut by the cutter 32 can be reliably suctioned by the suctioning unit 35. Further, it is possible to suppress entanglement of the cut yarns.

[0069] Further, according to a present embodiment described above, control for stopping the godet rollers 4a, 4b is not performed until, *e.g.*, all of the twelve yarns Y (Y1 to Y12) are cut. In other words, the godet rollers 4a, 4b are not stopped and are not decelerated to such an extent that the yarn Y decreases in tension even if only some yarns Y of the twelve yarns Y1 to Y12 are cut. A decrease in tension of the uncut yarns Y can therefore be suppressed until all of the twelve yarns Y (Y1 to Y12) are cut. As a result, all of the yarns Y (Y1 to Y12) traveling in a yarn traveling direction can be reliably cut.

[6. Extended Example]

[0070] In the above-described embodiments, the control to stop the godet rollers 4a, 4b is not performed until

all of twelve yarns Y (Y1 to Y12) are cut; however, the present invention is not necessarily limited thereto. A control to *e.g.* stop the godet rollers 4a, 4b may not be performed when only a yarn Y1 closest to one side along an alignment direction is cut out of twelve yarns Y1 to Y12, and a control to *e.g.* stop the godet rollers 4a, 4b may not be performed until at least a plurality of yarns Y (*e.g.*, yarns Y1 and Y2) are cut. In other words, even if all of the twelve yarns Y (Y1 to Y12) are not necessarily cut, the godet rollers 4a, 4b are not stopped until at least a yarn Y1 is cut. As a result, at least a yarn Y1 can be cut reliably.

[0071] In a present embodiment described above, after all of the twelve yarns Y (Y1 to Y12) are cut, the rotation of the first godet roller 4a and the second godet roller 4b is stopped. In other words, the controller 50 does not immediately stop the rotation of the two godet rollers 4a, 4b even if the controller 50 receives a signal to stop operation, but the rotation of the two godet rollers 4a, 4b continues while maintaining the rotation velocity. Without being limited to the above, however, if it is possible to suppress a decrease in tension of the uncut yarn Y, it is sufficient that the rotation velocity of the two godet rollers 4a, 4b does not decrease at least until all of the twelve yarns Y (Y1 to Y12) are cut after the controller 50 receives a signal to stop operation. The controller 50 may therefore cause the rotation velocity of the two godet rollers 4a, 4b to increase until all of the twelve yarns Y (Y1 to Y12) are cut after receiving a signal to stop operation.

[0072] In a present embodiment described above, after the controller 50 receives a signal to stop operation, the rotation velocity of the two godet rollers 4a, 4b does not decrease; however, the present invention is not limited thereto. If the rotation velocity of at least one of the two godet rollers 4a, 4b (*e.g.*, the first godet roller 4a closer to the yarn cutting-suctioning unit 30 than the second godet roller 4b) does not decrease, *e.g.*, a decrease in tension of the uncut yarn Y can be suppressed.

[0073] In a present embodiment, after the controller 50 receives a signal to stop operation, the rotation velocity of the godet rollers 4a, 4b does not decrease. Instead of or in addition to this, even when the rotation velocity of a yarn feed roller arranged downstream from the yarn cutting-suctioning unit 30 does not decrease, it is possible to suppress a decrease in tension of the uncut yarn Y.

[0074] In a present embodiment described above, the yarn regulating guide 20 having the plurality of grooves 20a aligned in a left-and-right direction corresponding to the plurality of yarns Y, respectively, is provided. The yarn regulating guide 20 is however not an essential configuration for cutting and suctioning the plurality of yarns Y with the cutter 32 and the suctioning unit 35 in a state where a decrease in tension of the plurality of yarns Y is suppressed. In other words, the present invention can also be applied to a spun yarn take-up apparatus without having any yarn regulating guide 20. Further, although the present invention is provided with the yarn regulating guide 20, the present invention can also be applied to,

e.g., a spun yarn take-up apparatus configured to retract from a plurality of yarns Y when the plurality of yarns Y are cut and suctioned by the cutter 32 and the suctioning unit 35.

[0075] In a present embodiment described above, an example where the cutter 32 and the suctioning unit 35 are caused to move with respect to the plurality of yarns Y to bring the plurality of yarns Y closer to the cutter 32 and the suctioning unit 35 has been described. The method of bringing the plurality of yarns Y closer to the cutter 32 and the suctioning unit 35 is however not limited to the example of the cutter 32 and the suctioning unit 35 caused to move with respect to the plurality of yarns Y. The plurality of yarns Y may be caused to move, e.g., with respect to the cutter 32 and the suctioning unit 35, or the cutter 32 and the suctioning unit 35 may be caused to move with respect to the plurality of yarns Y while said plurality of yarns Y moving with respect to the cutter 32 and the suctioning unit 35. These modified examples are described below.

[8. Modified Embodiments]

[0076] Next, a first modified embodiment and second modified embodiment obtained by modifying the yarn regulating guide 20 and yarn cutting-suctioning unit 30 according to a present embodiment will be described below. The description of a configuration common to the above-described yarn cutting-suctioning unit 30 will be omitted, and a configuration different from that of the yarn cutting-suctioning unit 30 will be mainly described.

[8-1. First modified embodiment]

[0077] FIG. 6 is a view showing schematically an example of a yarn regulating guide 20A and a yarn cutting-suctioning unit 30A according to a first modified embodiment. Similar to the yarn regulating guide 20 (see, e.g., FIG. 2), the yarn regulating guide 20A is in a comb-teeth shape having a plurality of grooves 20Aa aligned in a left-and-right direction corresponding to the plurality of yarns Y, and the plurality of yarns Y are allowed to pass through the grooves 20Aa, respectively.

[0078] The yarn cutting-suctioning unit 30A according to a first modified embodiment is different from the yarn cutting-suctioning unit 30 where the cutter 32 and the suctioning unit are caused to move from one side to the other side along an alignment direction, i.e., when a plurality of yarns Y are cut and suctioned, the yarn regulating guide 20A is caused to move from the other side to one side along the alignment direction. In other words, in the first modified embodiment, the yarn cutting-suctioning unit 30A is not caused to move while the yarn regulating guide 20A is caused to move so that the plurality of yarns Y and the yarn cutting-suctioning unit 30A are closer to each other.

[0079] As shown in FIG. 6, the yarn cutting-suctioning unit 30A does not include the air cylinder 37 (see, e.g.,

FIG. 2) but includes an air cylinder 39 having a larger expansion/contraction stroke than the air cylinder 37. The air cylinder 39 causes the yarn regulating guide 20A to move with respect to the cutter 32 and the suctioning unit 35. The air cylinder 39 having a cylinder rod 39a is provided inside the holder 31 as a base. The cylinder rod 39a is connected with one end of the yarn regulating guide 20A along an alignment direction. When the air cylinder 39 is actuated, the cylinder rod 39a is expanded and contracted in a left-and-right direction, and accordingly, the yarn regulating guide 20A advances and retracts in a left-and-right direction. A position of the yarn regulating guide 20A shown in FIG. 6 is a position when the spun yarn take-up apparatus 1 is in operation. It is to be noted that the holder 31 does not move even if the cylinder rod 39a is expanded or contracted.

[0080] In S3 of processing of stop operation, the controller 50 performs control to cause the yarn regulating guide 20A to start moving from the other side to one side along an alignment direction instead of performing control to cause the cutter 32 and the suctioning unit 35 to start moving from one side to the other side along the alignment direction. More specifically, the cylinder rod 39a is operated in a contracting direction to cause the yarn regulating guide 20A to move from the other side to one side (toward a left side in FIG. 5) along the alignment direction. At this time, the yarn regulating guide 20A is caused to move from the other side to one side along the alignment direction while maintaining the interval along the alignment direction between one yarn Y_n (n is an integer) and another yarn Y(n+1) adjacent to the one yarn Y_n. In other words, the interval between the yarn Y_n and the yarn Y(n+1) along the alignment direction is the same before and after the plurality of yarns Y and the cutter 32 and suctioning unit 35 are caused to move closer to each other. In such a manner, the cutter 32 and suctioning unit 35 are caused to move relative to the plurality of yarns Y.

[0081] The yarn regulating guide 20A is caused to move at a low velocity of, e.g., 20 mm/s from the other side to one side (toward a left side in FIG. 6) along an alignment direction. The moving velocity of the yarn regulating guide 20A from the other side to one side along the alignment direction can be reduced, e.g., by reducing the operating velocity of the cylinder rod 39a operating in a contracting direction.

[0082] For example, all of the intervals between one yarn Y_n (n is an integer) out of the plurality of yarns Y aligned along an alignment direction and another yarn Y(n+1) adjacent to the one yarn Y_n on the other side along the alignment direction are defined as d. The time from when the yarn Y_n is cut to when the yarn Y(n+1) is cut is defined as t, and the moving velocity of the yarn regulating guide 20A moving from the other side to one side along the alignment direction is defined as u. At this time, the yarn regulating guide 20A can move from the other side to one side along the alignment direction at a moving velocity satisfying a relationship of " $u \leq d/t$ ", i.e., a relationship " $u \leq d/5$ " while ensuring the interval d

between the yarn Y_n and the yarn $Y_{(n+1)}$. It is possible therefore to sequentially cut and suction the plurality of yarns Y aligned along the alignment direction one by one.

[0083] Thus, according to the yarn regulating guide 20A and the yarn cutting-suctioning unit 30A according to the first modified embodiment, it is possible to achieve the same effects as those achieved by a present embodiment described above. In other words, since it is possible to sequentially cut and suction the plurality of yarns Y aligned along an alignment direction one by one, it is possible to suppress the occurrence of breakage of the blade portion 33 in a short period of time and the yarn Y cut by the cutter 32 can be reliably suctioned by the suctioning unit 35. Further, the control to stop the godet rollers 4a, 4b is not performed until, e.g., all of the twelve yarns Y (Y_1 to Y_{12}) are cut. A decrease in tension of the uncut yarns Y can therefore be suppressed until all of the twelve yarns Y (Y_1 to Y_{12}) are cut, which is similar to the effects achieved by a present embodiment described above. As a result, all of the yarns Y (Y_1 to Y_{12}) traveling in a yarn traveling direction can be reliably cut.

[0084] Further, according to the yarn regulating guide 20A and the yarn cutting-suctioning unit 30A according to the first modified embodiment, since the yarn Y can be cut in a state where the cutter 32 is fixed without movement, the yarn Y can be cut in a stable state without any influence from the vibration or the like caused by the movement of the cutter 32. Still further, the yarn regulating guide 20A is caused to move while ensuring the interval d between the yarn Y_n (n is an integer) and the yarn $Y_{(n+1)}$. In other words, the above-described interval d is the same when the spun yarn take-up apparatus 1 is in operation (i.e., when spun yarns are produced) and when the operation of the spun yarn take-up apparatus 1 is stopped and the yarns Y are cut and suctioned by the yarn cutting-suctioning unit 30A. As a result, even when the yarn regulating guide 20A is caused to move with respect to the yarn cutting-suctioning unit 30A, it is possible to reliably cut and suction the plurality of yarns Y aligned along an alignment direction one by one.

[0085] Further, the yarn regulating guide 20A and the yarn cutting-suctioning unit 30A according to a first modified embodiment can be extended in the same manner as the extended example in a present embodiment described above.

[0086] Further, in the first modified embodiment described above, it has been explained that when the plurality of yarns Y are cut and suctioned, the yarn regulating guide 20A is caused to move so that the plurality of yarns Y and the yarn cutting-suctioning unit 30A are closer to each other. Means for causing the plurality of yarns Y to move closer to the yarn cutting-suctioning unit 30A is, however, not limited to the yarn regulating guide 20A. Instead of the yarn regulating guide 20A having the plurality of grooves 20Aa arranged in a left-and-right direction corresponding to the plurality of yarns Y , e.g., a guide having one or more hook-shaped grooves through which the plurality of yarns Y are allowed to pass may be pro-

vided. In this case, the plurality of yarns Y aligned along an alignment direction can be cut and suctioned by causing the guide to move from the other side to one side along the alignment direction so that the plurality of yarns Y are hooked at one or more grooves.

[8-2. Second modified embodiment]

[0087] FIG. 7 is a view showing schematically an example of a yarn regulating guide 20A and a yarn cutting-suctioning unit 30B according to a second modified embodiment. The yarn regulating guide 20A has the same configuration as that of the yarn regulating guide 20A according to the first modified embodiment, and a plurality of yarns Y are allowed to pass through the plurality of grooves 20Aa, respectively.

[0088] In the yarn cutting-suctioning unit 30B according to the second modified embodiment, when a plurality of yarns Y are cut and suctioned, the cutter 32 and the suctioning unit 35 are caused to move from one side to the other side along an alignment direction and the yarn regulating guide 20A is caused to move from the other side to one side along the alignment direction. In the yarn cutting-suctioning unit 30B according to the second modified embodiment, the cutter 32 and the suctioning unit 35 are caused to move relative to the plurality of yarns Y in such a manner. In other words, in the second modified embodiment, both the yarn cutting-suctioning unit 30B and the yarn regulating guide 20A are caused to move so that the plurality of yarns Y and the yarn cutting-suctioning unit 30B are closer to each other.

[0089] As shown in FIG. 7, the yarn cutting-suctioning unit 30B includes the air cylinder 37 described with reference to FIG. 2 and FIG. 5 ((A), (B)) in a present embodiment described above and the air cylinder 39 described with reference to FIG. 6 in the first modified embodiment described above.

[0090] Further, in S3 of processing of stop operation, the controller 50 performs control to cause the cutter 32 and the suctioning unit 35 to start moving from one side to the other side along an alignment direction, and performs control to cause the yarn regulating guide 20A to start moving from the other side to one side along the alignment direction. More specifically, the cylinder rod 37a is operated in an expanding direction, and the cylinder rod 39a is operated in a contracting direction. In this manner, the cutter 32 and the suctioning unit can be caused to move relative to the plurality of yarns Y . It is to be noted that the yarn regulating guide 20A is caused to move from the other side to one side along the alignment direction while maintaining the interval along the alignment direction between one yarn Y_n (n is an integer) and another yarn $Y_{(n+1)}$ adjacent to the one yarn Y_n .

[0091] Further, it is preferred that the relative velocity of the cutter 32 and the suctioning unit 35 with respect to the plurality of yarns Y be as low as e.g. 20 mm/s. By reducing both the operating velocity of the cylinder rod 37a operating in an expanding direction and the operat-

ing velocity of the cylinder rod 39a operating in a contracting direction, e.g., the relative velocity of the cutter 32 and the suctioning unit 35 with respect to the plurality of yarns Y can be reduced.

[0092] For example, the intervals between one yarn Y_n (n is an integer) out of the plurality of yarns Y aligned along an alignment direction and another yarn $Y_{(n+1)}$ adjacent to the one yarn Y_n on the other side along the alignment direction are defined as d . Further, the time from when the yarn Y_n is cut to when the yarn $Y_{(n+1)}$ is cut is defined as t , the moving velocity of the cutter 32 and the suctioning unit 35 moving from one side to the other side along the alignment direction is defined as V , and the moving velocity of the yarn regulating guide 20A moving from the other side to one side along the alignment direction is defined as U . At this time, the moving velocity of the cutter 32 and the suctioning unit 35 with respect to the yarn Y is $(V + U)$. At this time, the cutter 32, the suctioning unit 35, and the yarn regulating guide 20A can move at a moving velocity satisfying the relationship of " $V + U \leq d/t$ ", i.e., a relationship of " $V + U \leq d/5$ " (the yarn regulating guide 20A can move while ensuring the interval d between the yarn Y_n and the yarn $Y_{(n+1)}$ in particular). It is therefore possible to sequentially cut and suction the plurality of yarns Y aligned along the alignment direction one by one. Further, the yarn regulating guide 20A moves while ensuring the interval d between the yarn Y_n (n is an integer) and the yarn $Y_{(n+1)}$. In other words, the interval d is the same when the spun yarn take-up apparatus 1 is in operation and when the spun yarn take-up apparatus 1 stops and the yarns Y are cut and suctioned by the yarn cutting-suctioning unit 30B. As a result, even when the yarn regulating guide 20A is caused to move with respect to the yarn cutting-suctioning unit 30B, it is possible to reliably cut and suction the plurality of yarns Y aligned along the alignment direction one by one.

[0093] Thus, according to the yarn regulating guide 20A and the yarn cutting-suctioning unit 30B according to the second modified embodiment, it is possible to achieve the same effects as those achieved by a present embodiment described above. In other words, since it is possible to sequentially cut and suction the plurality of yarns Y aligned along the alignment direction one by one, it is possible to suppress the occurrence of breakage of the blade portion 33 in a short period of time and the yarn Y cut by the cutter 32 can be reliably suctioned by the suctioning unit 35. Further, no control to stop any godet rollers 4a, 4b is performed until, e.g., all of the twelve yarns Y (Y_1 to Y_{12}) are cut. As a result, a decrease in tension of the uncut yarns Y can be suppressed until all of the twelve yarns Y (Y_1 to Y_{12}) are cut, which is similar to the effects achieved by a present embodiment described above and the first modified embodiment described above. As a consequence, all of the yarns Y_1 to Y_{12} traveling in a yarn traveling direction can be reliably cut.

[0094] Furthermore, according to the yarn regulating

guide 20A and the yarn cutting-suctioning unit 30B according to the first modified embodiment, since an amount of movement of the cutter 32 and suctioning unit 35 can be reduced in comparison to that of the cutter 32 and the suctioning unit 35 in the above-described embodiment, the air cylinder 37 can be made compact. Further, since an amount of movement of the yarn regulating guide 20A can be reduced in comparison to that of the yarn regulating guide 20A described in the first modified embodiment, the air cylinder 39 can be made compact. Thus, an amount of movement of the yarn cutting-suctioning unit 30B with respect to a plurality of yarns Y required for cutting and suctioning the plurality of yarns Y can be distributed to an amount of movement of the cutter 32 and the suctioning unit 35 and an amount of movement of the yarn regulating guide 20A. All of the plurality of yarns Y aligned along the alignment direction can therefore be sequentially cut and suctioned one by one while suppressing an increase in size of the peripheral equipment (the air cylinder 37 and the air cylinder 39 in particular) of the yarn cutting-suctioning unit 30B and the entire device.

[0095] Further, the yarn regulating guide 20A and the yarn cutting-suctioning unit 30B according to the second modified embodiment can be extended in the same manner as the extended example in a present embodiment described above.

[0096] In the above-described second modified embodiment, it has been explained that when the plurality of yarns Y are cut and suctioned, both the yarn cutting-suctioning unit 30B and the yarn regulating guide 20A are caused to move so that the plurality of yarns Y and the yarn cutting-suctioning unit 30B are closer to each other. Means for causing the plurality of yarns Y to move closer to the yarn cutting-suctioning unit 30A is, however, not limited to the yarn regulating guide 20A. As described in the first modified embodiment, e.g., instead of the yarn regulating guide 20A having the plurality of grooves 20Aa arranged in a left-and-right direction corresponding to the plurality of yarns Y, e.g., a guide having one or more hook-shaped grooves through which the plurality of yarns Y can be allowed to pass may be provided.

(Reference Numerals)

[0097]

1	Spun yarn take-up apparatus
32	Cutter
30	Yarn cutting-suctioning unit
4a	First godet roller
4b	Second godet roller
50	Controller
Y	Yarn

Claims**1.** A spun yarn take-up apparatus (1) comprising:

a yarn cutting-suctioning unit (30, 30A, 30B) including a cutter (32) for cutting a plurality of yarns (Y) aligned along an alignment direction to travel and a suctioning unit (35) for suctioning a yarn (Y) cut by the cutter (32);
 a roller (4a, 4b) arranged downstream side from the yarn cutting-suctioning unit (30, 30A, 30B) in a yarn traveling direction so as to feed the plurality of yarns (Y) traveling in the yarn traveling direction; and
 a controller (50) configured to perform control to stop the roller (4a, 4b) when a yarn (Y) is cut and suctioned by the yarn cutting-suctioning unit (30, 30A, 30B), wherein
 as a result of causing the plurality of yarns (Y) and the cutter (32) and suctioning unit (35) to be closer to each other, the plurality of yarns (Y) can be sequentially cut and suctioned, and the controller (50) is further configured to perform control not to decelerate rotation of the roller (4a, 4b) even in a case where one of the plurality of yarns (Y) is in a state of being cut, and perform control to stop the roller (4a, 4b) based upon a case where at least a plurality of yarns (Y) are in a state of being cut.

2. The spun yarn take-up apparatus (1) as claimed in claim 1, wherein

the cutter (32) and suctioning unit (35) are caused to move closer to the plurality of yarns (Y) in a state of traveling in the yarn traveling direction.

3. The spun yarn take-up apparatus (1) as claimed in claim 1, wherein

the plurality of yarns (Y) are caused to move closer to the cutter (32) and suctioning unit (35) at rest so that the plurality of yarns (Y) and the cutter (32) and suctioning unit (35) are closer to each other.

4. The spun yarn take-up apparatus (1) as claimed in claim 1, wherein

both the plurality of yarns (Y) and the cutter (32) and suctioning unit (35) are caused to move closer to each other so that the plurality of yarns (Y) and the cutter (32) and suctioning unit (35) are closer to each other.

5. The spun yarn take-up apparatus (1) as claimed in any one of claims 1 to 4, wherein alignment is made such that

an interval between yarns (Y) adjacent to each other of the plurality of yarns (Y) aligned along the alignment direction is the same between:

before causing the plurality of yarns (Y) and the cutter (32) and suctioning unit (35) to be closer to each other; and
 after having caused the plurality of yarns (Y) and the cutter (32) and suctioning unit (35) to be closer to each other.

6. The spun yarn take-up apparatus (1) as claimed in any one of claims 1 to 5, wherein,

when sequentially cutting and suctioning the plurality of yarns (Y),
 at least one of: the plurality of yarns (Y); and the cutter (32) and suctioning unit (35) is caused to move in a relationship of $v \leq 5d$, where d denotes an interval between a first yarn (Y1) of the plurality of yarns (Y) and a second yarn (Y2) adjacent to the first yarn aligned along the alignment direction, and where v denotes a relative velocity of the cutter (32) and suctioning unit (35) with respect to the plurality of yarns (Y),
 so that the plurality of yarns (Y) and the cutter (32) and suctioning unit (35) are closer to each other.

7. The spun yarn take-up apparatus (1) as claimed in any one of claims 1 to 6, wherein

the controller (50) performs control not to decelerate rotation of the roller (4a, 4b) until a case where all of the plurality of yarns (Y) aligned along the alignment direction to travel are in a state of being cut, and performs control to stop the roller (4a, 4b) based upon a case where all of the plurality of yarns (Y) are in a state of being cut.

FIG. 1

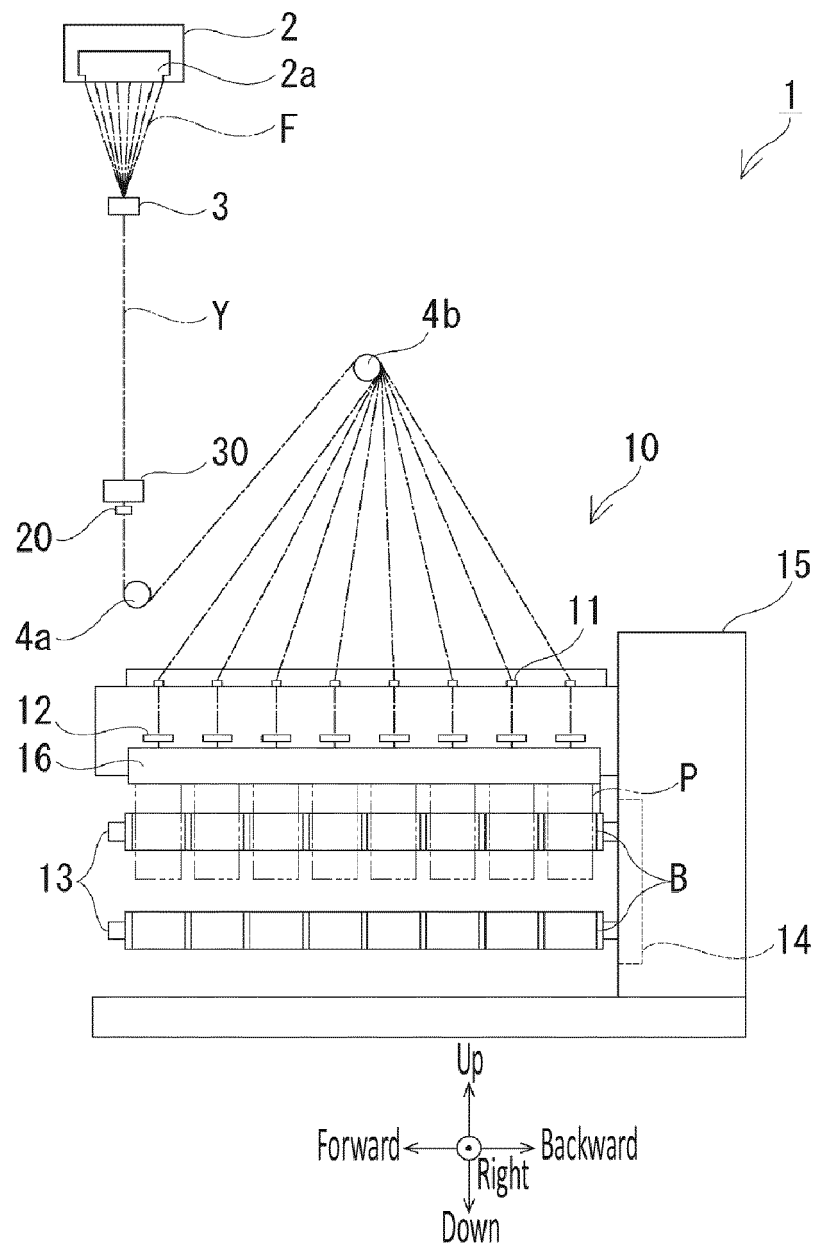


FIG. 2

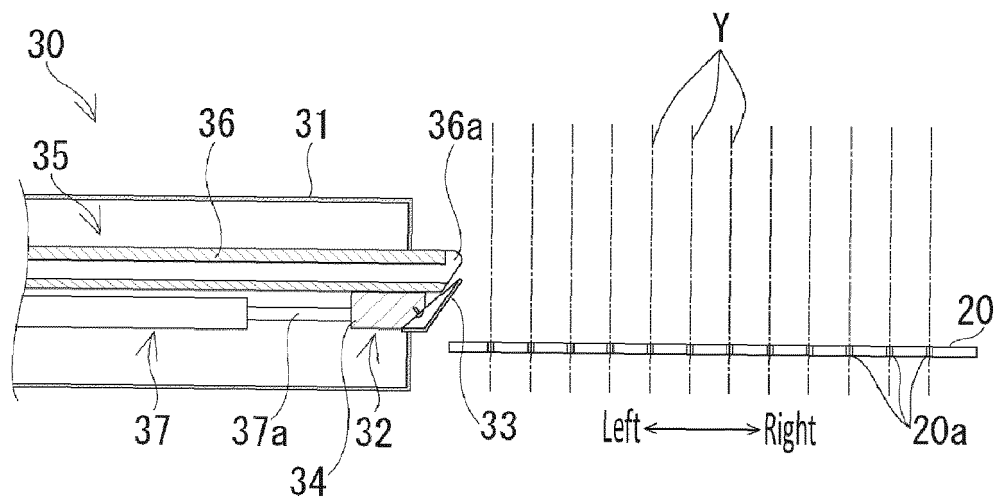


FIG. 3

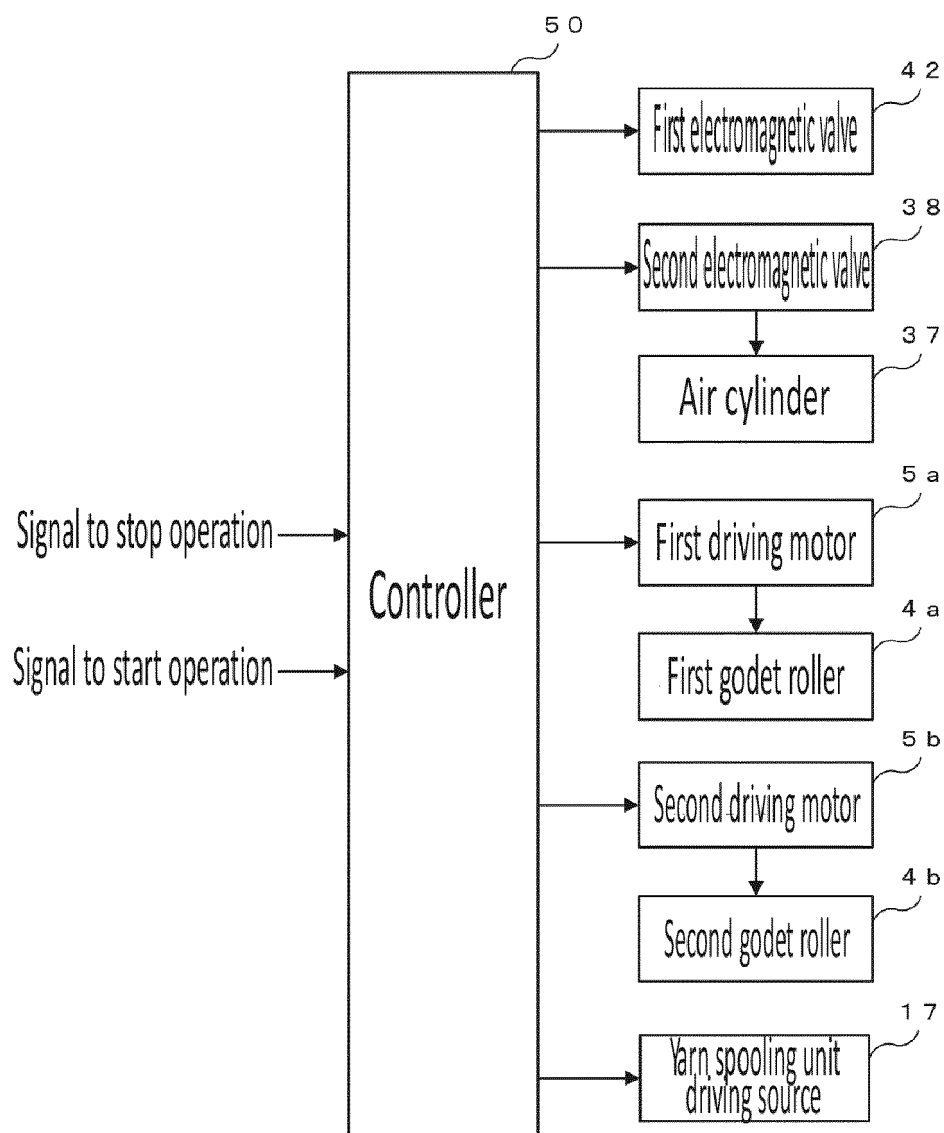


FIG. 4

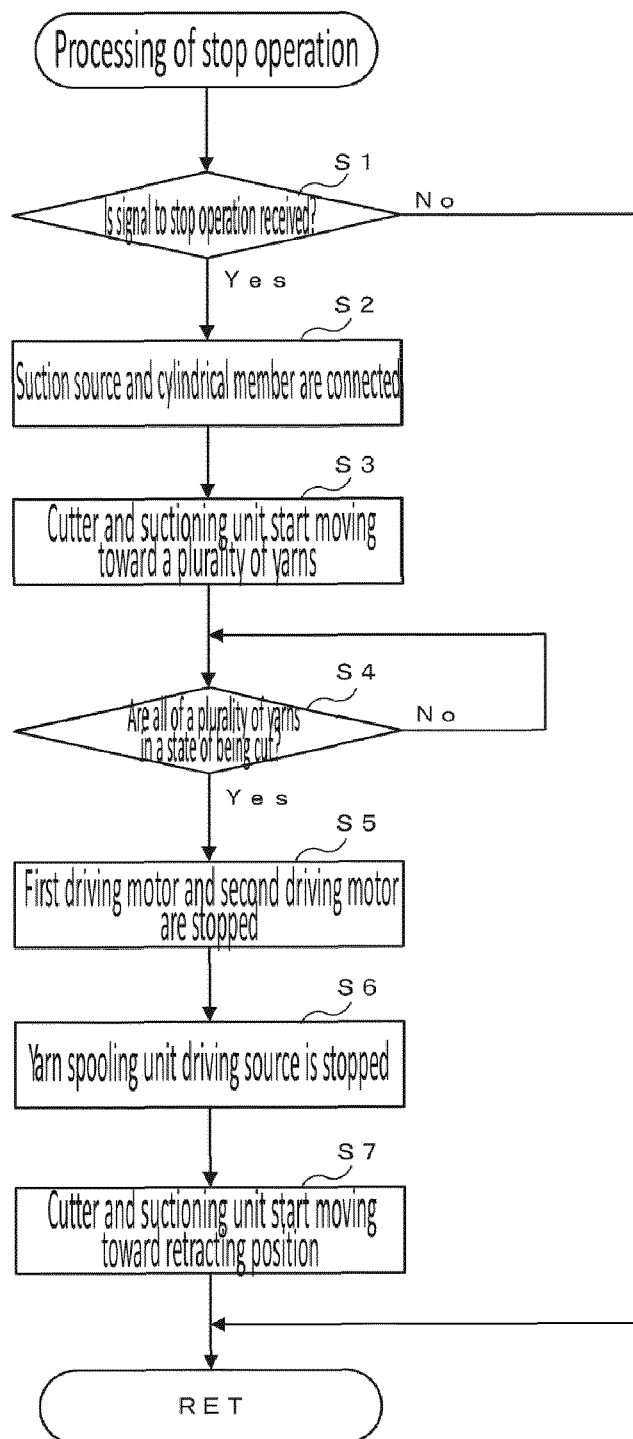


FIG. 5

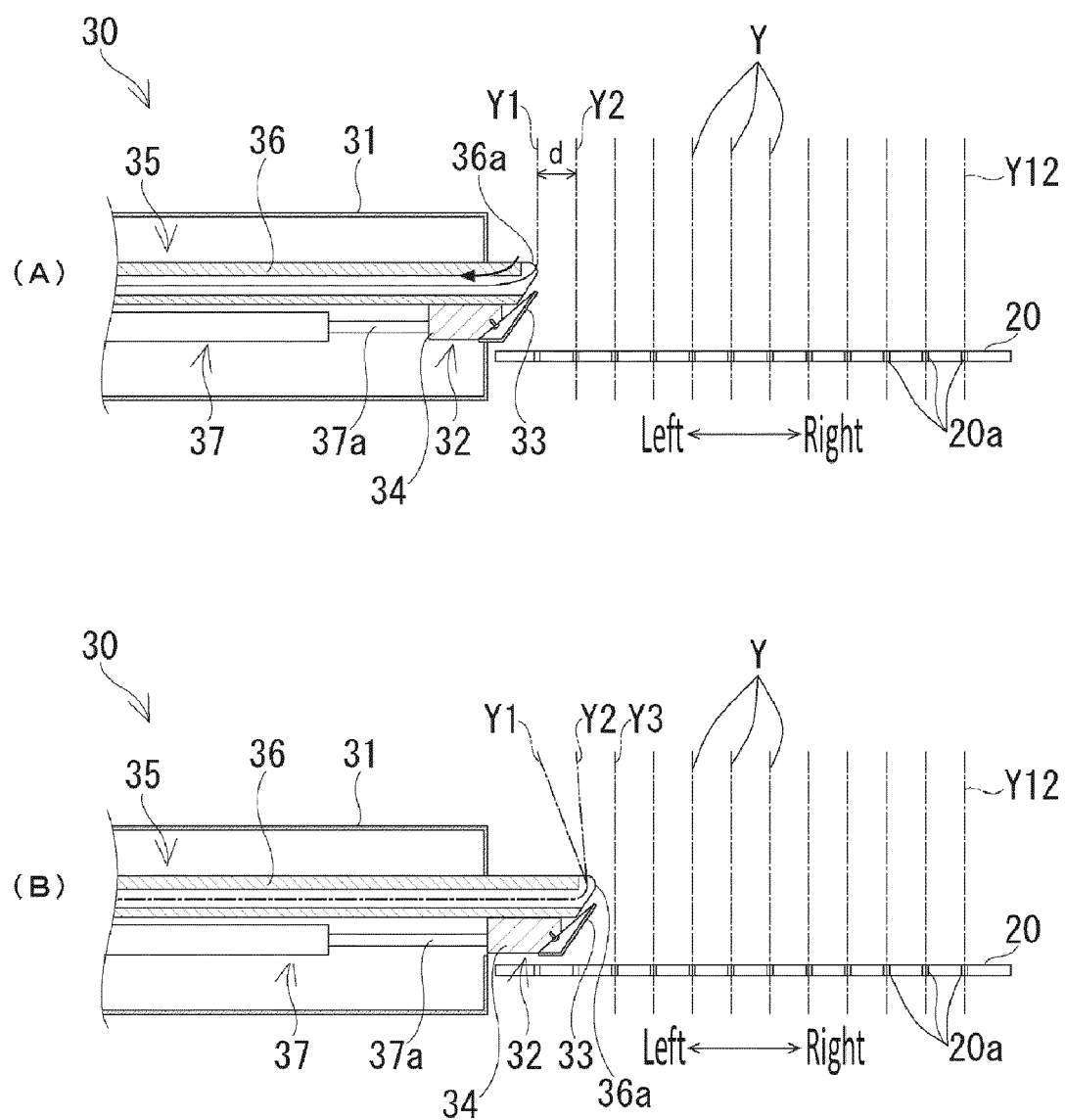


FIG. 6

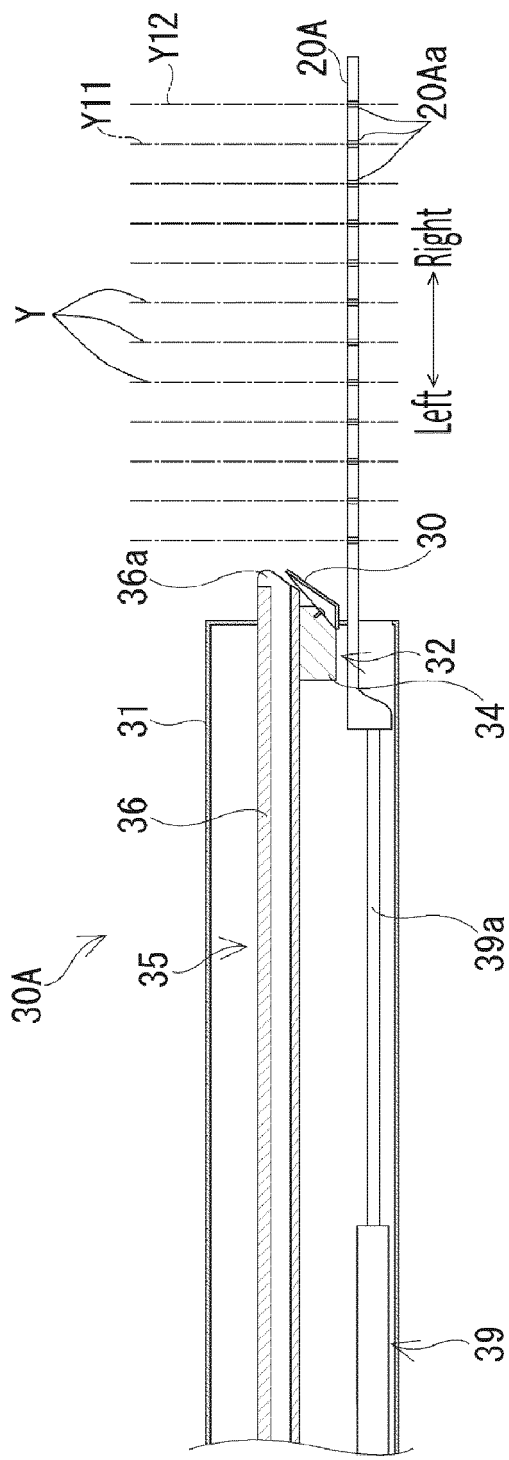
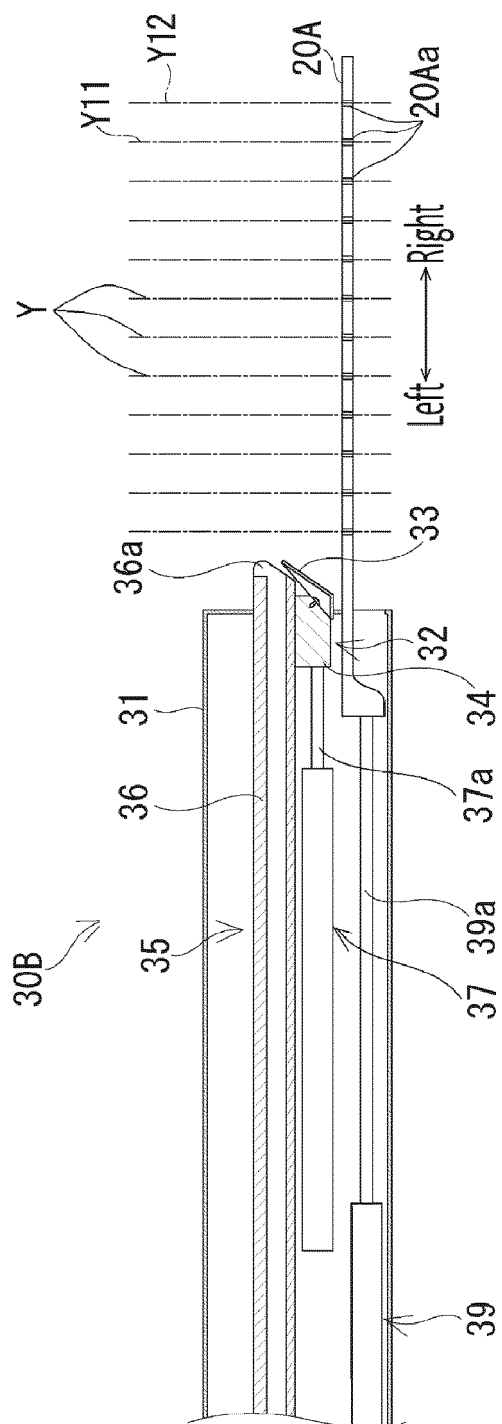


FIG. 7





EUROPEAN SEARCH REPORT

Application Number

EP 23 17 0266

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y,D	JP 2012 180610 A (TMT MACHINERY INC) 20 September 2012 (2012-09-20)	1-5, 7	INV.
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