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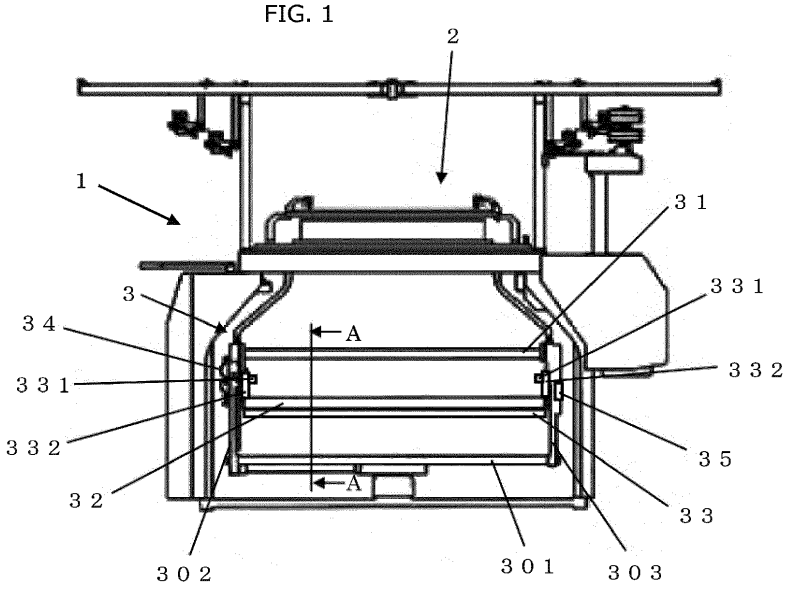
(54) TAKE-UP UNIT FOR CIRCULAR KNITTING MACHINE AND CONTROL METHOD OF DRIVE ROLLER IN THE TAKE-UP UNIT

(57) A take-up unit (3) for a circular knitting machine collects a knitted fabric knitted by a knitting unit of a circular knitting machine, and includes an arm drive device (35) connected to arm rotation shafts (331). The arm drive device (35) is capable of rotating arms (332) with a constant torque selectively in either a forward direction or a backward direction. A drive roller (33) moves toward a take-up roller (32) when the arms (332) are rotated in the forward direction, and the drive roller (33) moves away from the take-up roller (32) when the arms (332) are rotated in the backward direction. The take-up unit (3) further includes a stopper (37) that is provided on a rotational trajectory of the arms (32) and the drive roller (33), and that comes into contact with the arms (32) and the drive roller (33) to stop the rotation thereof.

FIG. 1



EP 4 124 683 A1

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a take-up unit for a circular knitting machine and a control method of a drive roller in the take-up unit which is disposed in the lower part of the circular knitting machine. In the take-up unit, a knitted fabric, attached to a take-up roller, is rolled up thereon and stored by a drive roller placed thereagainst.

2. Description of Related Art

[0002] For a circular knitting machine, it is known that a tubular knitted fabric produced by a knitting unit provided at an upper portion of the knitting machine is taken up and stored by a take-up unit provided below the knitting unit. In general, in the take-up unit, a tension roller pulls down the tubular knitted fabric, and the tubular knitted fabric is rolled upon a take-up roller and thus is collected in the form of a roll. Several types of the take-up units are available, and one of them is known as a take-up unit using transmission of friction from a drive roller. This is a take-up unit that uses an arm swingably attached to the take-up unit, with a drive roller held on one side of the arm and a rotation center shaft provided on the opposite side thereof, and causes the drive roller to be placed against a knitted fabric rolled onto the take-up roller by its own weight.

[0003] This take-up unit is a transmission-type take-up unit that drives a drive roller to rotate with the drive roller placed against a knitted fabric rolled upon a take-up roller, thereby pulling down the knitted fabric in response to the rotation, and rotating the knitted fabric together with the take-up roller, to form a knitted fabric roll and collect it. This take-up unit is also called a friction-type take-up unit since the take-up roller is rotated by the friction of the drive roller. Unlike other types of take-up units, the transmission-type take-up unit does not require a significant change of the torque of the drive roller according to the weight and the size of the knitted fabric roll. Since the transmission-type take-up unit is not significantly affected by the weight and the size of the roll, and can pull down a constant amount of knitted fabric by simply rotating the drive roller by a constant amount, the transmission-type take-up unit is capable of performing stable take up. This can reduce misalignment of the roll ends, and thus a neat roll in a good condition can be easily produced. Examples of such a transmission-type take-up unit include those described in JP 2011-11878A and JP 2007-8599A.

[0004] In each of these transmission-type take-up units, the drive roller is in contact with the take-up roller by its own weight. Accordingly, when the take-up roller is removed in order to unload the knitted fabric roll from the take-up unit, the roll cannot be unloaded unless the drive roller is manually raised and is, for example, retained with a stopper because removal of the take-up roller causes the drive roller to move down with momentum due to the gravity, and causes a damage as a result of colliding against the operator or another member. Also, when the take-up roller is attached to the take-up unit again after the roll has been unloaded, the drive roller needs to be manually moved because the drive roller has a structure in which the drive roller leans on the take-up roller by its own weight, which requires a certain amount of time and effort.

[0005] For a so-called auto doffing take-up unit that, after a knitted fabric has been knitted in a predetermined amount, automatically cuts the knitted fabric by an automatic cutting device, and automatically unloads a knitted fabric roll from the take-up unit and discharges the roll to the outside of a knitting machine, there is also the risk of damage of the drive roller caused by its own weight. To attach the take-up roller again, the drive roller needs to be raised, and the drive roller acts as an impediment.

[0006] In this respect, the take-up unit described in JPS63-309655A retains the drive roller using a retaining projection, thus enabling auto doffing using a transmission-type take-up unit. However, according to JPS63-309655A, the drive roller cannot be retained unless the roll diameter of the knitted fabric is larger than that at the position of the retaining projection. When the knitted fabric roll is unloaded, the drive roller moves down due to its own weight so as to naturally fall down, thus colliding with momentum against the retaining projection. When the retaining projection is removed, the drive roller collides with momentum against the take-up roller. This causes damage or degradation of a member, thus possibly resulting in a decrease in the quality of a knitted fabric that has been taken up.

SUMMARY OF THE INVENTION

[0007] An object of the present invention is to provide a take-up unit for a circular knitting machine and a control method of a drive roller in a take-up unit that can realize a transmission-type take-up unit that eliminates the time and effort to perform manual operations associated with a drive roller in the transmission-type take-up unit, facilitates unloading of a knitted fabric, and has no limitation on the roll diameter and low possibility of damage to components.

[0008] A take-up unit for a circular knitting machine according to the present invention is a take-up unit for a circular knitting machine that collects a knitted fabric knitted by a knitting unit of a circular knitting machine, the take-up unit including: a base provided at a bottom portion of the take-up unit; side members respectively provided on both ends of the base; a take-up roller rotatably provided between the two side members; two arm rotation shafts rotatably connected respectively to opposing surfaces of the two side members; two arms provided so

as to be rotatable parallel to each other about the two arm rotation shafts; a drive roller provided between the two arms so as to be rotationally driven; and a roller drive device that rotationally drives the drive roller, wherein the take-up unit includes an arm drive device connected to the arm rotation shafts, and the arm drive device is capable of driving the arm rotations shaft, and rotating the arms with a constant torque selectively in either a forward direction or a backward direction, the forward direction being a direction in which the drive roller moves toward the take-up roller, and the backward direction being a direction in which the drive roller moves away from the take-up roller, and the take-up unit further includes a stopper that is provided on a rotational trajectory of the arms and the drive roller, and that comes into contact with each of the arms or with the drive roller to stop rotation of the arms and the drive roller.

[0009] With this configuration, rotating the arms and the drive roller in the forward direction by the arm drive device enables the drive roller to come into contact with the take-up roller or a knitted fabric rolled upon the take-up roller without any manual operation. Rotating the arms and the drive roller backward enables the drive roller to move away from the take-up roller or the knitted fabric rolled upon the take-up roller without any manual operation. Accordingly, it is possible to save the time and effort to manually operate the drive roller. Consequently, there is no need to move the drive roller to the near side, and the drive roller will not act as an impediment when the knitted fabric is unloaded. In addition, the positions of the arms and the drive roller can be freely rotated by the arm drive device. Accordingly, the arms are rotated backward with a constant torque when moving the drive roller away from a knitted fabric roll, and the stopper comes into contact with each of the arms or with drive roller after the arms have been rotated by a certain amount, and thus can stop the backward rotation of the arms. At this time, since the rotation is a movement with a constant torque and in a direction opposite to the direction of the gravity, the stopper comes into contact with each of the arms or with the drive roller without any momentum, and therefore there is very little influence on the components. This makes it possible to utilize auto doffing of a transmission-type take-up unit that has no limitation on the roll diameter and low possibility of damage to components.

[0010] Preferably, the arm drive device is capable of changing a set value of the constant torque with which the arm rotation shafts are rotated.

[0011] With this configuration, it is possible to change the setting of the arm drive device to freely change the size of the constant torque applied to the arm rotation shafts. Accordingly, the size of the pressure applied to the knitted fabric by the drive roller can be easily changed without using a component such as a weight. The transmission-type take-up unit has a structure in which the drive roller is pressed against the take-up roller or a knitted fabric by its own weight. Therefore, when the knitting machine is operated at high speed, the take-up unit is also rotated at high speed, which may result in such a situation where the drive roller is lifted up by a centrifugal force to move away from the knitted fabric, and becomes unable to pull down and store the knitted fabric. However, if the pressure is excessively increased, it becomes difficult to manually lift the drive roller. In addition, since a tubular knitted fabric is folded, strong wrinkling occurs at both ends of the knitted fabric. A component serving as a weight is needed to increase the pressure applied to the knitted fabric by the drive roller, and the cost and the attachment/removal operation for the component are required. It is possible to reduce such time, effort, and cost for adjusting the pressure applied to the knitted fabric by the drive roller. Note that the setting can be changed using a setting changing device such as a knob or an operation panel that is directly or indirectly connected to the arm drive device.

[0012] Further preferably, the stopper is a rubber member provided on the rotational trajectory of the arms, and is attached onto at least one of the opposing surfaces of the side members.

[0013] With this configuration, the rubber member and the arms come into contact with each other, and therefore no significant impact will be applied to the arms, and there is no risk of damaging the drive roller. Since the rotation is stopped by a physical contact with the member, the arms will not accidentally rotate farther to come into contact with another member or to damage the knitted fabric.

[0014] Also preferably, wherein the arm drive device is a servo motor provided on at least one of the side members, the servo motor and the corresponding arm rotation shaft are connected to each other via a gear, and switching a direction of rotation of the servo motor enables switching between the forward direction and the backward direction of rotation of the arms accordingly.

[0015] With this configuration, the servo motor causes the arms to rotate by causing the arm rotation shaft to rotate while moving the gear in conjunction therewith. Accordingly, the direction of rotation of the arms, and the size of the torque or the like can be changed by issuing a command to the servo motor.

[0016] Also preferably, a side on which the drive roller is located and a side on which the knitted fabric is unloaded are sides opposite to each other as viewed from the take-up unit.

[0017] When the side on which the drive roller is located and the side on which the knitted fabric is unloaded are on the same side, the operation of unloading the knitted fabric needs to be performed in a state in which the drive roller is in front of the eyes of the operator, and thus the drive roller acts as an impediment. On the other hand, when the side on which the drive roller is located and the side on which the knitted fabric is unloaded are on sides opposite to each other, the drive roller is not in front of the operator, and thus the operation can be easily performed. In addition, a situation where a space through which a knitted fabric passes when the knitted fabric is unloaded is narrowed by the presence of the drive roller

will not occur. This improves the ease of operation, and also is effective when using an auto doffer, for which it is desirable to ensure a space for unloading the knitted fabric by a device for auto doffer. Since the drive roller does not need to be manually operated, the direction in which the knitted fabric rolled upon the take-up roller is unloaded and the direction in which the drive roller is located are made opposite to each other. This makes it possible to ensure a large space for unloading the knitted fabric.

[0018] A control method of a drive roller in a take-up unit for a circular knitting machine according to the present invention is the method including: using the above-described take-up unit, when starting knitting, automatically driving the arm drive device to rotate the arms in the forward direction so as to press the drive roller against the take-up roller or a knitted fabric rolled upon the take-up roller; and, after completion of the knitting, automatically driving the arm drive device to rotate the arms in the backward direction so as to move the drive roller away from the knitted fabric.

[0019] With this configuration, the drive roller does not need to be manually operated, and the time and effort therefor can be eliminated. Since the drive roller does not need to be operated manually, the drive roller can be retained in a direction opposite to the direction in which the knitted fabric is unloaded, and the drive roller will not act as an impediment, thus facilitating unloading of a knitted fabric roll from the take-up unit. Note that the knitted fabric roll is not limited to a knitted fabric roll resulting from pulling out the take-up roller from a knitted fabric, and also includes a knitted fabric that is kept rolled upon the take-up roller. This method can also be used when an auto doffer is used.

[0020] Also preferably, the control method further includes: after predetermined knitting of a knitted fabric has been started and the knitted fabric has been automatically rolled upon the take-up roller, rotating the arms in the forward direction so as to press the drive roller against the knitted fabric; after the predetermined knitting has been completed and a knitting machine has automatically stopped, rotating the arms in the backward direction to move the drive roller away from the knitted fabric; automatically unloading the knitted fabric from the take-up unit; and automatically discharging the knitted fabric to the outside of the circular knitting machine.

[0021] With this configuration, it is possible to perform auto doffing in which substantially all steps are automatically performed. For example, after knitting has been started using a predetermined program, a knitted fabric is automatically rolled upon the take-up roller using a member such as a friction tape or a claw, or air pressure, or a method such as sandwiching the knitted fabric between the divided parts of the take-up roller or holes formed in the take-up roller, without the need for manually rolling the knitted fabric onto the take-up roller. The drive roller is automatically pressed against the knitted fabric, and feeds the knitted fabric. After completion of the knitting, the circular knitting machine stops, the drive roller moves away from the knitted fabric, the knitted fabric is unloaded from the take-up roller or unloaded from the take-up unit together with the take-up roller, and is discharged to the outside of the circular knitting machine, and then the next kitting is started.

[0022] According to the present invention, in a transmission-type take-up unit, arms are rotated by an arm drive device with a set constant torque applied thereto. Thus, the drive roller can be automatically pressed against a take-up roller or a knitted fabric rolled upon the take-up roller without any manual operation, and the drive roller can be automatically moved away from the take-up roller or the knitted fabric rolled upon the take-up roller without any manual operation. Accordingly, the time and effort for manually operating the drive roller are saved, thus facilitating unloading of the knitted fabric. In addition, the arms can be moved by the arm drive device regardless of the roll diameter of the knitted fabric. Furthermore, since the drive roller is moved at a constant speed using a constant torque produced by the arm drive device, the drive roller can be brought into contact with a component to which the drive roller is to come into contact, without a significant impact, and thus has low possibility of causing damage to the component.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023] An embodiment of the present invention will be described with reference to the drawings, in which:

FIG. 1 is a front view of an overall circular knitting machine in which a take-up unit according to Embodiment 1 of the present invention is installed.

FIG. 2 is a cross-sectional view taken along the line A-Ain FIG. 1, showing the position of a drive roller in the take-up unit shown in FIG. 1 when arms are rotated in a forward direction. The hatching of the cross-sectional portion has been omitted.

FIG. 3 is a cross-sectional view taken along the line A-Ain FIG. 1, showing the position of the drive roller in the take-up unit shown in FIG. 1 when the arms are rotated in a backward direction.

FIG. 4 is a side view of a side member to which the arm drive device shown in FIG. 1 is attached.

DETAILED DESCRIPTION OF THE INVENTION

[0024] FIG. 1 is a front view of an overall circular knitting machine in which a take-up unit according to Embodiment 1 is installed. In the present embodiment, a knitted fabric knitted by a knitting unit 2 located at an upper portion of a circular knitting machine 1 is pulled by a tension roller 31 provided at an upper portion of a take-up unit 3, and is then collected by being rolled upon the take-up roller 32. When no knitted fabric is rolled upon the take-up roller 32, a drive roller 33 is in contact with the take-up roller 32. When a knitted fabric is rolled upon

the take-up roller 32, the drive roller 33 is in contact with the knitted fabric. The drive roller 33 is rotated by receiving a drive from a roller drive device 34, feeds the knitted fabric rolled upon the take-up roller 32 by a certain amount by receiving transmitted friction caused by the rotation, and causes the take-up roller 32 to rotate together with the knitted fabric to roll the knitted fabric onto the take-up roller 32, to form a knitted fabric roll 36, thus collecting the knitted fabric. The tension roller 31 and the drive roller 33 are driven by the roller drive device 34 to rotationally drive the rollers. The roller drive device 34 is a servo motor that is separate from an arm drive device 35.

[0025] In the present embodiment, knitting in a general single circular knitting machine is performed by the knitting unit. That is, the knitting unit includes a cylinder in which a plurality of needles are stored. When the cylinder is rotated by receiving a drive using power, the butts of the needles are guided to grooves of a cam attached to a cam holder fixed to an outer circumference of the cylinder so as to oppose the cylinder, whereby the needles move up and down. At this time, yarn is captured by the hooks of the needles while the needles move down, and stitches are formed as a result of the needles moving down in this state. By repeating this operation, a tubular knitted fabric is produced.

[0026] A tubular knitted fabric thus knitted by the knitting unit is guided in the form of a double plane by a general tentering device or the like, and is collected by the take-up unit. The take-up unit includes a base 301 at a bottom portion thereof, and side members 302 and 303 are respectively provided on both ends of the base 301. The take-up roller 32 is rotatably provided between the two side members 302 and 303. Arm rotation shafts 331 are respectively rotatably provided on opposing surfaces of the two side members 302 and 303.

[0027] An arm 332 is connected to each of the arm rotation shafts 331. The arm rotation shafts 331 are each connected to one side in a longitudinal direction of the corresponding arm 332, and the drive roller 33 is provided on the opposite side so as to be rotationally driven. The two arms 332 are capable of rotating parallel to each other about the respective arm rotation shafts 331. The drive roller 33 is connected to the roller drive device 34, and thus the drive roller 33 can be rotationally driven.

[0028] The tension roller 31, the take-up roller 32, and the drive roller 33 are provided parallel and horizontal in the longitudinal direction thereof. One of the arm rotation shafts 331 is connected to the arm drive device 35 via gears 38, and the arm rotation shaft 331 can be rotated by the driving of the arm drive device 35, whereby the arm 332 connected to the arm rotation shaft 331 and the drive roller 33 connected to the arm 332 can also be rotated upward and downward about the arm rotation shaft 331.

[0029] FIG. 2 is a cross-sectional view taken along the line A-Ain FIG. 1, showing the position of the drive roller in the take-up unit shown in FIG. 1, when the arms are rotated in a forward direction. The direction in which the drive roller 33 moves toward the take-up roller 32 is defined as the "forward direction".

[0030] In FIG. 2, the arm rotation shaft 331 is rotated clockwise, as a result of which the arms 332 and the drive roller 33 are also rotated clockwise about the arm rotation shafts 331. Since the arms 332 are rotated with a constant torque by the arm drive device 35, the drive roller 33 is also pressed toward the knitted fabric roll 36 at a constant speed. The drive roller 33 that has been pressed in this manner cannot move any farther, and stays at that position. At this time, the torque transmitted from the arm drive device 35 is still applied to the drive roller 33 in the direction of the knitted fabric, thus firmly holding the knitted fabric. By changing the set value of the arm drive device 35, it is possible to increase the torque to increase the pressure applied to the knitted fabric roll 36. Conversely, it is possible to reduce the torque to reduce the pressure. It is possible to easily perform an adjustment such as increasing the pressure such that the drive roller 33 will not be elevated by a centrifugal force when the knitting machine is required to be rotated at high speed, or reducing the pressure to weaken the fold of both ends of a knitted fabric that has been bent into a double plane from a circular shape. In the present embodiment, this adjustment can be set via an operation panel that is electrically connected to the arm drive device 35. In addition to this method, there are various conceivable methods, including, for example, a method in which a knob is provided outside the knitting machine, and the torque is adjusted by turning the knob.

[0031] FIG. 3 is a cross-sectional view taken along the line A-Ain FIG. 1, showing the position of the drive roller in the take-up unit 3 shown in FIG. 1 when the arms 332 are rotated in a backward direction. A direction in which the drive roller 33 moves away from the take-up roller 32 is referred to as a "backward direction". In FIG. 3, the arm rotation shaft 331 is rotated counterclockwise, and the arms 332 and the drive roller 33 are also rotated counterclockwise about the arm rotation shafts 331.

[0032] In the present embodiment, a hard rubber stopper 37 that stops the rotation of the arm 332 is provided. The stopper 37 is provided so as to abut on a side portion in the longitudinal direction of the arm 332 that is opposite to the drive roller 33 as viewed from the arm rotation shaft 331. The stopper 37 is provided on a surface of one of the side members 303 which faces the other side member 302 at a position that is lower than the position of the arm rotation shaft 331, and which is located in a direction opposite to the direction of the drive roller 33 as viewed from the arm rotation shaft 331. When the arm 332 is rotated in the backward direction and abuts on the stopper 37, the arm 332 cannot move any farther, and thus stays at that position. Since the arm 332 moves at an equal speed and comes into contact with the stopper 37, the impact on the stopper 37 is smaller than that when the arm 332 is accelerated and comes into contact with the stopper 37 with momentum. This increases the serv-

ice life of the stopper 37.

[0033] FIG. 4 is a side view of a side member to which the arm drive device shown in FIG. 1 is attached. In the present embodiment, the arm drive device 35 is a servo motor that is separate from the roller drive device 34, and is not attached to the side member 302 located on a side on which the roller drive device 34 is attached, but is attached to the side member 303 located on the opposite side. The arm drive device 35 is located below the arm rotation shaft 331, and is connected to the arm rotation shaft 331 via several gears 38. In addition, the arm drive device 35 is electrically connected to an operation panel, and a set value such as a torque of the servo motor can be changed via the operation panel. By inputting a predetermined number of rotations according to the requirement for the knitted fabric, and starting the knitting machine, the arm rotation shafts 331 are automatically rotated in the forward direction by the driving of the arm drive device 35, and the arms 332 are also rotated in the forward direction, thus pressing the drive roller 33 against the knitted fabric.

[0034] Then, after the predetermined number of rotations have been completed, the knitting machine stops, and the arms 332 are automatically rotated in the backward direction by the driving of the arm drive device 35, whereby the drive roller 33 moves away from the knitted fabric. Doing so eliminates the need to manually operate the drive roller 33. For this reason, the side on which the drive roller 33 is located and the side on which the knitted fabric is unloaded are positioned opposite to each other as viewed from the take-up unit 3. Since a space for an operator to move to the opposite side of the take-up unit does not exist in a conventional circular knitting machine, the operation on the take-up unit needs to be able to be completed on one side. Therefore, the side on which the drive roller 33 is located and the side on which the knitted fabric is unloaded need to be positioned on the same side. As a result, the presence of the drive roller 33 impedes the operation when unloading the knitted fabric. By positioning the side on which the knitted fabric is unloaded and the side on which the drive roller 33 opposite to each other, the drive roller 33 will not act as an impediment.

[0035] Note that the present invention is not limited to the present embodiment. For example, it is conceivable to apply the present invention to an auto doffing take-up unit that automatically unloads a knitted fabric from a take-up roller, and discharges the knitted fabric to the outside of a circular knitting machine. This enables a fully automatic knitting operation in which substantially all steps such as production, take up, and discharge are performed without human intervention. For example, the take-up roller is automatically divided at an intermediate position in the longitudinal direction, and is pulled out from a knitted fabric from both sides. The knitted fabric is discharged to the outside of the circular knitting machine by a transport device. The take-up roller is installed again, and the knitting machine is rotated. The knitted fabric is automatically rolled upon the take-up roller using a member such as a friction tape or a claw, or air pressure, or a method such as sandwiching the knitted fabric between the divided parts of the take-up roller or holes formed in the take-up roller, without the need for manually rolling the knitted fabric onto the take-up roller. After the knitted fabric has been rolled upon the take-up roller to a certain degree, the drive roller is automatically pressed against the knitted fabric, and the knitted fabric is fed out and stored by the drive roller. After completion of the knitting, the machine stops, and the drive roller automatically moves away from the knitted fabric, and the take-up roller is divided at the intermediate position.

[0036] In addition, it is also conceivable to provide the arm rotation shafts at a position lower than the position of the take-up roller, or provide the drive roller so as to come into contact with a knitted fabric but not with the take-up roller. It is also conceivable to change the component to those having similar functions. For example, the servo motor may be replaced by a motor of a different type, and the hard rubber of the stopper may be replaced by a sensor. Needless to say, the present invention can be applied even when the side on which the drive roller is located and the side on which a knitted fabric is unloaded are on the same side.

List of Reference Numerals

[0037]

1: Circular knitting machine
2: Knitting unit
3: Take-up unit
301: Base
302, 303: Side member
31: Tension roller
32: Take-up roller
33: Drive roller
331: Arm rotation shaft
332: Arm
331: Arm rotation shaft
34: Roller drive device
35: Arm drive device
36: Knitted fabric roll
37: Stopper
38: Gear

Claims

1. A take-up unit (3) for a circular knitting machine that collects a knitted fabric knitted by a knitting unit (2) of a circular knitting machine (1), the take-up unit (3) comprising:

   a base (301) provided at a bottom portion of the take-up unit (3);
   side members (302, 303) respectively provided

on both ends of the base (301);
a take-up roller (32) rotatably provided between the two side members (302, 303);
two arm rotation shafts (331) rotatably connected respectively to opposing surfaces of the two side members (302, 303);
two arms (332) provided so as to be rotatable parallel to each other about the two arm rotation shafts (331);
a drive roller (33) provided between the two arms (332) so as to be rotationally driven; and
a roller drive device (34) that rotationally drives the drive roller (33),
wherein the take-up unit (3) comprises an arm drive device (35) connected to the arm rotation shafts (331), the arm drive device (35) being capable of driving the arm rotations shaft (331), and rotating the arms (332) with a constant torque selectively in either a forward direction or a backward direction, the forward direction being a direction in which the drive roller (33) moves toward the take-up roller (32), and the backward direction being a direction in which the drive roller (33) moves away from the take-up roller (32), and
the take-up unit (3) further comprises a stopper (37) that is provided on a rotational trajectory of the arms (32) and the drive roller (33), and that comes into contact with each of the arms (32) or with the drive roller (33) to stop rotation of the arms (32) and the drive roller (33).

2. The take-up unit according to claim 1,
wherein the arm drive device (35) is capable of changing a set value of the constant torque with which the arm rotation shafts (331) are rotated.

3. The take-up unit according to claim 1 or 2,
wherein the stopper (37) is a rubber member provided on the rotational trajectory of the arms (332), and is attached onto at least one of the opposing surfaces of the side members (302, 303).

4. The take-up unit according to any one of claims 1 to 3,
wherein the arm drive device (35) is a servo motor provided on at least one of the side members (302, 303), the servo motor and the corresponding arm rotation shaft (331) are connected to each other via a gear (38), and switching a direction of rotation of the servo motor enables switching between the forward direction and the backward direction of rotation of the arms (332) accordingly.

5. The take-up unit according to any one of claims 1 to 4,
wherein a side on which the drive roller (33) is located and a side on which the knitted fabric is unloaded are sides opposite to each other as viewed from the take-up unit (3).

6. A control method of a drive roller (32) in a take-up unit for a circular knitting machine, the method comprising:

using the take-up unit according to any one of claims 1 to 5, when starting knitting, automatically driving the arm drive device (35) to rotate the arms (332) in the forward direction so as to press the drive roller (33) against the take-up roller (32) or a knitted fabric rolled upon the take-up roller (32); and,
after completion of the knitting, automatically driving the arm drive device (35) to rotate the arms (332) in the backward direction so as to move the drive roller (32) away from the knitted fabric.

7. The control method according to claim 6, further comprising:

after predetermined knitting of a knitted fabric has been started and the knitted fabric has been automatically rolled upon the take-up roller (32), rotating the arms (332) in the forward direction so as to press the drive roller (33) against the knitted fabric;
after the predetermined knitting has been completed and a knitting machine has automatically stopped, rotating the arms (332) in the backward direction to move the drive roller (33) away from the knitted fabric;
automatically unloading the knitted fabric from the take-up unit (3); and
automatically discharging the knitted fabric to the outside of the circular knitting machine (1).

FIG. 1

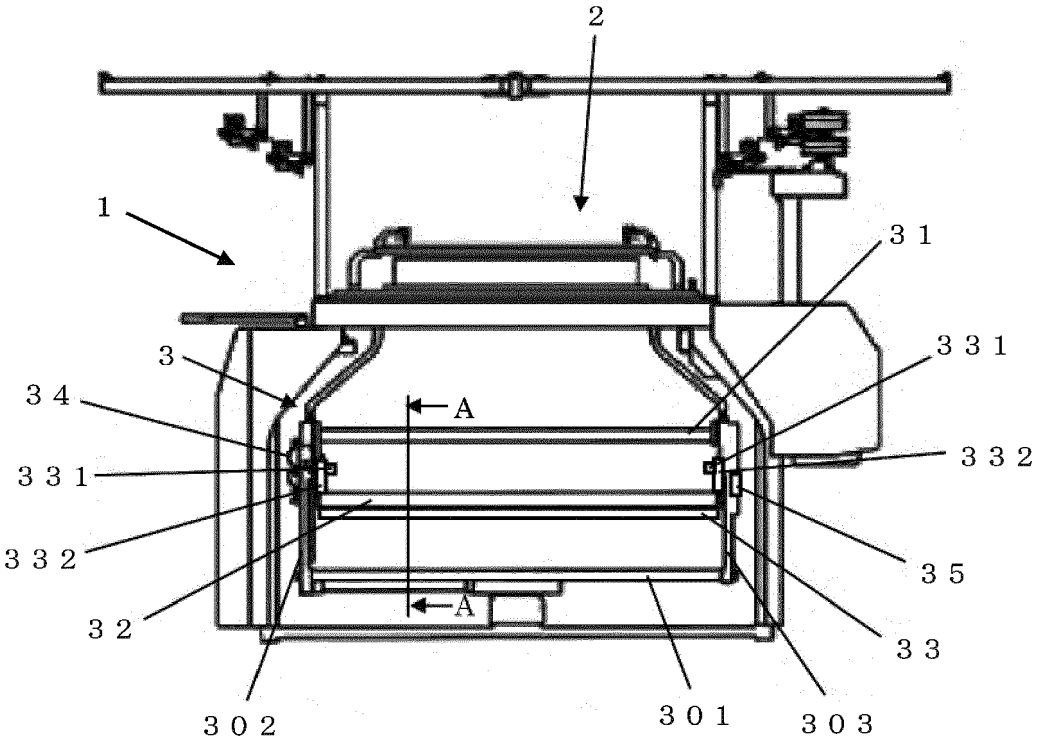

2
1
3 1
3 3 1
3
3 4
A
3 3 1
3 3 2
3 3 2
3 5
3 2
A
3 3
3 0 2
3 0 1
3 0 3

FIG. 2

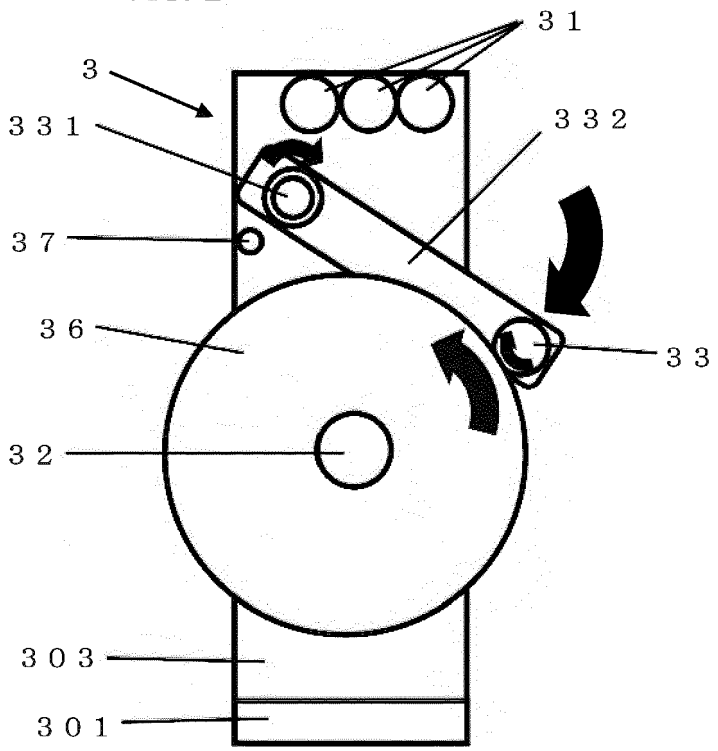

3 1
3
3 3 1
3 3 2
3 7
3 6
3 3
3 2
3 0 3
3 0 1

FIG. 3

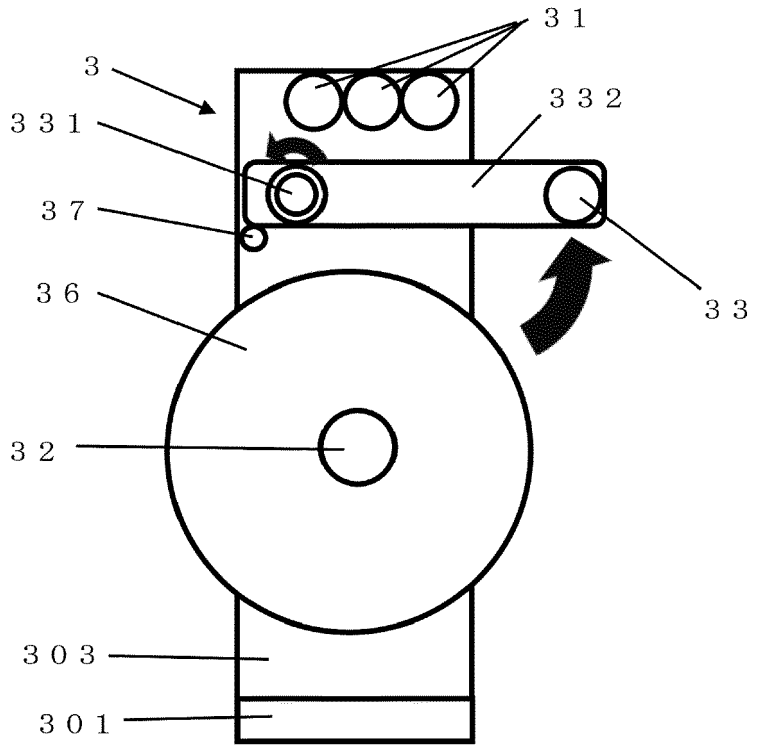
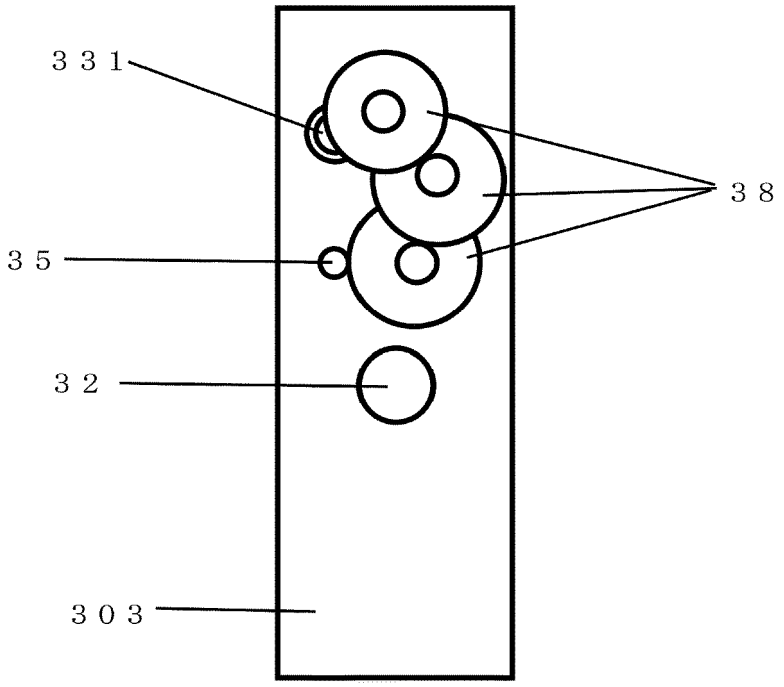


FIG. 4



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EUROPEAN SEARCH REPORT

Application Number
EP 22 18 7400

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	BR PI0 904 217 A2 (PAI LUNG MACHINERY MILL CO LTD [TW]) 17 January 2012 (2012-01-17) * page 8, line 1 - page 9, line 24; figures 1-7D *	1-7	INV. D04B15/88
A	US 6 062 507 A (SUMMEY III SHALA W [US]) 16 May 2000 (2000-05-16) * column 3, lines 43-61; figures 1-4 *	1-7	

TECHNICAL FIELDS SEARCHED (IPC)

D04B
B65H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	14 December 2022	Kirner, Katharina

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BR PI0904217 A2	17-01-2012	NONE	
US 6062507 A	16-05-2000	NONE	

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