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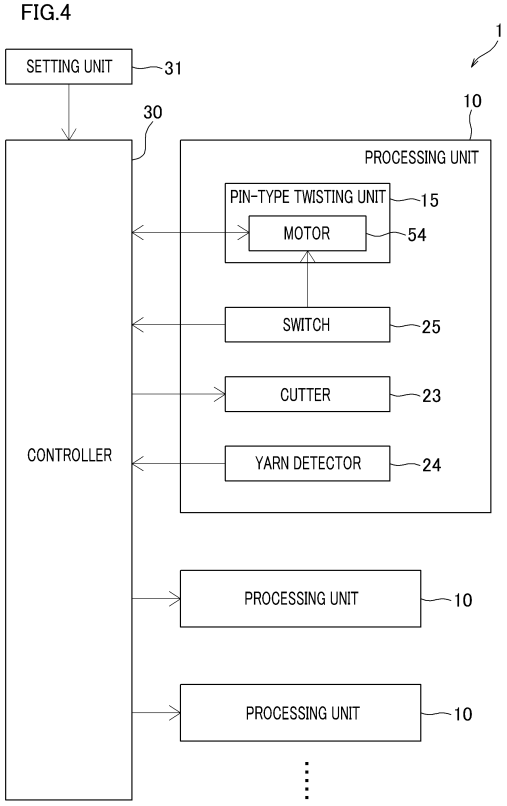
# (54) FALSE TWISTING MACHINE

(57) An object of the present invention is to suppress the detachment of a pin at the time of cutting a yarn during false twisting in a false-twist texturing machine including a pin-type twisting unit.

A false-twist texturing machine 1 includes a pin-type twisting unit 15 configured to twist a yarn Y running inside a rotating pin 41. The false-twist texturing machine 1 further includes an operation unit 25 by which a deceleration operation of decelerating the number of rotations of the pin 41 from a production rotation number which is the number of rotations of the pin 41 at the time of yarn production is performable, and a cutter 23 configured to cut the yarn Y. After the deceleration operation is performed, the cutter 23 cuts the yarn Y when the number of rotations of the pin 41 reaches a predetermined cutting rotation number which is lower than the production rotation number.

FIG.4

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## Description

[Technical Field]

**[0001]** The present invention relates to a false-twist texturing machine including a pin-type twisting unit configured to twist a yarn running inside a rotating pin.

[Background]

**[0002]** For example, each of Patent Literatures 1 and 2 discloses a false-twist texturing machine including a pin-type twisting unit configured to twist a yarn running inside a rotating pin. In such a false-twist texturing machine, when production of the yarn is finished or when there is a defect in running of the yarn, an operator may intentionally cut the yarn. In the false-twist texturing machine, a yarn detector referred to as a feeler is typically provided. When the yarn detector detects the absence of the yarn, a cutter provided on a yarn path automatically works. That is, as the operator detaches the yarn from the yarn detector, the cutter works so as to cut the yarn.

[Citation List]

[Patent Literatures]

**[0003]**

[Patent Literature 1] Japanese Laid-Open Patent Publication No. 2019-157313
[Patent Literature 2] Japanese Laid-Open Patent Publication No. 2019-157314

[Summary of the Invention]

[Technical Problem]

**[0004]** However, when the yarn is cut while yarn production (i.e., false twisting) is being performed in the false-twist texturing machine, the following problem may occur. During the false twisting, the pin rotates at a high speed so that the yarn is twisted many times, i.e., a strong twist is applied to the yarn. Therefore, when the yarn is cut during the yarn production, an end of the yarn tends to be tangled. When passing the pin, this tangle may disadvantageously apply a large force functioning as resistance to the pin so that the pin is detached and lost. Because the pin is expensive, it is desired to avoid losing the pin as much as possible.

**[0005]** In consideration of the above, an object of the present invention is to suppress the detachment of a pin at the time of cutting a yarn during false twisting in a false-twist texturing machine including a pin-type twisting unit.

[Solution to Problem]

**[0006]** The present invention relates to a false-twist texturing machine including a pin-type twisting unit configured to twist a yarn running inside a rotating pin, the false-twist texturing machine comprising: an operation unit by which a deceleration operation of decelerating the number of rotations of the pin from a production rotation number is performable, the production rotation number being the number of rotations of the pin at the time of yarn production; and a cutter configured to cut the yarn. After the deceleration operation is performed, the cutter cuts the yarn when the number of rotations of the pin reaches a predetermined cutting rotation number which is lower than the production rotation number.

**[0007]** According to the present invention, when an operator performs the deceleration operation by means of the operation unit, the cutter cuts the yarn after the pin decelerates to the cutting rotation number. The number of twists of the yarn is therefore low at the time of yarn cutting. As a result, formation of a tangle at an end of the cut yarn is suppressed. This allows the end of the yarn to smoothly pass the pin, and suppresses detachment of the pin at the time of yarn cutting during false twisting.

**[0008]** The present invention is preferably arranged such that the number of rotations of the pin is maintained at the cutting rotation number.

**[0009]** By maintaining the number of rotations of the pin at the cutting rotation number, the yarn is cut while the number of rotations of the pin is at a desired rotation number. It is therefore possible to further reliably suppress the detachment of the pin.

**[0010]** The present invention is preferably arranged such that a yarn detector configured to detect presence of the yarn is provided downstream of the cutter in a yarn running direction. When the yarn detector detects absence of the yarn after the cutter cuts the yarn, the pin starts to decelerate again from the cutting rotation number.

**[0011]** With this arrangement, even when the number of rotations of the pin is temporarily maintained at the cutting rotation number, the deceleration of the pin is automatically started again and the rotation of the pin is automatically stopped.

**[0012]** The present invention is preferably arranged such that a yarn-threading rotation number used at the time of yarn threading to the pin-type twisting unit is set as the number of rotations of the pin, and the cutting rotation number is equal to the yarn-threading rotation number.

**[0013]** When the number of rotations of the pin is too low, the number of twists of the yarn decreases so that the tension of the yarn increases. As a result, the yarn may be unintentionally broken. To solve this problem, the cutting rotation number is arranged to be equal to the yarn-threading rotation number at which the yarn threading is performed without the yarn breakage. It is therefore possible to avoid a case where the yarn breakage occurs before the number of rotations of the pin reaches the cutting rotation number.

**[0014]** The present invention is preferably arranged

such that processing units each of which includes the pin-type twisting unit are aligned, and the operation unit is independently provided for each of the processing units.

**[0015]** With this arrangement, the operator needs to move to a desired processing unit which is a target of the yarn cutting and to operate the operation unit of this processing unit. It is therefore possible to prevent yarn cutting for being erroneously performed from an undesired processing unit.

**[0016]** The present invention is preferably arranged such that processing units each of which includes the pin-type twisting unit are aligned, and the operation unit is shared between the processing units.

**[0017]** With this arrangement, the yarn cutting is performed for any processing unit by using the single operation unit. It is therefore possible to save the operator's labor of moving to each desired processing unit which is a target of the yarn cutting.

[Brief Description of Drawings]

**[0018]**

FIG. 1 is a schematic diagram of the structure of a false-twist texturing machine of an embodiment of the present invention.

FIG. 2 is a schematic diagram of the structure of a pin-type twisting unit.

FIG. 3 shows the pin-type twisting unit viewed in the direction III in FIG. 2.

FIG. 4 is a block diagram of the electrical structure of the false-twist texturing machine.

FIG. 5 is a flowchart of cutting of a yarn.

FIG. 6 is a timing diagram of the yarn cutting.

[Preferred Embodiment of Invention]

**[0019]** The following will describe an embodiment of the present invention with reference to figures.

(Overall Structure of False-Twist Texturing Machine)

**[0020]** FIG. 1 is a schematic diagram of the structure of a false-twist texturing machine 1 of the present embodiment. In the false-twist texturing machine 1, processing units 10 (these units may be referred to spindles) configured to perform false twisting of yarns Y are aligned in a vertical direction to the sheet of FIG. 1 (hereinafter, this direction will be referred to as a base longitudinal direction). Each processing unit 10 includes a yarn supplying part 2 configured to supply a yarn Y, a processing part 3 configured to perform false twisting of the yarn Y supplied from the yarn supplying part 2, and a winding part 4 configured to wind the yarn Y false-twisted by the processing part 3 so as to form a package P.

**[0021]** The yarn supplying part 2 is configured to supply the yarn Y from a yarn supply package Q to the processing part 3. The processing part 3 is configured to false-twist the yarn Y running along a yarn path. In the processing part 3, the following members are provided along the yarn path in this order from the upstream side in a yarn running direction: a first feed roller 11, a twist-stopping guide 12, a first heater 13, a cooler 14, a pin-type twisting unit 15, a second feed roller 16, an interlacing device 17, a third feed roller 18, a second heater 19, and a fourth feed roller 20. The winding part 4 is configured to wind the yarn Y false-twisted by the processing part 3 by means of a winding device 21, so as to form the package P.

**[0022]** The false-twist texturing machine 1 includes a main base 5 and a winding base 6 provided to oppose each other and to be spaced apart from each other in a left-right direction of FIG. 1. The main base 5 and the winding base 6 extend in the base longitudinal direction. An upper part of the main base 5 is connected to an upper part of the winding base 6 by a supporting frame 7. The devices forming the processing part 3 of each processing unit 10 are mainly attached to the main base 5 or the supporting frame 7. The main base 5, the winding base 6, and the supporting frame 7 surround a space that is a working space 8. The yarn Y mainly runs around the working space 8. An operator performs operations such as yarn threading in the working space 8.

(Processing Part)

**[0023]** The first feed roller 11 is configured to send a yarn Y supplied from the yarn supplying part 2, toward the first heater 13. The first feed roller 11 is provided at the upper part of the winding base 6. The first feed roller 11 includes a drive roller and a driven roller, and is configured to send the yarn Y to the downstream side in the yarn running direction. In this regard, the yarn Y is sent while being sandwiched by the drive roller and the driven roller. In regard to the processing units 10, drive rollers are connected to a common drive shaft so that the drive rollers are simultaneously driven. The second feed roller 16, the third feed roller 18, and the fourth feed roller 20 are similarly arranged.

**[0024]** The twist-stopping guide 12 is arranged to prevent the twist of the yarn Y, which is formed by the pin-type twisting unit 15, from being propagated to the upstream side of the twist-stopping guide 12 in the yarn running direction. The twist-stopping guide 12 is provided between the first feed roller 11 and the first heater 13 in the yarn running direction.

**[0025]** The first heater 13 is configured to heat the yarn Y twisted by the pin-type twisting unit 15. The first heater 13 is attached to an upper end portion of the supporting frame 7.

**[0026]** The cooler 14 is configured to cool the yarn Y heated by the first heater 13. The cooler 14 is provided between the first heater 13 and the pin-type twisting unit 15 in the yarn running direction.

**[0027]** The pin-type twisting unit 15 is configured to

twist the yarn Y. The pin-type twisting unit 15 is provided at the upper part of the main base 5. The pin-type twisting unit 15 of each processing unit 10 can be independently driven by a later-described motor 54 (see FIG. 2 and FIG. 4).

**[0028]** The second feed roller 16 is configured to send the yarn Y twisted by the pin-type twisting unit 15, toward the interlacing device 17. The second feed roller 16 is provided below the pin-type twisting unit 15 in the main base 5. The conveyance speed of conveying the yarn Y by the second feed roller 16 is higher than the conveyance speed of conveying the yarn Y by the first feed roller 11. The yarn Y is therefore drawn between the first feed roller 11 and the second feed roller 16.

**[0029]** The interlacing device 17 is configured to interlace the yarn Y by injecting air thereto. The interlacing device 17 is provided below the second feed roller 16 in the main base 5.

**[0030]** The third feed roller 18 is configured to send the yarn Y interlaced by the interlacing device 17, toward the second heater 19. The third feed roller 18 is provided below the interlacing device 17 in the main base 5. The conveyance speed of conveying the yarn Y by the third feed roller 18 is lower than the conveyance speed of conveying the yarn Y by the second feed roller 16. The yarn Y is therefore relaxed between the second feed roller 16 and the third feed roller 18.

**[0031]** The second heater 19 is configured to heat the yarn Y sent from the third feed roller 18. The second heater 19 is provided below the third feed roller 18 in the main base 5.

**[0032]** The fourth feed roller 20 is configured to send the yarn Y thermally treated by the second heater 19, toward the winding device 21. The fourth feed roller 20 is provided at a lower part of the winding base 6. The conveyance speed of conveying the yarn Y by the fourth feed roller 20 is lower than the conveyance speed of conveying the yarn Y by the third feed roller 18. The yarn Y is therefore relaxed between the third feed roller 18 and the fourth feed roller 20.

**[0033]** In the processing part 3 arranged as described above, the yarn Y drawn between the first feed roller 11 and the second feed roller 16 is twisted by the pin-type twisting unit 15. The twist formed by the pin-type twisting unit 15 is propagated to the twist-stopping guide 12, but is not propagated to the upstream side of the twist-stopping guide 12 in the yarn running direction. The yarn Y which is twisted and drawn in this way is heated by the first heater 13. After that, the yarn Y is cooled by the cooler 14 and thermally set. The yarn Y then passes the pin-type twisting unit 15. After that, the yarn Y is unwound before reaching the second feed roller 16. However, the twist of the yarn Y is thermally set as described above. Each filament is therefore maintained to be wavy in shape. Thereafter, interlacing is performed by the interlacing device 17, and the yarn Y thermally set by the second heater 19 is wound by the winding device 21.

**[0034]** In the processing unit 10, a cutter 23 and a yarn detector 24 are also provided on the yarn path. The cutter 23 is provided upstream of the first feed roller 11 in the yarn running direction, and configured to cut the yarn Y. The yarn detector 24 is provided downstream of the fourth feed roller 20 in the yarn running direction, and configured to detect the presence of the yarn Y. In the main base 5, a switch 25 (corresponding to an operation unit of the present invention) is provided to correspond to each processing unit 10. The switch 25 is used for switching the state of a rotating pin 41. The switch 25 of the present embodiment is formed of a button. However, the switch 25 may be formed of a lever, a dial, or the like.

(Pin-Type Twisting Unit)

**[0035]** FIG. 2 is a schematic diagram of the structure of the pin-type twisting unit 15. FIG. 3 shows the pin-type twisting unit 15 in the direction III in FIG. 2. The pin-type twisting unit 15 is configured to twist the yarn Y running inside the pin 41, as the cylindrical pin 41 rotates axially. In FIG. 2, the yarn Y runs downward. FIG. 3 does not show a guide member 52.

**[0036]** The pin-type twisting unit 15 includes two rotational shafts 43 and 44 which are rotatably supported by a supporter 42 via unillustrated bearings. To the rotational shaft 43, two rollers 45 and 46 separated from each other in an axial direction of the pin 41 are attached. To the rotational shaft 44, two rollers 47 and 48 separated from each other in the axial direction are attached. The rollers 45 and 47 are at the same position in the axial direction, and are slightly separated from each other as shown in FIG. 3 so as not to make contact with each other. Both the rollers 46 and 48 are similarly provided at the same position in the axial direction, and are slightly separated from each other so as not to make contact with each other. The rotational shaft 43 is axially and rotationally driven by the motor 54.

**[0037]** The pin 41 is a cylindrical member extending in the axial direction, and the yarn Y runs inside the pin 41. At an intermediate portion of the pin 41 in the axial direction, a magnetic portion 41a is formed to oppose later-described magnets 49 and 50. To one end portion of the pin 41 in the axial direction (i.e., a downstream end portion in the yarn running direction), a wound portion 41b extending in a diameter direction of the pin 41 is internally fixed. The yarn Y is wound once on the wound portion 41b. With this arrangement, the yarn Y is twisted as the pin 41 rotates axially.

**[0038]** The magnet 49 is provided between the roller 45 and the roller 46 in the axial direction. Similarly, the magnet 50 is provided between the roller 47 and the roller 48 in the axial direction. The magnets 49 and 50 are fixed to the supporter 42 via a bracket 51 (see FIG. 3). When the pin 41 is inserted into a gap between the rollers 45 and 47 (46 and 48) so that the magnetic portion 41a of the pin 41 opposes the magnets 49 and 50, the pin 41 is retained by the magnets 49 and 50 as shown in FIG. 3. To be more specific, the magnets 49 and 50 retain the

pin 41 which is sandwiched between the rollers 45 and 47 (46 and 48) and which is in contact with circumferential surfaces of the rollers 45 and 47 (46 and 48). The pin 41 is not mechanically fixed to other members, but is retained by the magnetic force of the magnets 49 and 50 and the friction force with the circumferential surfaces of the rollers 45 to 48.

**[0039]** The ring-shaped guide member 52 is provided upstream of the pin 41 in the yarn running direction. The guide member 52 is fixed to the supporter 42 via an unillustrated bracket. A pipe-shaped guide member 53 is provided downstream of the pin 41 in the yarn running direction. The guide member 53 is fixed directly to the supporter 42. The shape and way of fixation of each of the guide members 52 and 53 are not limited to the above-described shape and way of fixation, and may be suitably changed.

**[0040]** As indicated by arrows in FIG. 3, when the roller 45 is rotated by rotationally driving the rotation shaft 43, the pin 41 in contact with the circumferential surface of the roller 45 is rotationally driven in a direction opposite to the roller 45. Furthermore, the roller 47 in contact with the circumferential surface of the pin 41 is rotationally driven in a direction opposite to the pin 41. As the pin 41 is axially and rotationally driven in this way, the yarn Y is twisted.

(Electrical Structure)

**[0041]** FIG. 4 is a block diagram of the electrical structure of the false-twist texturing machine 1. FIG. 4 shows only one processing unit 10 because of limited space. However, other processing units 10 are also similarly structured. The false-twist texturing machine 1 includes a controller 30 configured to control operations of processing units 10. To the controller 30, a setting unit 31 used by the operator to input control programs and setting values is connected. For example, the setting unit 31 may be formed of a touch panel or a combination of a keyboard and a monitor, etc.

**[0042]** The switch 25 provided for each processing unit 10 is electrically connected to the motor 54 of the pin-type twisting unit 15, and used for switching the state of the rotating pin 41. When the switch 25 is pressed while the pin 41 is stopped, the pin 41 accelerates to a predetermined yarn-threading rotation number and the yarn-threading rotation number is maintained. When the switch 25 is pressed while the pin 41 rotates at the yarn-threading rotation number, the pin 41 accelerates to a production rotation number and the production rotation number is maintained. When the switch 25 is pressed while the pin 41 rotates at the production rotation number, the pin 41 decelerates from the production rotation number and is finally stopped. The yarn-threading rotation number is the number of rotations of the pin 41, which is appropriate for performing the yarn threading to the pin-type twisting unit 15 while yarn breakage is avoided. The production rotation number is the number of rotations of the pin 41 at the time of yarn production (i.e., the false twisting). The yarn-threading rotation number is lower than the production rotation number.

**[0043]** In the present embodiment, when a long-press gesture is performed for the switch 25 while the pin 41 rotates at the production rotation number, the pin 41 decelerates from the production rotation number to a predetermined cutting rotation number and the cutting rotation number is maintained. In other words, the long-press gesture for the switch 25 is equivalent to a deceleration operation of the present invention. The cutting rotation number is the small number of rotations, and the number of twists of the yarn Y processed at the cutting rotation number is low enough to suppress the formation of a tangle at an end of the yarn Y when the tangle is formed when the yarn Y is cut by the cutter 23. However, when the number of rotations of the pin 41 is too low, the number of twists of the yarn Y is excessively low so that the tension of the yarn Y is excessively high. As a result, the yarn breakage may unintentionally occur. The cutting rotation number is therefore set to be high so that, when the number of rotations of the pin 41 changes from the production rotation number to the cutting rotation number, the yarn Y is prevented from being broken. In the present embodiment, the cutting rotation number is arranged to be equal to the yarn-threading rotation number. The production rotation number and cutting rotation number (i.e., yarn-threading rotation number) of the pin 41 are settable through the setting unit 31.

**[0044]** The controller 30 is electrically connected to the motor 54, switch 25, cutter 23, and yarn detector 24 of each processing unit 10. The controller 30 is configured to control operations of the motor 54 and the cutter 23 in accordance with (i) the number of rotations of the motor 54 (i.e., the number of rotations of the pin 41) and (ii) a detection result regarding the presence of the yarn Y by the yarn detector 24. The controller 30 is able to recognize the state of the rotating pin 41 of the pin-type twisting unit 15 by recognizing the state of the switch 25 of each processing unit 10. The state of the rotating pin 41 can be switched not only by using the switch 25 but also by using the controller 30.

(Operation of Yarn Cutting)

**[0045]** The following will describe a flow of an operation at the time when the operator cuts the yarn Y which is being produced at the processing unit 10 in the false-twist texturing machine 1 arranged as described above. FIG. 5 is a flowchart of yarn cutting. FIG. 6 is a timing diagram of the yarn cutting.

**[0046]** When a yarn Y at one processing unit 10 is cut, the operator moves to this processing unit 10 and performs a long-press gesture for the switch 25 of the processing unit 10. When the long-press gesture is performed for the switch 25 while the pin 41 of the pin-type twisting unit 15 rotates at the production rotation number (YES in the step S1: timing T1), the pin 41 starts to de-

celerate (step S2).

**[0047]** Subsequently, after the number of rotations of the pin 41 decelerates to the cutting rotation number (YES in the step S3: timing T2), the controller 30 temporarily stops the deceleration of the pin 41 and causes the number of rotations of the pin 41 to be kept constant at the cutting rotation number (step S4). While the pin 41 rotates at the cutting rotation number, the controller 30 causes the cutter 23 to cut the yarn Y (step S5: timing T3) . As such, because the yarn Y is cut after the pin 41 decelerates to the cutting rotation number, the number of twists of the yarn Y is small at the time of yarn cutting. It is therefore possible to suppress the formation of a tangle at an end of the yarn Y after the yarn cutting. Furthermore, the end of the yarn Y easily and smoothly passes the pin 41.

**[0048]** After the end of the cut yarn Y finishes passing the yarn detector 24, the yarn detector 24 detects the absence of the yarn Y. When the yarn detector 24 has detected the absence of the yarn Y (YES in the step S6: timing T4), the controller 30 starts the deceleration of the pin 41 again (step S7) . The rotation of the pin 41 is finally stopped (timing T5).

(Effects)

**[0049]** In the present embodiment, when the operator performs the deceleration operation by means of the switch 25 (i.e., the operation unit), the cutter 23 cuts the yarn Y after the pin 41 decelerates to the cutting rotation number. The number of twists of the yarn Y is therefore low at the time of yarn cutting. As a result, the formation of a tangle at an end of the cut yarn Y is suppressed. This allows the end of the yarn Y to smoothly pass the pin 41, and to suppress the detachment of the pin 41 at the time of yarn cutting during the false twisting.

**[0050]** In the present embodiment, the number of rotations of the pin 41 is maintained at the cutting rotation number. By maintaining the number of rotations of the pin 41 at the cutting rotation number, the yarn Y is cut while the number of rotations of the pin 41 is at a desired rotation number. It is therefore possible to further reliably suppress the detachment of the pin 41.

**[0051]** In the present embodiment, the yarn detector 24 configured to detect the presence of the yarn Y is provided downstream of the cutter 23 in the yarn running direction. When the yarn detector 24 detects the absence of the yarn Y after the cutter 23 cuts the yarn Y, the pin 41 decelerates from the cutting rotation number again. Because of this, even when the number of rotations of the pin 41 is temporarily maintained at the cutting rotation number, the deceleration of the pin 41 is automatically started again and the rotation of the pin 41 is automatically stopped.

**[0052]** In the present embodiment, as the number of rotations of the pin 41, the yarn-threading rotation number used at the time of yarn threading to the pin-type twisting unit 15 is set. In this regard, the cutting rotation number is equal to the yarn-threading rotation number. When the number of rotations of the pin 41 is too low, the number of twists of the yarn Y decreases so that the tension of the yarn Y increases. As a result, the yarn Y may be unintentionally broken. To solve this problem, the cutting rotation number is arranged to be equal to the yarn-threading rotation number at which the yarn threading is performed without the yarn breakage. It is therefore possible to avoid a case where the yarn breakage occurs before the number of rotations of the pin 41 reaches the cutting rotation number.

**[0053]** In the present embodiment, the processing units 10 each of which includes the pin-type twisting unit 15 are aligned. The switch 25 is independently provided for each processing unit 10. With this arrangement, the operator needs to move to a desired processing unit 10 which is a target of the yarn cutting and to operate the switch 25 of this processing unit 10. It is therefore possible to prevent yarn cutting from being erroneously performed for an undesired processing unit 10.

(Other Embodiments)

**[0054]** The following will describe modifications of the above-described embodiment.

**[0055]** In the embodiment above, a long-press gesture for the switch 25 is equivalent to the deceleration operation of the present invention. However, the specific arrangement of the deceleration operation is not limited to this. For example, the deceleration operation may be to press the switch 25 a predetermined number of times within a predetermined time.

**[0056]** In the embodiment above, when the cutter 23 cuts a yarn Y, the number of rotations of the pin 41 is maintained at the cutting rotation number. However, in the yarn cutting, the number of rotations of the pin 41 may not be maintained at the cutting rotation number. The yarn Y may be cut during the deceleration of the pin 41.

**[0057]** In the embodiment above, when (i) the number of rotations of the pin 41 is maintained at the cutting rotation number and (ii) the yarn detector 24 detects the absence of the yarn Y, the pin 41 starts to decelerate again. However, a way of starting the deceleration of the pin 41 again is not limited to this. For example, the pin 41 may start to decelerate again as the operator operates the switch 25. Alternatively, the controller 30 may be configured to start the deceleration of the pin 41 again when a predetermined time elapses after the number of rotations of the pin 41 reaches the cutting rotation number or after the yarn Y is cut. When the yarn detector 24 is not used for determining when to start the deceleration of the pin 41 again, the yarn detector 24 may be omitted. Alternatively, the yarn detector 24 may not be omitted.

**[0058]** In the embodiment above, the cutting rotation number is arranged to be equal to the yarn-threading rotation number. However, the cutting rotation number may be arranged to be different from the yarn-threading

rotation number.

**[0059]** In the embodiment above, the switch 25 provided for each processing unit 10 functions as the operation unit of the present invention. However, the operation unit of the present invention may be shared between the processing units 10. For example, the setting unit 31 may function as a shared operation unit. In this case, when one processing unit 10 is selected by the setting unit 31 as a target of the yarn cutting, the pin 41 of this processing unit 10 may start to decelerate. Alternatively, it may be structured so that, when some processing units 10 are selected by the setting unit 31 as targets of the yarn cutting, all pins 41 of those processing units 10 start to decelerate. In these cases, the yarn cutting is performed for any processing unit 10 by using the single setting unit 31. It is therefore possible to save the operator's labor of moving to each desired processing unit 10 for cutting a yarn Y. In these cases, an operation of selecting at least one processing unit 10 as a target of the yarn cutting by using the setting unit 31 is equivalent to the deceleration operation of the present invention. When the yarn cutting is performed for some processing units 10, pin-type twisting units 15 of those processing units 10 may be commanded by the controller 30 at the same time or at different times.

[Reference Signs List]

**[0060]**

1 false-twist texturing machine
10 processing unit
15 pin-type twisting unit
23 cutter
24 yarn detector
25 switch (operation unit)
41 pin
Y yarn

**Claims**

**1.** A false-twist texturing machine including a pin-type twisting unit configured to twist a yarn running inside a rotating pin, the false-twist texturing machine comprising:

an operation unit by which a deceleration operation of decelerating the number of rotations of the pin from a production rotation number is performable, the production rotation number being the number of rotations of the pin at the time of yarn production; and
a cutter configured to cut the yarn, and
after the deceleration operation is performed, the cutter cutting the yarn when the number of rotations of the pin reaches a predetermined cutting rotation number which is lower than the production rotation number.

**2.** The false-twist texturing machine according to claim 1, wherein, the number of rotations of the pin is maintained at the cutting rotation number.

**3.** The false-twist texturing machine according to claim 2, wherein, a yarn detector configured to detect presence of the yarn is provided downstream of the cutter in a yarn running direction, and
when the yarn detector detects absence of the yarn after the cutter cuts the yarn, the pin starts to decelerate again from the cutting rotation number.

**4.** The false-twist texturing machine according to any one of claims 1 to 3, wherein, a yarn-threading rotation number used at the time of yarn threading to the pin-type twisting unit is set as the number of rotations of the pin, and
the cutting rotation number is equal to the yarn-threading rotation number.

**5.** The false-twist texturing machine according to any one of claims 1 to 4, wherein, processing units each of which includes the pin-type twisting unit are aligned, and
the operation unit is independently provided for each of the processing units.

**6.** The false-twist texturing machine according to any one of claim 1 to 4, wherein, processing units each of which includes the pin-type twisting unit are aligned, and
the operation unit is shared between the processing units.

FIG.1

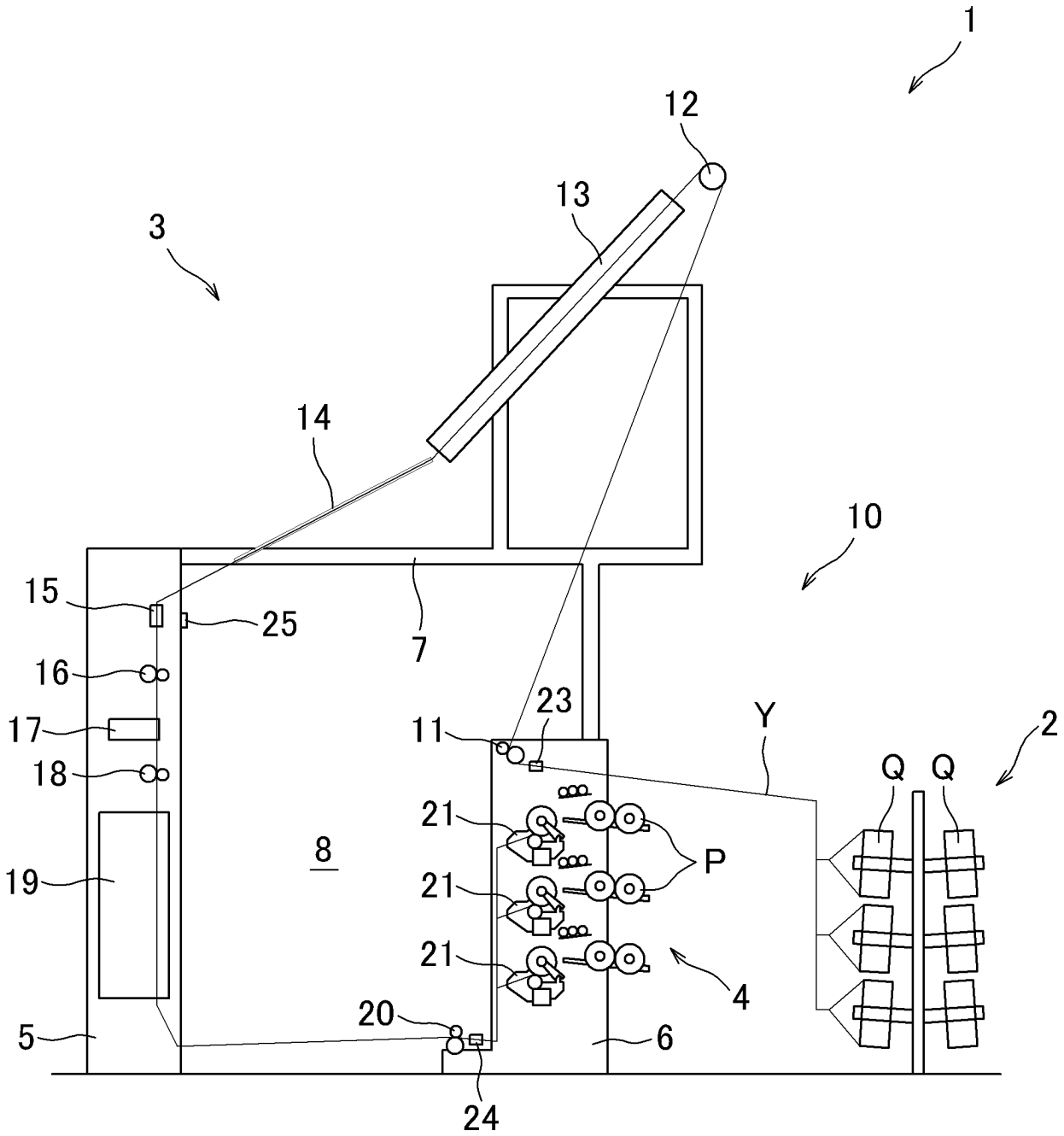


FIG.2

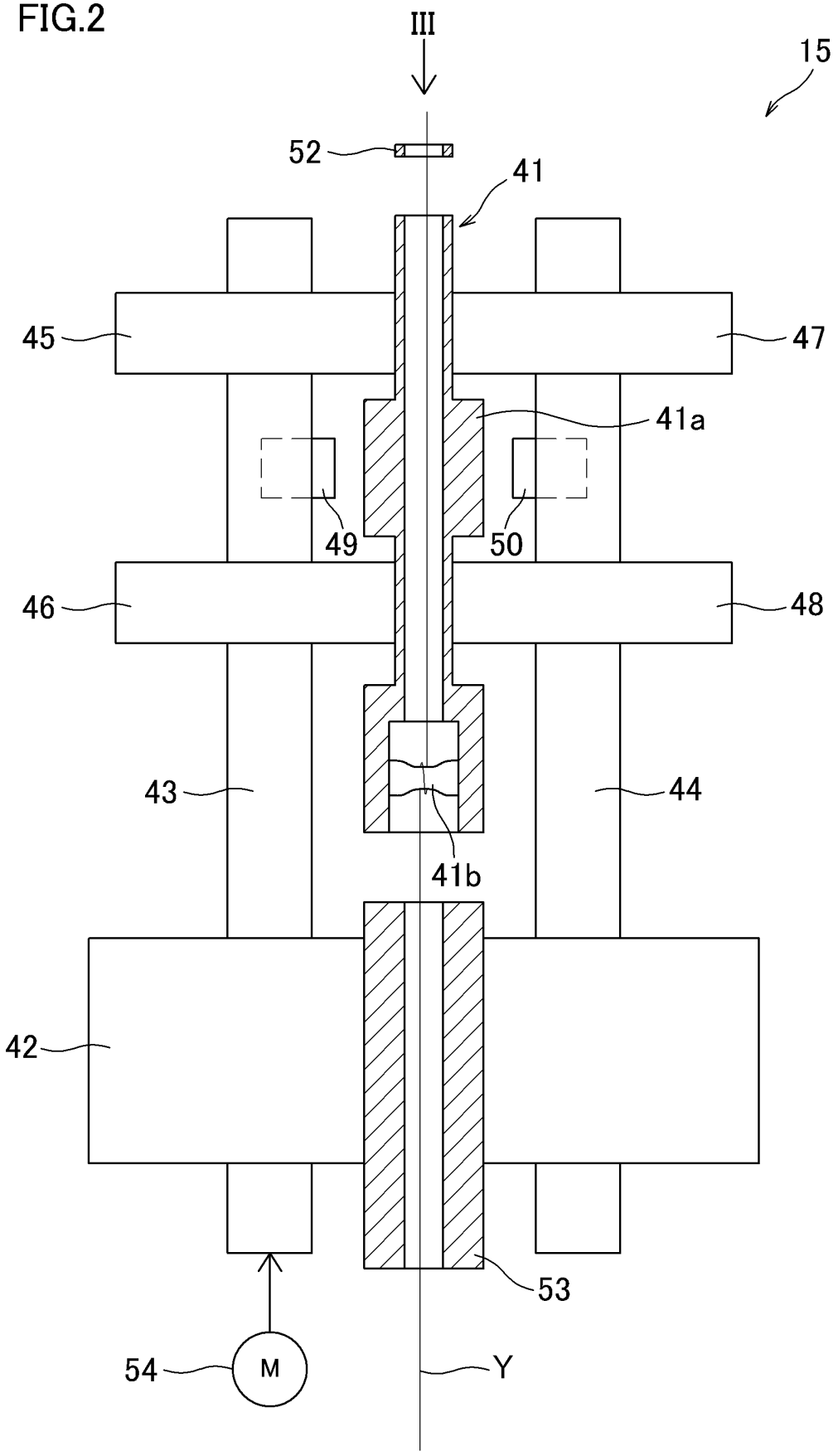


FIG.3

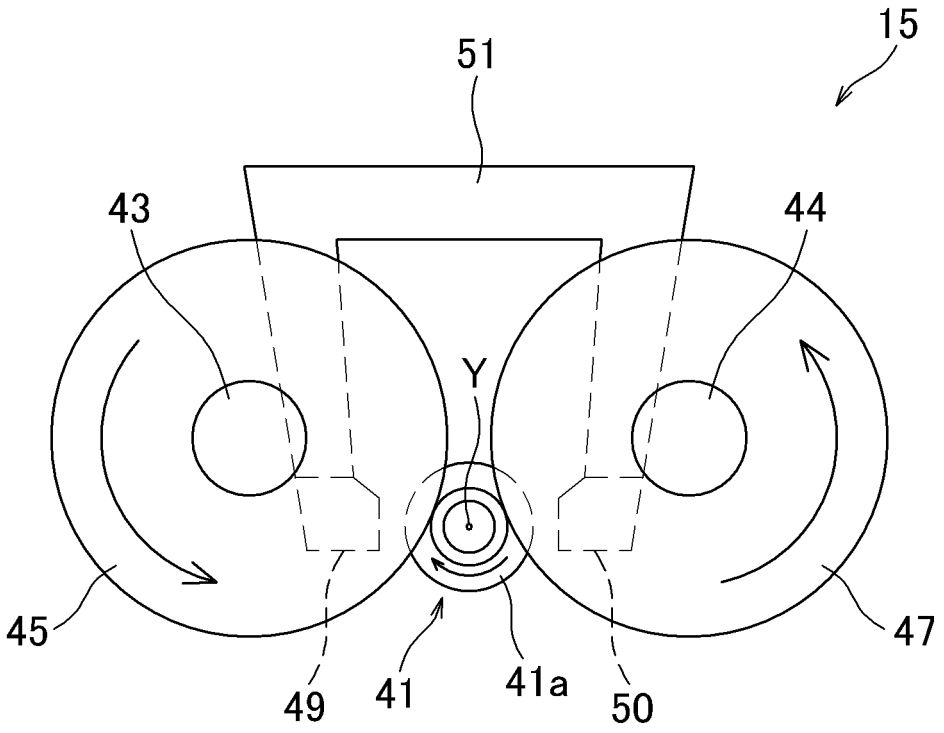


FIG.4

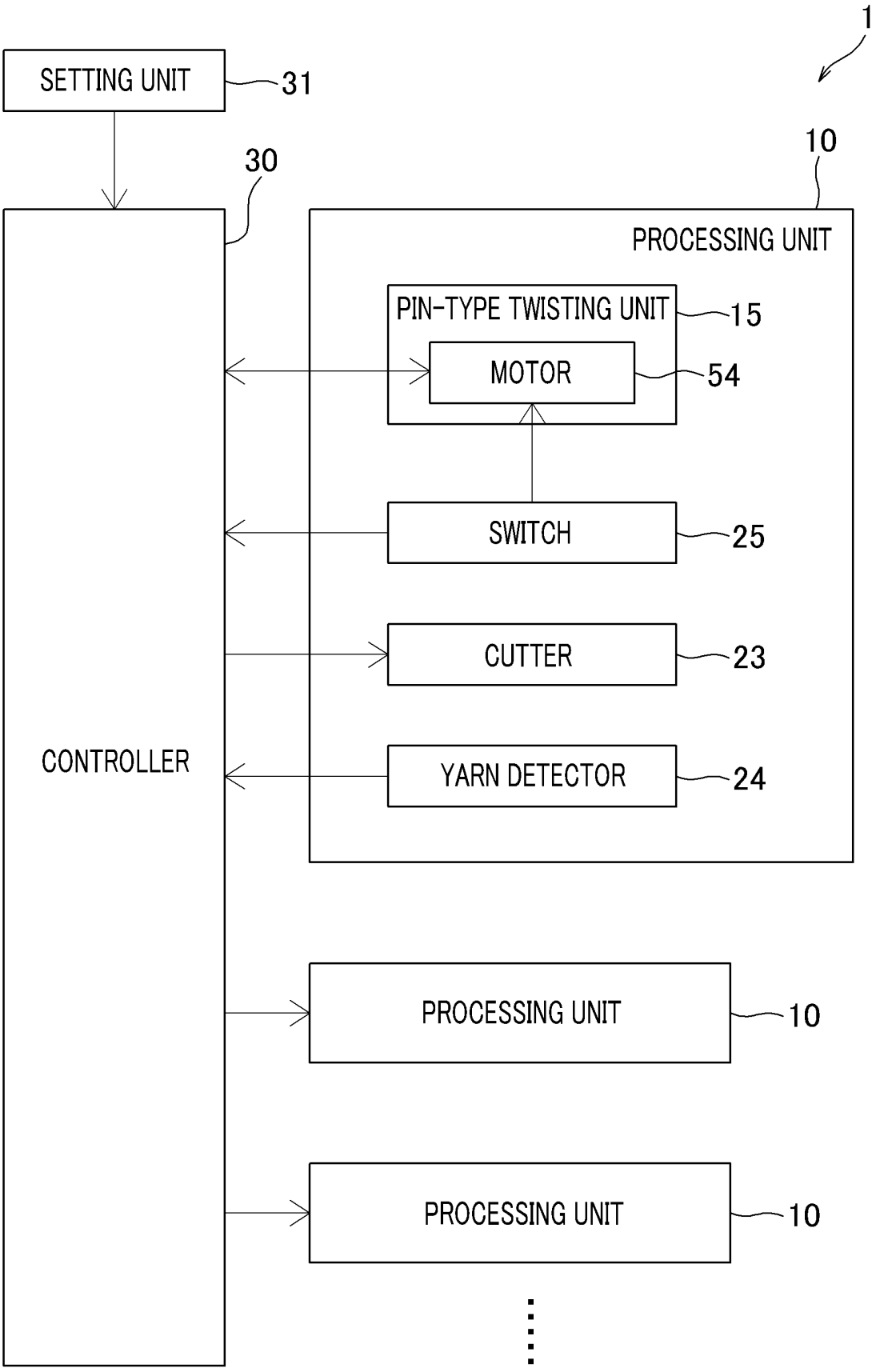

1
SETTING UNIT
31
30
10
PROCESSING UNIT
PIN-TYPE TWISTING UNIT
15
MOTOR
54
SWITCH
25
CUTTER
23
YARN DETECTOR
24
CONTROLLER
PROCESSING UNIT
10
PROCESSING UNIT
10

FIG.5

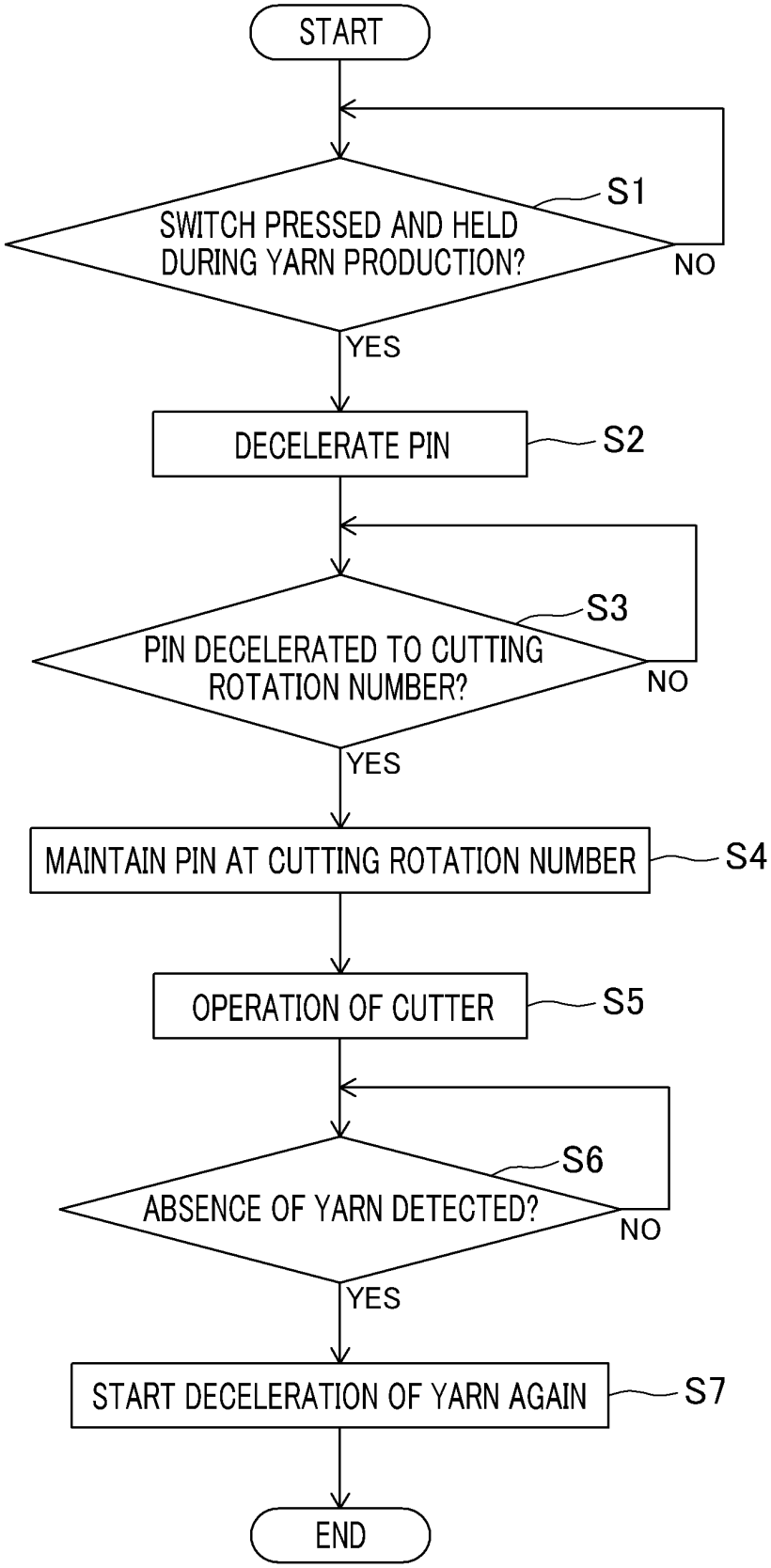
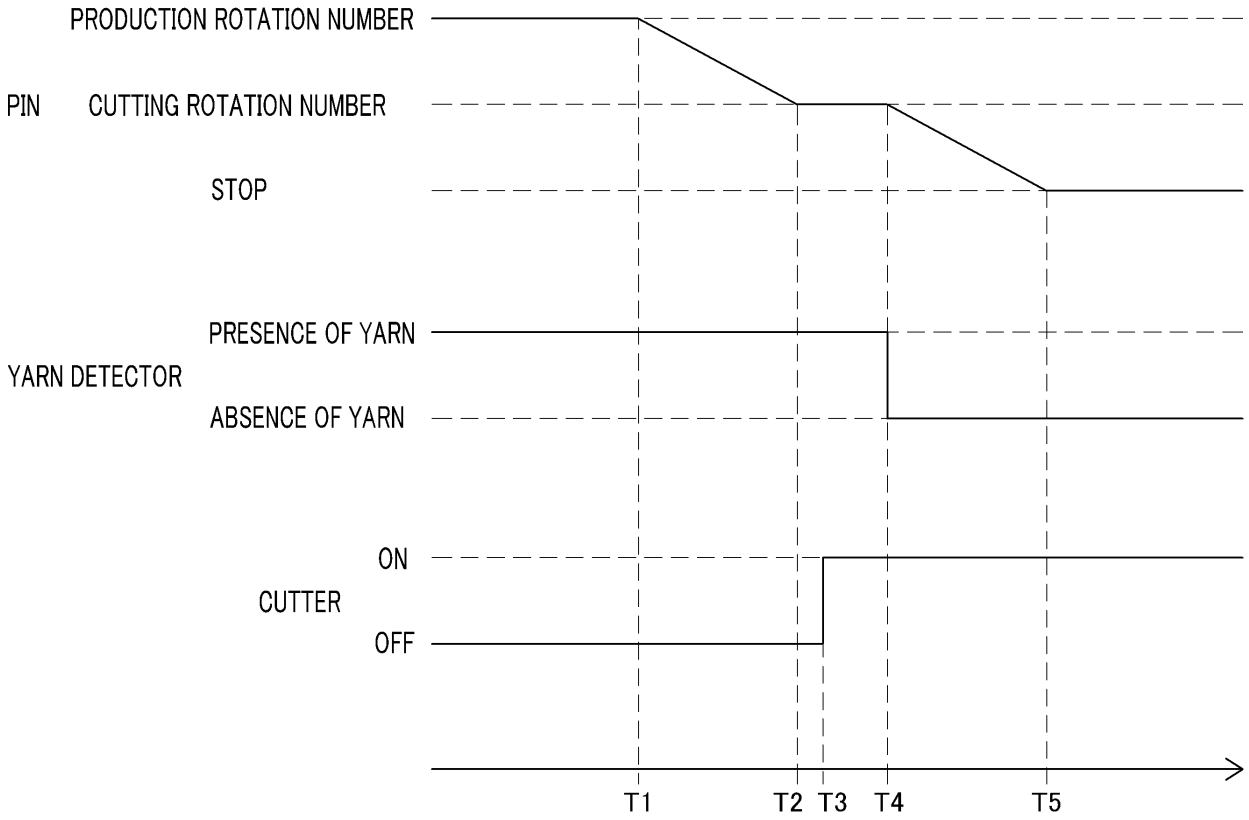

START
SWITCH PRESSED AND HELD DURING YARN PRODUCTION?
S1
NO
YES
DECELERATE PIN
S2
PIN DECELERATED TO CUTTING ROTATION NUMBER?
S3
NO
YES
MAINTAIN PIN AT CUTTING ROTATION NUMBER
S4
OPERATION OF CUTTER
S5
ABSENCE OF YARN DETECTED?
S6
NO
YES
START DECELERATION OF YARN AGAIN
S7
END

FIG.6


PRODUCTION ROTATION NUMBER
PIN
CUTTING ROTATION NUMBER
STOP
PRESENCE OF YARN
YARN DETECTOR
ABSENCE OF YARN
ON
CUTTER
OFF
T1
T2
T3
T4
T5

# INTERNATIONAL SEARCH REPORT

International application No.
**PCT/JP2022/004838**

## A. CLASSIFICATION OF SUBJECT MATTER

***D02G 1/06***(2006.01)i
FI: D02G1/06

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

D02G1/00-3/48

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Published examined utility model applications of Japan 1922-1996
Published unexamined utility model applications of Japan 1971-2022
Registered utility model specifications of Japan 1996-2022
Published registered utility model applications of Japan 1994-2022

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| A | JP 2019-157313 A (TMT MACHINERY INC) 19 September 2019 (2019-09-19)<br>claim 1, paragraph [0046], fig. 1 | 1-6 |
| A | US 3662531 A (JONATHAN LOGAN INC.) 16 May 1972 (1972-05-16)<br>claims 1, 8 | 1-6 |
| A | JP 2019-157314 A (TMT MACHINERY INC) 19 September 2019 (2019-09-19)<br>claims, paragraph [0011] | 1-6 |
| A | JP 47-28352 Y1 (HOTTA TEXTILE INDUSTRY CO LTD) 26 August 1972 (1972-08-26)<br>entire text | 1-6 |

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

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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"&" document member of the same patent family

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| **23 March 2022** | **05 April 2022** |
| Name and mailing address of the ISA/JP<br>**Japan Patent Office (ISA/JP)**<br>**3-4-3 Kasumigaseki, Chiyoda-ku, Tokyo 100-8915**<br>**Japan** | Authorized officer<br><br>Telephone No. |

Form PCT/ISA/210 (second sheet) (January 2015)

**INTERNATIONAL SEARCH REPORT**
**Information on patent family members**

International application No.
**PCT/JP2022/004838**

| Patent document cited in search report | Publication date (day/month/year) | Patent family member(s) | Publication date (day/month/year) |
|---|---|---|---|
| JP 2019-157313 A | 19 September 2019 | EP 3540103 A1<br>claim 1, paragraph [0045], fig. 1<br>CN 110273207 A | |
| US 3662531 A | 16 May 1972 | (Family: none) | |
| JP 2019-157314 A | 19 September 2019 | EP 3540104 A1<br>claims, paragraph [0010]<br>CN 110273206 A | |
| JP 47-28352 Y1 | 26 August 1972 | (Family: none) | |

Form PCT/ISA/210 (patent family annex) (January 2015)

## REFERENCES CITED IN THE DESCRIPTION

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### Patent documents cited in the description


- JP 2019157313 A **[0003]**
- JP 2019157314 A **[0003]**