(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 995 612 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
11.05.2022 Bulletin 2022/19

(21) Application number: **21201150.6**

(22) Date of filing: **06.10.2021**

(51) International Patent Classification (IPC):
D02G 1/02 *(2006.01)* ***D02G 1/06*** *(2006.01)*
D02G 1/08 *(2006.01)* ***D02G 1/20*** *(2006.01)*
B65H 54/22 *(2006.01)* ***B65H 61/00*** *(2006.01)*
B65H 63/00 *(2006.01)* ***B65H 51/30*** *(2006.01)*
B65H 63/036 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
D02G 1/0213; B65H 51/30; B65H 63/00; D02G 1/0266; D02G 1/0273; D02G 1/06; D02G 1/082; D02G 1/20

(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 MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **04.11.2020 JP 2020184200**

(71) Applicant: **TMT Machinery, Inc.**
Osaka-shi, Osaka 541-0041 (JP)

(72) Inventors:
- **Demizu, Yoshimitsu**
Kyoto-shi, Kyoto, 612-8686 (JP)
- **Hirose, Taishi**
Kyoto-shi, Kyoto, 612-8686 (JP)

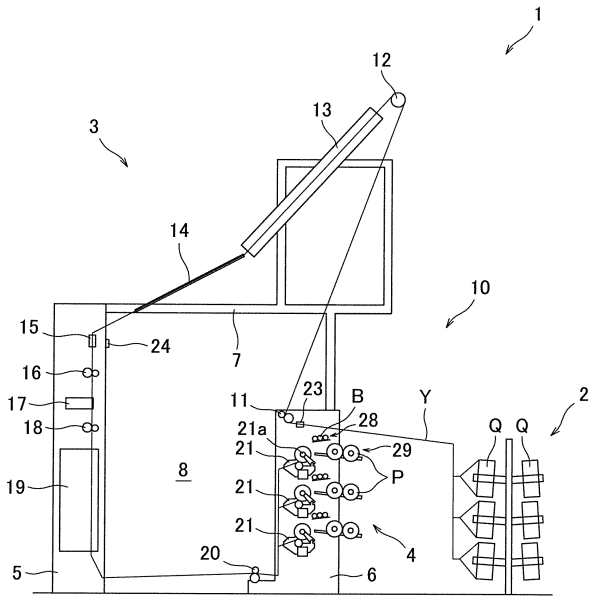
(74) Representative: **Hoffmann Eitle**
Patent- und Rechtsanwälte PartmbB
Arabellastraße 30
81925 München (DE)

(54) DRAW TEXTURING MACHINE

(57) An object of the present invention is to save time required for resumption of operation and to suppress occurrence of yarn breakage, in a draw texturing machine in which a pin-type twisting unit of each processing unit can be independently driven.

In a draw texturing machine 1, processing units 10 are aligned. The processing units 10 respectively include pin-type twisting units 15. The pin-type twisting units 15 are configured to respectively twist yarns Y running in rotating pins, and are able to be independently driven. The draw texturing machine 1 includes a control unit 30 which controls operations of the processing units 10. The control unit 30 is configured not to cut each of the yarns Y running in the processing units 10 at the time of operation stop of the processing units 10, and able to execute a simultaneous drive mode in which, at the time of resumption of operations of the processing units 10, the pin-type twisting units 15 of all of the processing units 10 are simultaneously driven.

FIG.1



EP 3 995 612 A1

Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a draw texturing machine in which processing units including pin-type twisting units are aligned.

[0002] In a draw texturing machine, processing units (these units may be referred to as spindles) including twisting units are aligned. For example, a pin-type twisting unit configured to twist a yarn running in the rotating pin has been known as these twisting units. In the draw texturing machine including the pin-type twisting unit, traditionally, a drive shaft of the pin-type twisting unit of each processing unit is placed onto a common tangential belt. As the tangential belt is rotated, pin-type twisting units of all processing units are simultaneously driven. Because of this arrangement, when yarn breakage occurs in one processing unit and rotation of the tangential belt is stopped, the pin-type twisting units of all processing units are simultaneously stopped. Therefore, a processing unit where yarn breakage occurs requires an operator to manually detach the drive shaft of the pin-type twisting unit of this processing unit from the tangential belt.

[0003] In order to reduce the above-described burden on the operator in case of occurrence of the yarn breakage in the draw texturing machine, for example, Patent Literature 1 (Japanese Laid-Open Patent Publication No. 2019-157314) describes that a pin-type twisting unit of each processing unit is independently driven by a motor. In addition to that, control is performed so that a pin-type twisting unit of a processing unit automatically stops when the processing unit detects occurrence of the yarn breakage.

SUMMARY OF THE INVENTION

[0004] The following describes yarn threading in a draw texturing machine in which a pin-type twisting unit of each processing unit is independently driven as that of Patent Literature 1. In the yarn threading, while feed rollers of each processing unit, etc., are in operation, an operator threads a yarn to processing units one by one in order. The operator activates a pin-type twisting unit of one processing unit by, e.g., switch operation as soon as the operator finishes the yarn threading to the pin-type twisting unit of the processing unit. If the pin-type twisting unit is not immediately activated, a yarn which is not twisted runs in the pin to increase the running resistance in the pin. As a result, yarn breakage tends to occur.

[0005] Typically, when operation of the draw texturing machine is stopped because of maintenance or a long holiday, a yarn of each processing unit is cut and the yarn threading is performed again for resumption of the operation. However, the yarn threading described above takes long time. Therefore, when the operation of the draw texturing machine is stopped in a short time for, e.g., electric work or a lot change, the yarn of each processing unit may not be cut but be stopped in order to omit the yarn threading at the resumption of the operation. When each processing unit is operated again while the yarn remains in the unit, feed rollers, etc., are driven. However, each pin-type twisting unit for which the switch operation, etc. is not performed by the operator remains stopped. As a result, the yarn starts to run while the pin of the pin-type twisting unit is not rotated, and the yarn breakage may occur.

[0006] In consideration of the above, an object of the present invention is to save time required for resumption of operation and to suppress occurrence of yarn breakage, in a draw texturing machine in which a pin-type twisting unit of each processing unit can be independently driven.

[Solution to Problem]

[0007] The present invention relates to a draw texturing machine in which processing units are aligned, the processing units respectively including pin-type twisting units, the pin-type twisting units being configured to respectively twist yarns running in rotating pins and being able to be independently driven, the draw texturing machine comprising: a control unit which controls operations of the processing units, and the control unit being configured not to cut each of the yarns running in the processing units at the time of operation stop of the processing units and being able to execute a simultaneous drive mode in which, at the time of resumption of operations of the processing units, the pin-type twisting units of all of the processing units are simultaneously driven.

[0008] In the present invention, when the simultaneous drive mode is executed, the operation of each of the processing units is stopped without cutting each yarn. Because of this, yarn threading at the time of resumption of the operations is omitted. In addition to that, the pin-type twisting units of all of the processing units are simultaneously activated when the operations are resumed, and each pin of the pin-type twisting units starts to rotate as each yarn starts to run. Because of this, the yarn breakage is suppressed. According to the present invention, it is therefore possible to save time required for resuming the operations and to suppress occurrence of the yarn breakage.

[0009] In the present invention, when the operations are resumed in the simultaneous drive mode, the control unit may increase the number of rotations of each of the pins to a low rotation number which is lower than a production rotation number.

[0010] When the number of rotations of each pin is instantly increased to the production rotation number, the tension of each yarn is temporarily high or each yarn is relaxed and deviated from a yarn path, with the result that the yarn breakage may occur. In this regard, when the simultaneous drive mode is executed, the occurrence of the yarn breakage is suppressed by accelerating each pin not to a production rotation number but to a low ro-

tation number as described above.

[0011] In the present invention, each of the processing units may have an operation unit configured to increase the number of rotations of each of the pins from the low rotation number to the production rotation number.

[0012] Provision of such an operation unit allows the pins of all of the processing units to accelerate to the production rotation number one by one in order, after an operator finishes checking of whether there are problems such as the yarn breakage and the deviation of each yarn from the yarn path in each of the processing units in which the pin rotates at the low rotation number.

[0013] In the present invention, an operation unit may be provided for simultaneously operating the pins of all of the processing units so that the number of rotations of each of the pins is increased from the low rotation number to the production rotation number.

[0014] Provision of such an operation unit allows the pins of all of the processing units to simultaneously accelerate to the production rotation number, only by operating the operation unit once after the operator finishes checking of whether there are problems such as the yarn breakage and the deviation of each yarn from the yarn path in each of the processing units in which the pin rotates at the low rotation number.

[0015] In the present invention, each of the processing units may include a winding device which is configured to wind each of the yarns twisted by the respective pin-type twisting units onto a bobbin so as to form a package and which is able to perform replacement for replacing the package with a new bobbin, and when the operations are resumed in the simultaneous drive mode, the control unit may cause the winding device to perform the replacement after the number of rotations of each of the pins reaches the production rotation number.

[0016] When the operation of each of the processing units is stopped, each yarn is false-twisted while each pin decelerates from the production rotation number. In addition to that, when the operation of each of the processing units is resumed, each yarn is false-twisted while each pin accelerates to the production rotation number. As such, when each yarn is false-twisted while the number of rotations of each pin is lower than the production rotation number, the yarn may be a defective yarn which does not have a predetermined quality. Therefore, such a yarn is preferably discarded as much as possible. In this regard, by performing the replacement as described above after the number of rotations of each pin reaches the production rotation number, the inclusion of a defective yarn in the package which is formed after the replacement is avoided, while the inclusion of a defective yarn in the package which is formed before the replacement may not be avoided.

[0017] In the present invention, the control unit may cause the winding device to perform the replacement after the number of rotations of each of the pins reaches the production rotation number and then a predetermined time elapses.

[0018] As such, because a predetermined time is waited for after the number of rotations of each pin reaches the production rotation number, the replacement is performed after the number of rotations of each pin becomes stable. As a result, the inclusion of a defective yarn in the package which is formed after the replacement is further reliably avoided.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019]

FIG. 1 is a schematic diagram illustrating the structure of a draw texturing machine of an embodiment of the present invention.

FIG. 2 is a schematic diagram illustrating 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 illustrating the electric structure of the draw texturing machine.

FIG. 5 is a flowchart of executing a simultaneous drive mode.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0020] The following will describe an embodiment of the present invention with reference to figures.

(Overall Structure of Draw Texturing Machine)

[0021] FIG. 1 is a schematic diagram illustrating the structure of a draw texturing machine 1 of an embodiment of the present invention. In the draw texturing machine 1, processing units 10 (these units may be referred to spindles) configured to false-twist yarns Y are aligned in a direction perpendicular to the plane of FIG. 1 (hereinafter, this direction is referred to as a base longitudinal direction). Each processing unit 10 includes a yarn supplying unit 2 configured to supply a yarn Y, a processing part 3 configured to false-twist the yarn Y supplied from the yarn supplying unit 2, and a winding unit 4 configured to wind the yarn Y false-twisted by the processing part 3 so as to form a package P.

[0022] The yarn supplying unit 2 supplies the yarn Y to the processing part 3. The processing part 3 false-twists 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 in a yarn running direction: first feed rollers 11, a twist-stopping guide 12, a first heater 13, a cooling apparatus 14, a pin-type twisting unit 15, second feed rollers 16, an interlacing device 17, third feed rollers 18, a second heater 19, and fourth feed rollers 20. The winding unit 4 winds, by using a winding device 21, the yarn Y false-twisted by the processing part 3, so as to form the package P.

[0023] The draw texturing machine 1 includes a main base 5 and a winding base 6 which are provided to op-

pose 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 are provided to extend in the base longitudinal direction. An upper part of the main base 5 and an upper part of the winding base 6 are connected with each other by a supporting frame 7. The apparatuses constituting the processing part 3 of each processing unit 10 are mainly attached to the main base 5 and the supporting frame 7. The main base 5 and the winding base 6 and the supporting frame 7 surround a space, and the space 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)

[0024] The first feed rollers 11 are rollers for sending a yarn Y supplied from the yarn supplying unit 2, toward the first heater 13. The first feed rollers 11 are placed at the upper part of the winding base 6. The first feed rollers 11 include a drive roller and a driven roller. The yarn Y is sent to the downstream side in the yarn running direction while being sandwiched by the drive roller and the driven roller. The driven rollers in each processing unit 10 are connected to a common drive shaft, and are simultaneously driven. The second feed rollers 16, the third feed rollers 18, and the fourth feed rollers 20 are similarly arranged.

[0025] The twist-stopping guide 12 prevents twist of the yarn Y formed by the pin-type twisting unit 15 from being propagated to the upstream in the yarn running direction of the twist-stopping guide 12. The twist-stopping guide 12 is provided between the first feed rollers 11 and the first heater 13 in the yarn running direction.

[0026] 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.

[0027] 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.

[0028] 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).

[0029] The second feed rollers 16 are rollers for sending the yarn Y twisted by the pin-type twisting unit 15 toward the interlacing device 17. The second feed rollers 16 are 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 rollers 16 is higher than the conveyance speed of conveying the yarn Y by the first feed rollers 11. The yarn Y is therefore drawn between the first feed rollers 11 and the second feed rollers 16.

[0030] 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 rollers 16 in the main base 5.

[0031] The third feed rollers 18 are rollers for sending the yarn Y interlaced by the interlacing device 17 toward the second heater 19. The third feed rollers 18 are provided below the interlacing device 17 in the main base 5. The conveyance speed of conveying the yarn Y by the third feed rollers 18 is lower than the conveyance speed of conveying the yarn Y by the second feed rollers 16. The yarn Y is therefore relaxed between the second feed rollers 16 and the third feed rollers 18.

[0032] The second heater 19 is configured to heat the yarn Y supplied from the third feed rollers 18. The second heater 19 is provided below the third feed rollers 18 in the main base 5.

[0033] The fourth feed rollers 20 are rollers for sending the yarn Y thermally treated by the second heater 19 toward the winding device 21. The fourth feed rollers 20 are provided at a lower part of the winding base 6. The conveyance speed of conveying the yarn Y by the fourth feed rollers 20 is lower than the conveyance speed of conveying the yarn Y by the third feed rollers 18. The yarn Y is therefore relaxed between the third feed rollers 18 and the fourth feed rollers 20.

[0034] In the processing part 3 arranged as described above, the yarn Y drawn between the first feed rollers 11 and the second feed rollers 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 in the yarn running direction of the twist-stopping guide 12. The yarn Y drawn and twisted in this way is heated by the first heater 13, and is then cooled by the cooler 14 and thermally set. The yarn Y having passed the pin-type twisting unit 15 is unwound before the yarn Y reaches the second feed rollers 16. The twist of each yarn Y, however, is thermally fixed as described above. Each of the filaments therefore maintains a wavy false-twisted state. 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.

[0035] A cutter 23 configured to cut the yarn Y is provided upstream in the yarn running direction of the first feed rollers 11. A drive switch 24 (corresponding to an operation unit of the present invention) is provided to correspond to each processing unit 10, in the main base 5. The drive switch 24 is a switch for switching the operation of the motor 54 of the pin-type twisting unit 15, i.e., the state of a rotating pin 41.

(Winding Unit)

[0036] The winding device 21 is configured to wind the yarn Y twisted by the pin-type twisting unit 15 onto the bobbin B attached to a winding axis 21a, so as to form the package P. A bobbin storage unit 28 configured to store a new bobbin B and a package storage unit 29

configured to temporarily store the package P are provided in the vicinity of the winding device 21. The winding device 21 can perform replacement by detaching the package P from the winding axis 21a, moving the package P to the package storage unit 29, receiving the new bobbin B from the bobbin storage unit 28, and attaching the new bobbin B to the winding axis 21a.

(Pin-Type Twisting Unit)

[0037] FIG. 2 is a schematic diagram 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 in the pin 41 as the cylindrical pin 41 rotates about the axis. In FIG. 2, the yarn Y runs upward from below. FIG. 3 does not show a guide member 52.

[0038] The pin-type twisting unit 15 includes two rotational shafts 43 and 44 which are rotatably supported by a supporter 42 via unillustrated bearings. Two rollers 45 and 46 separated from each other in the axial direction are attached to the rotational shaft 43. Two rollers 47 and 48 separated from each other in the axial direction are attached to the rotational shaft 44. The roller 45 and the roller 47 are at the same position in the axial direction, and are slightly separated from each other so as not to be in contact with each other, as shown in FIG. 3. Similarly, both of the rollers 46 and 48 are provided at the same position in the axial direction, and are slightly spaced apart from each other not to make contact with each other. The rotational shaft 43 is rotationally driven about the axis by the motor 54.

[0039] The pin 41 is a cylindrical member extending in the axial direction. The yarn Y runs in the pin 41. At an intermediate portion in the axial direction of the pin 41, a magnetic portion 41a is formed to oppose later-described magnets 49 and 50. At one end portion (downstream end portion in the yarn running direction) in the axial direction of the pin 41, a wound portion 41b is internally fixed to extend in the radial direction. The yarn Y is wound once on the wound portion 41b. With this arrangement, as the pin 41 rotates about the axis, the yarn Y is twisted.

[0040] 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) . As the pin 41 is inserted into the 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 pin 41 is retained by the magnets 49 and 50 while the pin 41 is sandwiched between the rollers 45 and 47 (46 and 48) and is in contact with the circumferential surfaces of the rollers 45 and 47 (46 and 48). The pin 41 is not mechanically fixed to another member, and is retained by the magnet forces of the magnets 49 and 50 and the friction force with the circumferential surfaces of the rollers 45 to 48.

[0041] A ring-shaped guide member 52 is provided upstream in the yarn running direction of the pin 41. The guide member 52 is fixed to the supporter 42 via an unillustrated bracket. A pipe-shaped guide member 53 is provided downstream in the yarn running direction of the pin 41. The guide member 53 is directly fixed to the supporter 42. The shape and way of fixation of each of the guide members 52 and 53 are not limited to those described above, and may be suitably changed.

[0042] 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 the direction opposite to the roller 45. Furthermore, the roller 47 in contact with the circumferential surface of the pin 41 is rotationally driven in the opposite direction to the pin 41. In this way, as the pin 41 is rotationally driven about the axis, the yarn Y is twisted.

[0043] Each time the drive switch 24 provided in each processing unit 10 is pressed, the state of the rotating pin 41 of the pin-type twisting unit 15 is switched between the stop, the low rotation number, the production rotation number, and the stop in this order. As such, the rotating pin 41 is temporarily maintained at the low rotation number which is lower than the production rotation number before being maintained at the production rotation number. This arrangement suppresses the occurrence of yarn breakage due to rapid acceleration of the pin 41 from the stop to the production rotation number at the time of yarn threading.

(Electric Architecture)

[0044] FIG. 4 is a block diagram illustrating the electric structure of the draw texturing machine 1. FIG. 4 shows only one processing unit 10 because of the space, but other processing units 10 are also similarly structured. The draw texturing machine 1 includes a control unit 30 which controls operations of processing units 10. A setting unit 31 by which the operator inputs control modes and setting values in the control unit 30 is connected to the control unit 30. Examples of the control modes include a normal mode and a simultaneous drive mode which are described later. Examples of the setting values which can be input by the setting unit 31 include the number of rotations of the pin 41 of the pin-type twisting unit 15 (e.g., low rotation number and production rotation number). The setting unit 31 may be formed of, e.g., a touch panel, or may be formed of a combination of a keyboard and a monitor, etc.

[0045] A base switch 32 is a switch for causing operations of the processing units 10 to be simultaneously stopped and resumed. As the operator operates the base switch 32, the control unit 30 controls operation of each processing unit 10 in accordance with the setting mode and the setting values which are set by the setting unit 31. The control unit 30 is connected also to the drive

switch 24 provided in each processing unit 10. The control unit 30 can assume the state of the rotating pin 41 of the pin-type twisting unit 15 by recognizing the state of the drive switch 24 of each processing unit 10. The state of the rotating pin 41 can be switched not only by using the drive switch 24, but also by the control unit 30.

(Problem of Operation Stop Without Cutting Yarn)

[0046] When the operation of the draw texturing machine 1 is stopped because of maintenance or a long holiday, the operator presses the base switch 32 after selecting the normal mode. In the normal mode, the control unit 30 stops the operation of each processing unit 10 either after causing the cutter 23 of each processing unit 10 to cut the yarn Y or at the same time as the cutter 23 cuts the yarn Y. As such, when the operation of each processing unit 10 is stopped after the yarn Y is cut, the operator needs to perform the yarn threading at the time of resumption of the operation.

[0047] In the yarn threading, the operator presses the base switch 32 to activate the apparatuses of each processing unit 10 such as the feed rollers 11, 16, 18, and 20 and the winding device 21. In the normal mode, when the base switch 32 is pressed to resume the operation, the pin-type twisting unit 15 is not activated. When the yarn threading to the pin-type twisting unit 15 is completed in one processing unit 10, the operator immediately presses the drive switch 24 of the processing unit 10 to rotate the pin 41 of the pin-type twisting unit 15. When the pin 41 of the pin-type twisting unit 15 is not rotated immediately after the completion of the yarn threading, the running resistance of the yarn Y passing through the wound unit 41b is increased. As a result, the yarn breakage tends to occur.

[0048] The yarn threading takes long time. Therefore, when the operation of the draw texturing machine 1 is stopped in a short time for, e.g., electric work and a lot change, the yarn Y may not be cut but be remained. However, in the normal mode, when the base switch 32 is pressed to resume the operation while the yarn Y remains in the unit, the apparatuses of each processing unit 10 such as the feed rollers 11, 16, 18, and 20 and winding device 21 are activated but the pin-type twisting unit 15 of each processing unit 10 is still stopped. As a result, the yarn Y runs while the pin 41 is not rotated, and hence the yarn breakage may occur. The draw texturing machine 1 therefore has the simultaneous drive mode in which, even after the operation of each processing unit 10 is stopped without cutting the yarn Y, the operation can be successfully resumed while the occurrence of the yarn breakage is suppressed at the same time.

(Simultaneous Drive Mode)

[0049] The following will describe a series of steps from operation stop of the draw texturing machine 1 to resumption of operation of the draw texturing machine 1 in the simultaneous drive mode, with reference to a flowchart of FIG. 5. After the base switch 32 is pressed in the operation of the draw texturing machine 1 while the simultaneous drive mode is selected (YES in step S1), the control unit 30 stops operation of each processing unit 10 without causing the cutter 23 to cut the yarn Y (step S2). Because of this, the yarn Y remains in each processing unit 10 so that the yarn threading at the resumption of the operation is unnecessary.

[0050] When operations such as the electric work and the lot change are completed while the draw texturing machine 1 is stopped, the operator presses the base switch 32 to resume operation of the draw texturing machine 1. After the base switch 32 is pressed (YES in step S3), the controller 30 causes each processing unit 10 to resume operation (step S4). In the simultaneous drive mode, after the base switch 32 is pressed, the apparatuses of each processing unit 10 such as the feed rollers 11, 16, 18, and 20 and the winding device 21 are activated. In addition to that, the pin-type twisting units 15 of all processing units 10 are simultaneously activated. It is therefore possible to suppress the yarn breakage due to running of the yarn Y without rotation of the pin 41. However, the number of rotations of the pin 41 is increased up to the low rotation number. This arrangement suppresses the occurrence of the yarn breakage when the pin 41 is rapidly accelerated from the stop to the production rotation number.

[0051] While the number of rotations of the pin 41 is maintained at the low rotation number, the operator checks, one by one in order, all processing units 10 to check whether each processing unit 10 has problems such as the yarn breakage and the deviation of the yarn Y from the yarn path. After the operator confirms that a processing unit 10 has no problem, the operator presses the drive switch 24 of that processing unit 10 once (YES in step S5) to accelerate the pin 41 to the production rotation number (step S6). In this regard, the steps S5 to S8 are executed for all processing units 10 one by one in order.

[0052] Although not shown in the flowchart of FIG. 5, when the yarn breakage occurs in one processing unit 10, the operator presses the drive switch 24 of the processing unit 10 twice to temporarily stop the pin-type twisting unit 15. Subsequently, after the yarn threading is completed, the operator presses the drive switch 24 once and checks whether the low rotation number causes a problem in the processing unit 10. When the low rotation number does not cause any problem in the processing unit 10, the operator presses the drive switch 24 once again to accelerate the pin 41 to the production rotation number (step S6). After that, the process proceeds to the step S7.

[0053] After the number of rotations of the pin 41 reaches the production rotation number and then a predetermined time elapses (YES in step S7), the control unit 30 causes the winding device 21 of the processing unit 10 to perform the above-described replacement (step S8).

In this regard, a predetermined time is time required for the pin 41 to accelerate from the low rotation number and to become stable at the production rotation number. A predetermined time can be set at will, by using the setting unit 31. The following describes the reasons why the replacement is performed after the pin 41 starts to accelerate to the production rotation number and a predetermined time elapses.

[0054] When the operation of each processing unit 10 is stopped, the winding device 21 continues to wind the yarn Y during a period from the start of deceleration of the feed rollers 11, 16, 18, and 20 and the pin-type twisting unit 15 to the stop of these apparatuses. However, when the yarn Y is false-twisted while these apparatuses do not work in conditions at the time of production, the quality of this yarn Y may be low. Therefore, the package P on which the low-quality yarn Y is wound is managed as a defective package or is discarded. Similarly, when the operation of each processing unit 10 is resumed, the yarn Y is processed before the apparatuses of each processing unit 10 such as the feed rollers 11, 16, 18, and 20 and the pin-type twisting unit 15 starts to work in operating conditions. The quality of this yarn Y may be also low.

[0055] In this regard, because the replacement is performed after the pin 41 of the pin-type twisting unit 15 reaches the production rotation number and then a predetermined time elapses, i.e., after the pin 41 becomes stable at the production rotation number, all low-quality yarn Y produced at the time of operation stop or at the time of resumption of the operation is wound onto the package P which is formed before the replacement. It is therefore possible to prevent inclusion of the low-quality yarn Y in the package P which is formed after the replacement, and hence the possibility of production of defective packages is minimized.

[0056] After the steps S5 to S8 are executed for each processing unit 10, the resumption of operation of the draw texturing machine 1 in the simultaneous drive mode is completed.

(Effects)

[0057] In the draw texturing machine 1 of the present embodiment, when the simultaneous drive mode is executed, the operation of each processing unit 10 is stopped without cutting the yarn Y. Because of this, the yarn threading at the time of resumption of the operation is omitted. In addition to that, the pin-type twisting units 15 of all processing units 10 are simultaneously activated when the operation is resumed, and the pin 41 of each pin-type twisting unit 15 starts to rotate as the yarn Y starts to run. Because of this, the yarn breakage is suppressed. It is therefore possible to save time required for resuming the operation and to suppress the occurrence of the yarn breakage.

[0058] In the present embodiment, when the operation is resumed in the simultaneous drive mode, the control unit 30 increases the number of rotations of the pin 41 to the low rotation number which is lower than the production rotation number. When the number of rotations of the pin 41 is instantly increased to the production rotation number, the tension of the yarn Y is temporarily high or the yarn Y is relaxed and deviated from the yarn path, with the result that the yarn breakage may occur. In this regard, when the simultaneous drive mode is executed, the occurrence of the yarn breakage is suppressed by accelerating the pin 41 not to the production rotation number but to the low rotation number as described above.

[0059] In the present embodiment, each processing unit 10 has the operation unit (i.e., the drive switch 24) for increasing the number of rotations of the pin 41 from the low rotation number to the production rotation number. Provision of such an operation unit allows pins 41 of all processing units 10 to accelerate to the production rotation number one by one in order, after the operator finishes checking of whether there are problems such as the yarn breakage and the deviation of the yarn Y from the yarn path in each processing unit 10 in which the pin 41 rotates at the low rotation number.

[0060] In the present embodiment, when the operation is resumed in the simultaneous drive mode, the control unit 30 causes the winding device 21 to perform the replacement after the number of rotations of the pin 41 reaches the production rotation number. When the operation of each processing unit 10 is stopped, the yarn Y is false-twisted while the pin 41 decelerates from the production rotation number. In addition to that, when the operation of each processing unit 10 is resumed, the yarn Y is false-twisted while the pin 41 accelerates to the production rotation number. As such, when the yarn Y is false-twisted while the number of rotations of the pin 41 is lower than the production rotation number, this yarn Y may be a defective yarn which does not have a predetermined quality. Therefore, such a yarn Y is preferably discarded as much as possible. In this regard, by performing the replacement as described above after the number of rotations of the pin 41 reaches the production rotation number, the inclusion of a defective yarn in the package P which is formed after the replacement is avoided, while inclusion of a defective yarn in the package P which is formed before the replacement may not be avoided.

[0061] In the present embodiment, after the number of rotations of the pin 41 reaches the production rotation number and then a predetermined time elapses, the control unit 30 causes the winding device 21 to perform the replacement. As such, because a predetermined time is waited for after the number of rotations of the pin 41 reaches the production rotation number, the replacement is performed after the number of rotations of the pin 41 becomes stable. As a result, the inclusion of a defective yarn in the package P which is formed after the replacement is further reliably avoided.

(Other Embodiments)

[0062] The following will describe modifications of the above-described embodiment.

[0063] In the embodiment above, when the operation of the draw texturing machine 1 is resumed, the number of rotations of the pin 41 of the pin-type twisting unit 15 is temporarily maintained at the low rotation number. However, at the time of resumption of the operation, the number of rotations of the pin 41 may be instantly increased to the production rotation number.

[0064] In the embodiment above, the operation unit (i.e., the drive switch 24) is provided in each processing unit 10 for increasing the number of rotations of the pin 41 from the low rotation number to the production rotation number. However, instead of this operation unit, an operation unit may be provided for simultaneously operating pins 41 of all processing units 10 so that the number of rotations of the pin 41 of each processing unit 10 is increased from the low rotation number to the production rotation number. In this case, the pins 41 of all processing units 10 can simultaneously accelerate to the production rotation number only by operating the operation unit once, after the operator finishes checking whether there are problems such as the yarn breakage and the deviation of the yarn Y from the yarn path in each processing unit 10 in which the pin 41 rotates at the low rotation number.

[0065] In the embodiment above, when the operation is resumed in the simultaneous drive mode, the winding device 21 of one processing unit 10 is caused to automatically perform the replacement after the number of rotations of the pin 41 included in the processing unit 10 reaches the production rotation number and then a predetermined time elapses. However, the winding device 21 may be caused to perform the replacement in such a way that the operator observes the rotation of the pin 41 being stable at the production rotation number and operates a predetermined switch, etc. It is not prerequisite to cause the winding device 21 to perform the replacement at the time of resumption of the operation.

[0066] The base switch 32 and the drive switch 24 in the embodiment above may be a button, a lever, a dial, etc.

Claims

1. A draw texturing machine (1) in which processing units (10) are aligned, the processing units (10) respectively including pin-type twisting units (15), the pin-type twisting units (15) being configured to respectively twist yarns (Y) running in rotating pins (41) and being able to be independently driven,

   the draw texturing machine (1) comprising a control unit (30) which controls operations of the processing units (10), and

   the control unit (30) being configured not to cut each of the yarns (Y) running in the processing units (10) at the time of operation stop of the processing units (10) and being able to execute a simultaneous drive mode in which, at the time of resumption of operations of the processing units (10), the pin-type twisting units (15) of all of the processing units (10) are simultaneously driven.

2. The draw texturing machine (1) according to claim 1, wherein, when the operations are resumed in the simultaneous drive mode, the control unit (30) increases the number of rotations of each of the pins (41) to a low rotation number which is lower than a production rotation number.

3. The draw texturing machine (1) according to claim 2, wherein, each of the processing units (10) has an operation unit (24) configured to increase the number of rotations of each of the pins (41) from the low rotation number to the production rotation number.

4. The draw texturing machine (1) according to claim 2, wherein, an operation unit is provided for simultaneously operating the pins (41) of all of the processing units (10) so that the number of rotations of each of the pins (41) is increased from the low rotation number to the production rotation number.

5. The draw texturing machine (1) according to any one of claims 1 to 4, wherein, each of the processing units (10) includes a winding device (21) which is configured to wind each of the yarns (Y) twisted by the respective pin-type twisting units (15) onto a bobbin (B) so as to form a package (P) and which is able to perform replacement for replacing the package (P) with a new bobbin (B), and
   when the operations are resumed in the simultaneous drive mode, the control unit (30) causes the winding device (21) to perform the replacement after the number of rotations of each of the pins (41) reaches the production rotation number.

6. The draw texturing machine (1) according to claim 5, wherein, the control unit (30) causes the winding device (21) to perform the replacement after the number of rotations of each of the pins (41) reaches the production rotation number and then a predetermined time elapses.

FIG.1

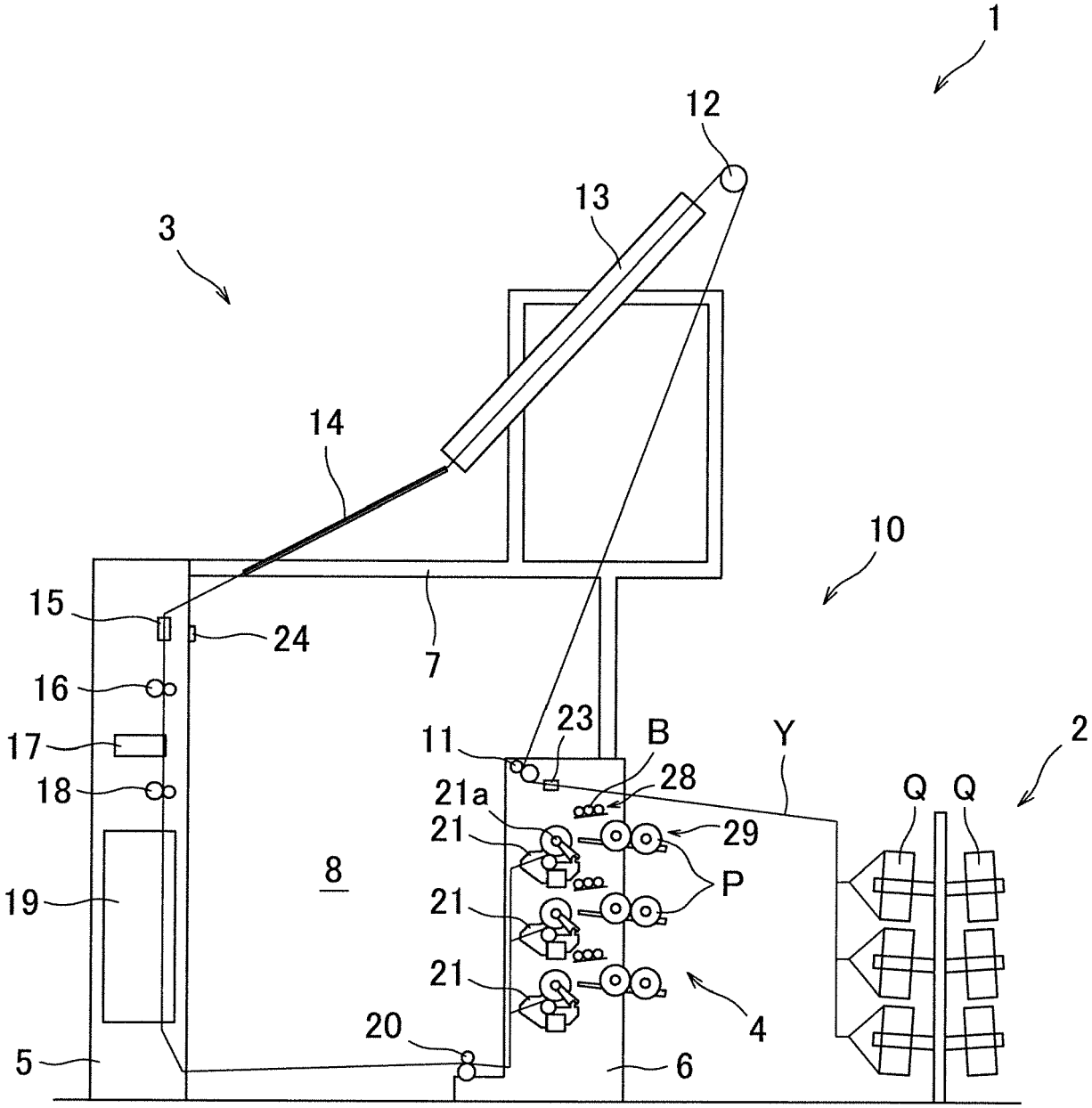

1
12
13
3
14
10
15
24
7
16
23
11
B
Y
2
17
28
Q
Q
18
21a
21
29
8
P
19
21
21
4
20
5
6

FIG.2

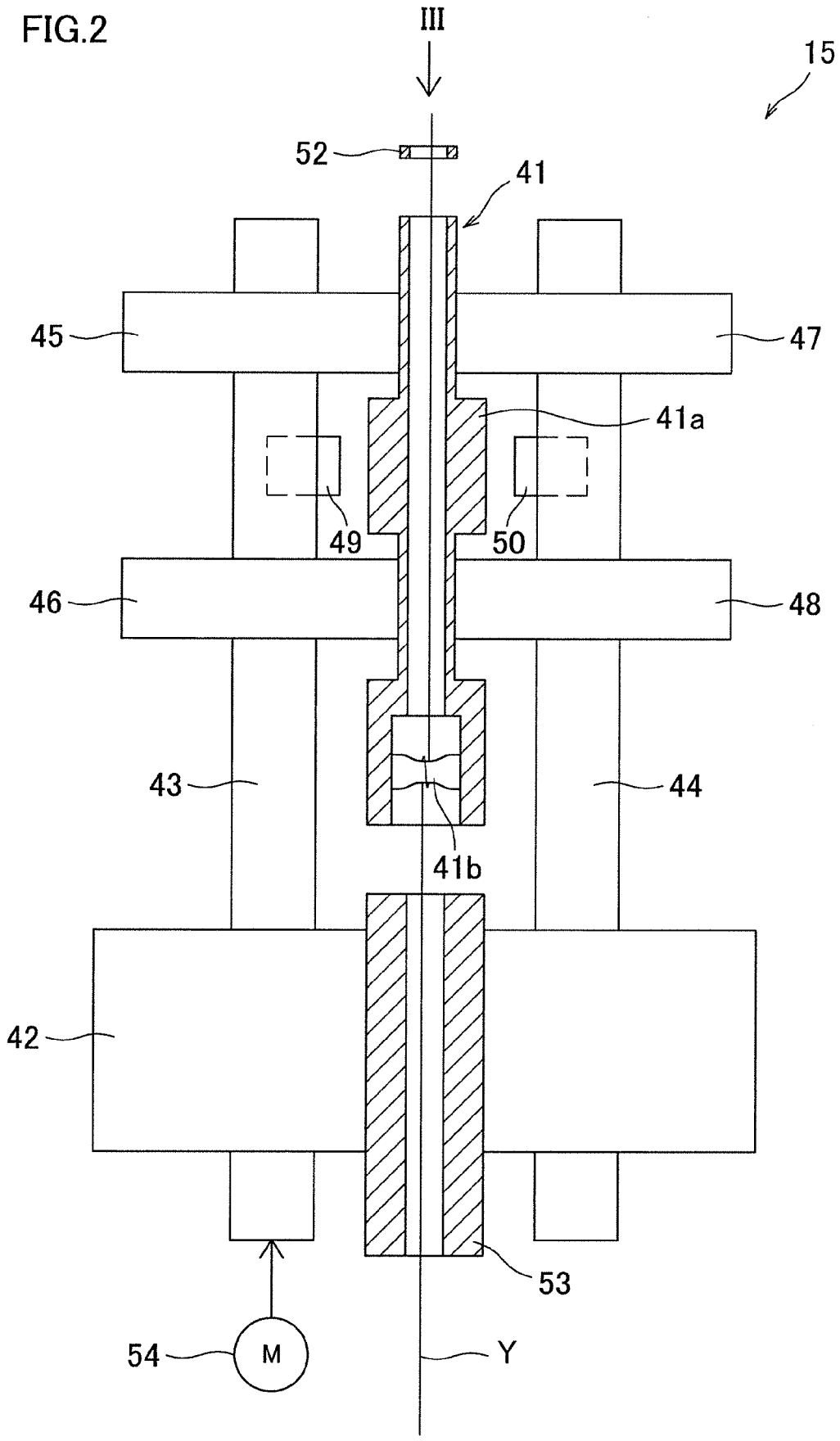


FIG.3

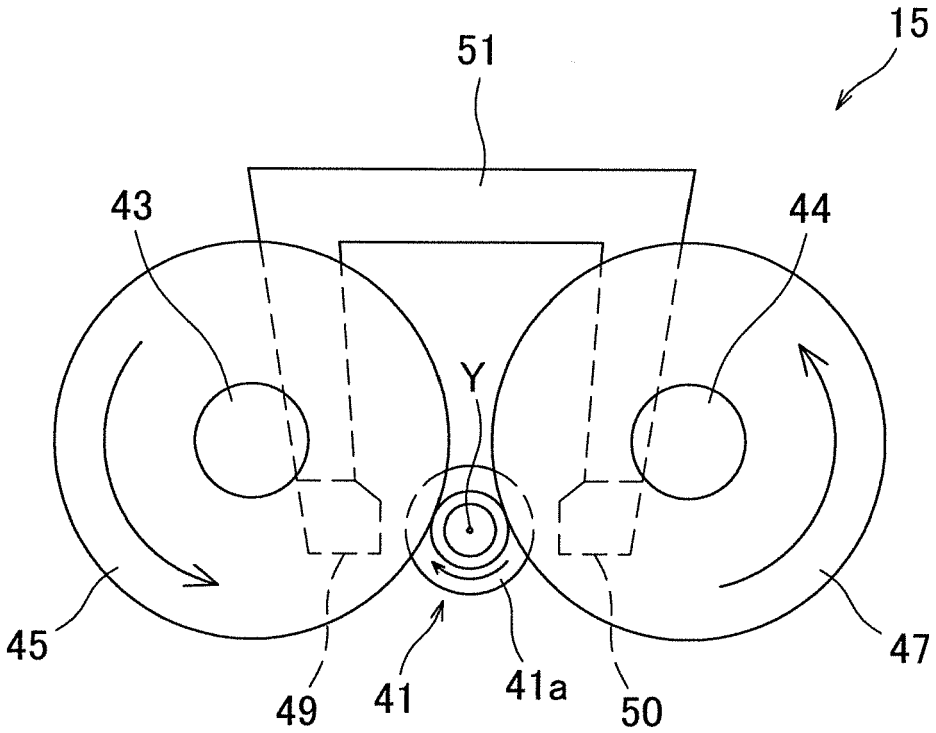


FIG.4

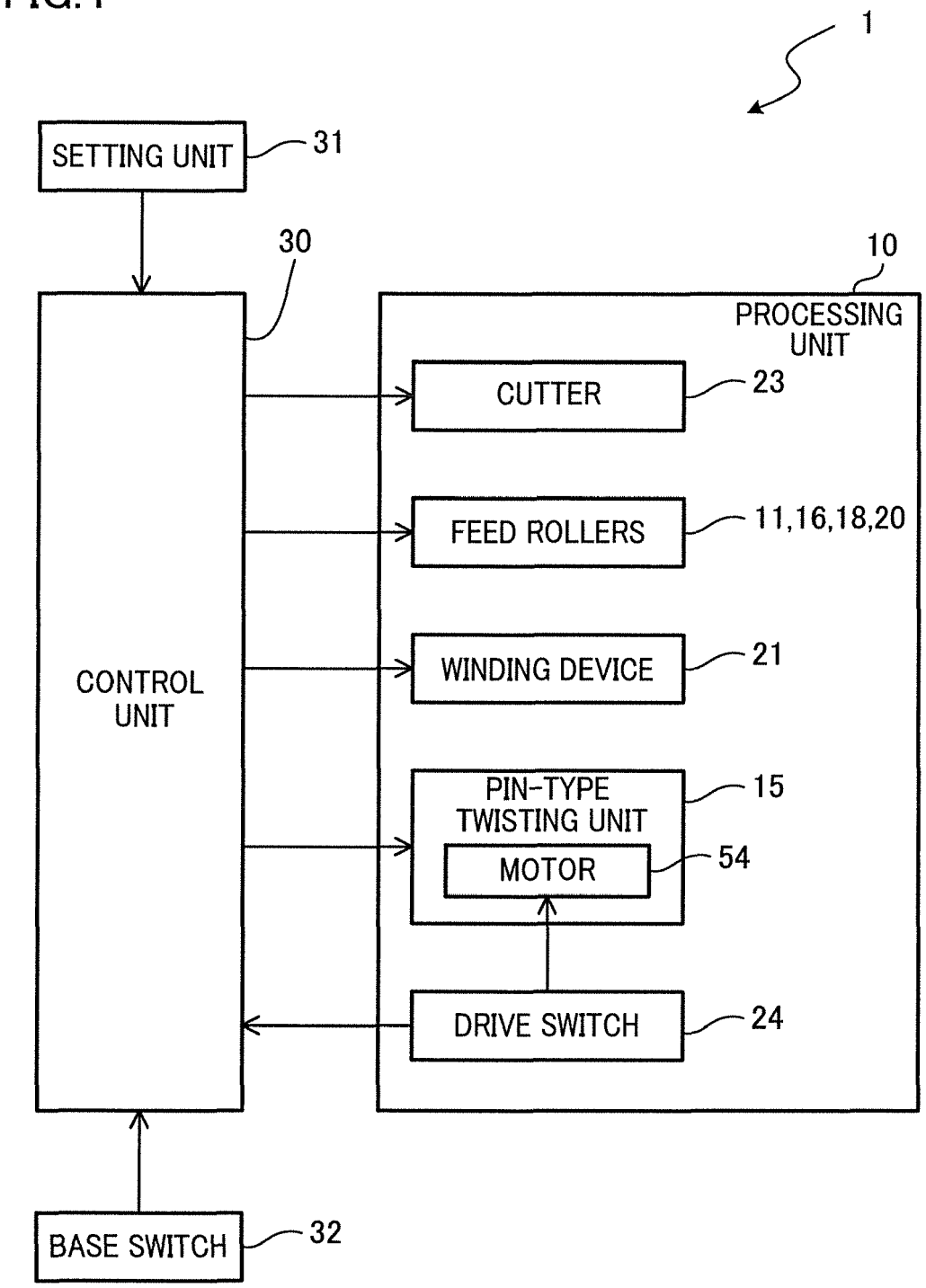
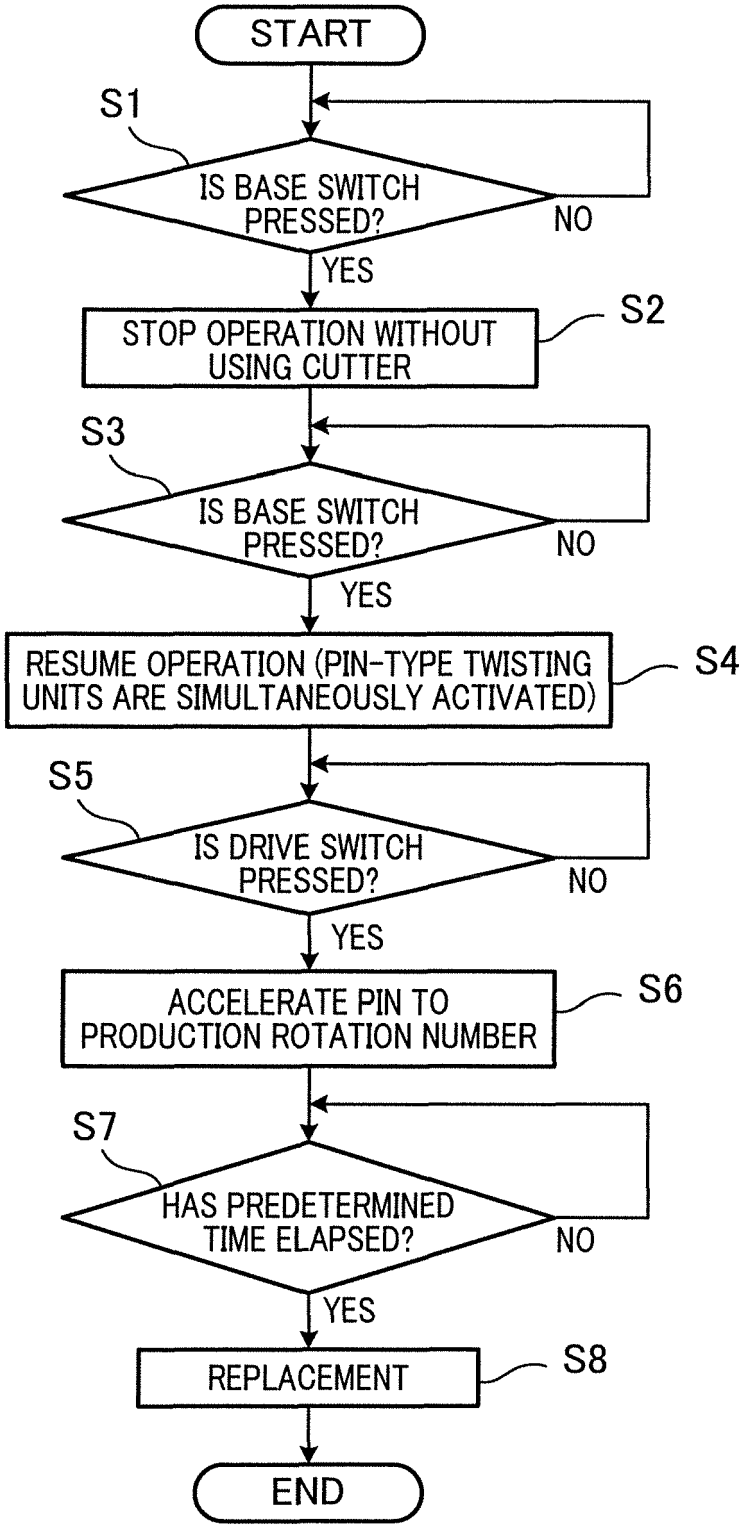

1
SETTING UNIT
31
30
10
PROCESSING UNIT
CUTTER
23
FEED ROLLERS
11,16,18,20
WINDING DEVICE
21
CONTROL UNIT
PIN-TYPE TWISTING UNIT
15
MOTOR
54
DRIVE SWITCH
24
BASE SWITCH
32

FIG.5


START
S1
IS BASE SWITCH PRESSED?
NO
YES
STOP OPERATION WITHOUT USING CUTTER
S2
S3
IS BASE SWITCH PRESSED?
NO
YES
RESUME OPERATION (PIN-TYPE TWISTING UNITS ARE SIMULTANEOUSLY ACTIVATED)
S4
S5
IS DRIVE SWITCH PRESSED?
NO
YES
ACCELERATE PIN TO PRODUCTION ROTATION NUMBER
S6
S7
HAS PREDETERMINED TIME ELAPSED?
NO
YES
REPLACEMENT
S8
END

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 21 20 1150

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	EP 3 540 103 A1 (TMT MACHINERY INC [JP]) 18 September 2019 (2019-09-18) * the whole document *	1-6	INV. D02G1/02 D02G1/06 D02G1/08 D02G1/20 B65H54/22 B65H61/00 B65H63/00 B65H51/30 B65H63/036
Y	DE 102 51 443 A1 (MURATA MACHINERY LTD [JP]) 18 September 2003 (2003-09-18) * paragraphs [0144] - [0162]; figure 7 *	1-6	
A	JP S59 150130 A (TORAY INDUSTRIES; TORAY ENG CO LTD) 28 August 1984 (1984-08-28) * claims 1-2; figures 1-7 *	1-6	
A,D	EP 3 540 104 A1 (TMT MACHINERY INC [JP]) 18 September 2019 (2019-09-18) * the whole document *	1-6	
A	EP 0 952 245 A1 (MURATA MACHINERY LTD [JP]) 27 October 1999 (1999-10-27) * claims 1-6; figures 1-9 *	1-6	
A	JP H03 33233 A (TOYODA AUTOMATIC LOOM WORKS) 13 February 1991 (1991-02-13) * abstract *	5,6	TECHNICAL FIELDS SEARCHED (IPC) D02G B65H G01N

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	28 March 2022	Barathe, Rainier

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 21 20 1150

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

28-03-2022

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 3540103 A1	18-09-2019	CN 110273207 A	24-09-2019
		EP 3540103 A1	18-09-2019
		JP 2019157313 A	19-09-2019
		TW 201938866 A	01-10-2019
DE 10251443 A1	18-09-2003	CN 1420621 A	28-05-2003
		DE 10251443 A1	18-09-2003
JP S59150130 A	28-08-1984	JP S6246655 B2	03-10-1987
		JP S59150130 A	28-08-1984
EP 3540104 A1	18-09-2019	CN 110273206 A	24-09-2019
		EP 3540104 A1	18-09-2019
		JP 2019157314 A	19-09-2019
		TW 201938867 A	01-10-2019
EP 0952245 A1	27-10-1999	CN 1234457 A	10-11-1999
		DE 69904771 T2	23-10-2003
		EP 0952245 A1	27-10-1999
		KR 19990078203 A	25-10-1999
JP H0333233 A	13-02-1991	JP 2527036 B2	21-08-1996
		JP H0333233 A	13-02-1991

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 2019157314 A **[0003]**