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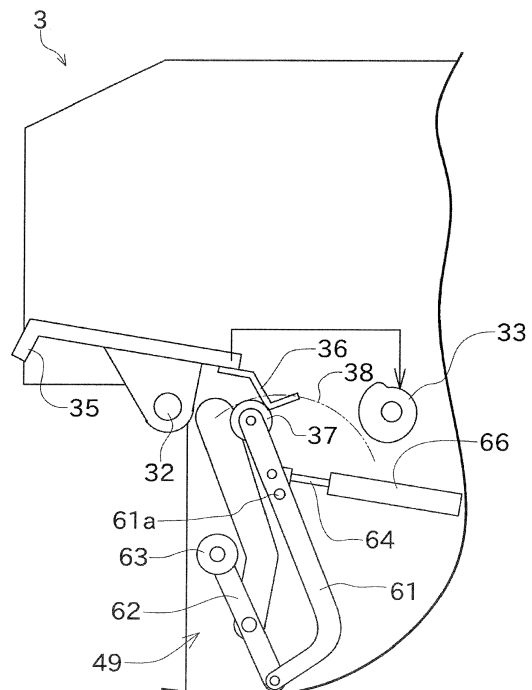
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(54) **Service vehicle of textile machine**

(57) A yarn joining vehicle (3) includes a reverse rotating roller (63), an air cylinder (66), and a stopper (36). The reverse rotating roller (63) is adapted to rotate while making contact with a cross-wound package (45) to rotationally drive the cross-wound package (45). The air cylinder (66) is adapted to move the reverse rotating roller (63) between a contacting position where the reverse rotating roller (63) can make contact with the cross-wound package (45), and a retracted position where the reverse rotating roller (63) is retracted from the cross-wound package (45). The stopper (36) is provided independent of the air cylinder (66) and adapted to hold the reverse rotating roller (63) at a held position closer to the retracted position than the contacting position.

FIG. 3



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a service vehicle arranged in a textile machine.

2. Description of the Related Art

[0002] A service vehicle (yarn joining vehicle) configured to be able to travel to a plurality of yarn processing units in a textile machine is conventionally known. The service vehicle travels to the yarn processing unit where disconnection of the yarn occurred for some reason, and connects (joins) the disconnected yarn. The service vehicle includes a reverse rotating roller adapted to reversely rotate a cross-wound package in the yarn joining operation. This type of service vehicle is described in Japanese Unexamined Patent Publication No. 2013-67484 (patent document 1).

[0003] Patent document 1 discloses a configuration in which the reverse rotating roller can be approached to or separated from a package (paragraph 0061). In patent document 1, the reverse rotating roller can be approached to or separated from the package by advancing or receding a cylinder of an air actuator. In the specification of the present application, a state in which the reverse rotating roller is brought into contact with the package by the air actuator (air cylinder) is referred to as a "contacting position" of the reverse rotating roller, and a state in which the reverse rotating roller is located away from the package (state in which the reverse rotating roller is accommodated in the service vehicle) by the air actuator (air cylinder) is referred to as a "receded position" of the reverse rotating roller.

BRIEF SUMMARY OF THE INVENTION

[0004] An object of the present invention is to provide a service vehicle configured to be able to hold position of the reverse rotating roller even at the time of maintenance, and the like.

[0005] This object is achieved by a service vehicle according to claim 1.

[0006] The present invention is based on the inventor's finding that in conventional approaches, if the reverse rotating roller is projected out when the service vehicle is travelling with respect to a plurality of units, the reverse rotating roller may make contact with a peripheral member thus causing damage, etc. When the service vehicle is travelling, the reverse rotating roller needs to be accommodated in the service vehicle. Conventionally, the air actuator holds the reverse rotating roller at the receded position (accommodated state) when the service vehicle does not perform the yarn joining operation.

[0007] For example, when maintenance of the service

vehicle is carried out, the supply of air to the air actuator is sometimes stopped. In this case, the cylinder of the air actuator is in a free state, and the reverse rotating roller cannot be held at the receded position. The reverse rotating roller may project out toward the contacting position than the receded position (toward a position close to the package) due to its own weight. An operator needs to have the reverse rotating roller, which has projected out by its own weight, pushed in by hand to move the service vehicle, and workability of the maintenance is poor.

[0008] In the conventional service vehicle, the reverse rotating roller unintentionally (without an intention of the operator) moves when the supply of air to the air actuator is stopped such as at the time of maintenance, and the workability of the maintenance is poor.

[0009] According to a first aspect of the invention of the present application, a service vehicle includes a driving roller, a first driving section, and a holding section. The driving roller is adapted to rotate while making contact with a cross-wound package to rotationally drive the cross-wound package. The first driving section is adapted to move the driving roller between a contacting position where the driving roller can make contact with the cross-wound package, and a receded position where the driving roller is receded from the cross-wound package. The holding section is provided independently from the first driving section and adapted to hold the driving roller at a held position where the driving roller is receded from the cross-wound package.

[0010] Since the holding section adapted to hold the driving roller at the held position is provided separately from the first driving section, the driving roller can be held at the held position even when the supply of a drive force to the first driving section is stopped. The held position and the receded position may coincide with each other, or the held position and the receded position may be different from each other.

[0011] The configuration of the above service vehicle is particularly suitable when applied to a service vehicle in which the first driving section is an air cylinder.

[0012] If the first driving section is the air cylinder, the driving roller cannot be held at the receded position by the first driving section when the supply of air to the air cylinder is stopped. Thus, by arranging the holding section separately from the first driving section (air cylinder) as described above, the driving roller can be held at the held position even when the supply of air to the first driving section is stopped.

[0013] The service vehicle preferably includes a contacted portion provided to move in a mechanical conjunction with a movement of the driving roller. The holding section is a stopper adapted to make contact with the contacted portion. At least one of the contacted portion and the stopper is adapted to elastically make contact with another of the contacted portion and the stopper.

[0014] The holding by the stopper thus can be released by applying a force of a certain extent.

[0015] In the service vehicle described above, the holding section is preferably adapted to be able to hold the driving roller at the held position during non-operation of the service vehicle.

[0016] The time of non-operation refers to a state in which the service vehicle does not carry out a normal operation such as the time of maintenance and/or power OFF. According to the configuration described above, the driving roller can be held at the held position even when the supply of the drive force to the first driving section is stopped such as at the time of maintenance.

[0017] In the service vehicle described above, the holding section is preferably adapted to release the holding of the driving roller when the first driving section moves the driving roller. The first driving section thus can move the driving roller.

[0018] The service vehicle further preferably includes a yarn guiding member adapted to guide a yarn from the cross-wound package to prevent the yarn from making contact with a traverse guide when rotationally driving the cross-wound package by the driving roller. The holding section is adapted to move in conjunction with a movement of the yarn guiding member. The number of components thus can be reduced compared to when the holding section is driven alone.

[0019] The service vehicle further preferably includes a second driving section adapted to move the yarn guiding member to a standby position and a guiding position, the standby position being a position where the yarn guiding member is located away from a yarn to be wound around the cross-wound package, and the guiding position being a position where the yarn guiding member guides the yarn from the cross-wound package to prevent the yarn from making contact with the traverse guide. The holding section is adapted to release holding of the driving roller when the second driving section moves the yarn guiding member from the standby position to the guiding position.

[0020] When the yarn guiding member is moved to the guiding position, and the yarn from the cross-wound package is prevented from being traversed by the traverse guide, the cross-wound package can be rotated by the driving roller. By providing the holding section and the yarn guiding member to be movable in conjunction with each other, the holding by the holding section can be released if the driving roller needs to be moved.

[0021] The service vehicle further preferably includes a link mechanism adapted to move the driving roller; and a contacted portion mounted on the link mechanism and adapted to move accompanying movement of the driving roller in a predetermined movement trajectory. The holding section is a stopper mounted on the yarn guiding member and adapted to move in conjunction with the movement of the yarn guiding member. When the yarn guiding member is located at the standby position, the stopper is positioned at a position where the stopper interferes with the movement trajectory of the contacted portion. When the yarn guiding member is located at the

guiding position, the stopper is positioned at a position where the stopper does not interfere with the movement trajectory of the contacted portion. The driving roller is adapted to be held at the held position by the stopper making contact with the contacted portion.

[0022] Since the stopper (holding section) is mounted on the yarn guiding member, the stopper can be rationally moved in conjunction with the movement of the yarn guiding member.

[0023] The yarn joining vehicle further preferably includes a control section adapted to control movements of the yarn guiding member and the driving roller by sequentially executing a releasing step, a roller advancing step, a package driving step, a roller receding step, and an activation step. In the releasing step, the yarn guiding member is moved from the standby position to the guiding position. In the roller advancing step, the driving roller is moved to the contacting position. In the package driving step, the cross-wound package is rotationally driven by the driving roller. In the roller receding position, the driving roller is moved from the contacting position to the receded position. In the activation step, the yarn guiding member is moved from the guiding position to the standby position.

[0024] When there is a need to rotationally drive the cross-wound package by the driving roller, the yarn guiding member is moved to the guiding position to prevent the yarn from the cross-wound package from making contact with the traverse guide. Accompanying such movement, since the holding of the driving roller by the holding section (stopper) is released, the driving roller is moved to the contacting position enabling the rotational drive of the cross-wound package. The yarn guiding member, the stopper, and the driving roller can be rationally moved in conjunction with one another.

[0025] According to another aspect of the invention of the present application, a textile machine includes the service vehicle, and a plurality of yarn winding units, each of which is adapted to wind a yarn to form a cross-wound package. The service vehicle is adapted to be assigned with all or a portion of the plurality of the yarn winding units as an assigned range, and is adapted to perform service with respect to a serving unit, the servicing unit being one of the yarn winding units belonging to the assigned range. The driving roller is adapted to rotationally drive the cross-wound package of the servicing unit in an unwinding direction.

[0026] With the configuration of rotationally driving the cross-wound package in the unwinding direction by the driving roller of the service vehicle, the configuration for driving the cross-wound package in the unwinding direction does not need to be provided in each yarn winding unit. The configuration of the entire textile machine thus can be simplified.

[0027] In the textile machine described above, the service vehicle includes a yarn joining device adapted to perform a yarn joining operation with respect to the servicing unit. The first driving section is adapted to move the

driving roller to the contacting position prior to performance of the yarn joining operation by the yarn joining device

[0028] When performing the yarn joining operation, the cross-wound package needs to be rotated in the unwinding direction to pull out the yarn of the cross-wound package. According to the configuration described above, the cross-wound package can be rotated in the unwinding direction when necessary by the driving roller of the service vehicle.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029]

FIG. 1 is a front view illustrating an overall configuration of a fine spinning machine according to one embodiment of the present invention;

FIG. 2 is a side view of a spinning unit and a yarn joining vehicle;

FIG. 3 is a side view illustrating a state in which a reverse rotating roller is held by a stopper;

FIG. 4 is a side view illustrating a state in which the reverse rotating roller is released from the stopper;

FIG. 5 is a side view illustrating a state in which holding of the reverse rotating roller by the stopper is released;

FIG. 6 is a side view illustrating a state in which yarn breakage occurred in the spinning unit;

FIG. 7 is a side view illustrating a releasing step;

FIG. 8 is a side view illustrating a roller advancing step and a package driving step;

FIG. 9 is a side view illustrating a yarn end guiding step;

FIG. 10 is a side view illustrating a yarn joining step; and

FIG. 11 is a side view illustrating a roller receding step.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0030] A description will be made on a fine spinning machine serving as a yarn winding machine according to an embodiment of the present invention with reference to the drawings. A fine spinning machine (spinning machine) 1 includes a plurality of spinning units (yarn winding unit) 2 arranged side by side, a yarn joining vehicle (service vehicle) 3, a blower box 80, and a motor box 5.

[0031] A negative pressure source adapted to supply negative pressure to each spinning unit 2, and the like is arranged in the blower box 80. A drive source common to the plurality of the spinning units 2 is arranged in the motor box 5.

[0032] As illustrated in FIG. 2, each spinning unit 2 includes, as main components, a draft device 7, a spinning device (yarn supplying section) 9, a yarn accumulating device 12, and a winding device 13, which are arranged

in order from upstream to downstream. Each spinning unit 2 spins a fiber bundle 8 fed from the draft device 7 with the spinning device 9 to generate a spun yarn 10, and winds the spun yarn 10 around a bobbin 48 with the winding device 13. The bobbin 48, around which the spun yarn 10 is wound, is referred to as a cross-wound package 45. In the present specification, "upstream" and "downstream" refer to upstream and downstream in a travelling direction of the fiber bundle 8 and the spun yarn 10 at the time of normal winding. The time of normal winding is the time when the spun yarn 10 between the spinning device 9 and the winding device 13 is in a continued state, and the cross-wound package 45 is rotationally driven at a substantially constant circumferential speed so that the spun yarn 10 is wound at a substantially constant speed.

[0033] The draft device 7 includes four draft rollers, i.e., a back roller 16, a third roller 17, a middle roller 19 around which a rubber apron belt 18 is provided, and a front roller 20, in order from the upstream side. Each draft roller is rotationally driven at a predetermined rotation speed. The draft device 7 includes opposing rollers arranged with respect to the draft rollers. The draft device 7 feeds a sliver 15, which is the raw material of the fiber bundle 8, by sandwiching the sliver 15 between the draft rollers and the opposing rollers, thus drafting the sliver 15 to a predetermined width, and generating the fiber bundle 8.

[0034] The spinning device 9 is arranged immediately downstream of the front roller 20. The fiber bundle 8 drafted by the draft device 7 is supplied to the spinning device 9. The spinning device 9 applies twists to the fiber bundle 8 supplied from the draft device 7 to generate the spun yarn 10. A pneumatic spinning device that applies twists to the fiber bundle 8 using whirling airflow is adopted for the spinning device 9 of the present embodiment.

[0035] As illustrated in FIG. 2, the winding device 13 is arranged downstream of the spinning device 9. The winding device 13 includes a cradle arm 71, a winding drum 72, and a traverse guide 76.

[0036] The winding drum 72 is rotationally driven at a constant rotation speed in one direction. The cradle arm 71 can rotatably support the bobbin 48 for winding the spun yarn 10. The cradle arm 71 is swingably supported about a supporting shaft 73. The cradle arm 71 can bring an outer circumferential surface of the bobbin 48 (or the cross-wound package 45) into contact with the winding drum 72 or separate the outer circumferential surface from the winding drum 72 by being swung about the supporting shaft 73 while supporting the bobbin 48 (or cross-wound package 45). The bobbin 48 (or cross-wound package 45) can be driven to be rotated in one direction and the spun yarn 10 can be wound around the bobbin 48 (or cross-wound package 45) by bringing the outer circumferential surface of the bobbin 48 (or the cross-wound package 45) into contact with the rotating winding drum 72. In the following, the direction in which the winding drum 72 rotates the cross-wound package 45 is re-

ferred to as a "winding direction". The winding drum 72 in the winding device 13 of each spinning unit 2 is rotationally driven simultaneously by a drive source (not illustrated) common to the plurality of the spinning units 2. The drive source is arranged in the motor box 5.

[0037] The traverse guide 76 is configured to be capable of engaging the spun yarn 10, and is reciprocated in a direction parallel to an axial direction of the winding drum 72 by a driving means (not illustrated). The driving means is arranged in the motor box 5. By reciprocating the traverse guide 76, to which the spun yarn 10 is engaged, while rotating the winding drum 72, the spun yarn 10 is wound into the cross-wound package 45 while being traversed.

[0038] The yarn accumulating device 12 is arranged between the spinning device 9 and the winding device 13. As illustrated in FIG. 2, the yarn accumulating device 12 includes a yarn accumulating roller 14, and an electric motor 25 adapted to rotationally drive the yarn accumulating roller 14.

[0039] The yarn accumulating roller 14 is configured to wind a constant amount of spun yarn 10 around its outer circumferential surface and temporarily accumulate the spun yarn 10. When the yarn accumulating roller 14 is rotated at a predetermined rotation speed with the spun yarn 10 wound around the outer circumferential surface of the yarn accumulating roller 14, the spun yarn 10 can be pulled out at a predetermined speed from the spinning device 9 and fed toward the downstream. The yarn accumulating device 12 can temporarily accumulate the spun yarn 10 on the yarn accumulating roller 14, and thus functions as one type of buffer between the spinning device 9 and the winding device 13. Thus, drawbacks (e.g., slackening of the spun yarn 10, etc.) of when the spinning speed in the spinning device 9 and the winding speed in the winding device 13 do not coincide with each other for some reason can be resolved.

[0040] A yarn quality measuring instrument 59 is arranged between the spinning device 9 and the yarn accumulating device 12. The spun yarn 10 from the spinning device 9 passes through the yarn quality measuring instrument 59 before being wound by the yarn accumulating device 12. The yarn quality measuring instrument 59 monitors thickness of the travelling spun yarn 10 with a capacitance sensor (not illustrated). When detecting a yarn defect of the spun yarn 10 (a portion with abnormality in thickness, etc. of the spun yarn 10), the yarn quality measuring instrument 59 transmits a yarn defect detection signal to a unit controller (not illustrated). The yarn quality measuring instrument 59 is not limited to a capacitance sensor, and, for example, may be configured to monitor the thickness of the spun yarn 10 with a light transmissive sensor. The yarn quality measuring instrument 59 may be configured to detect a foreign substance in the spun yarn 10 as a yarn defect.

[0041] A cutter (not illustrated) for immediately cutting the spun yarn 10 when a yarn defect is detected by the yarn quality measuring instrument 59 is arranged close

to the yarn quality measuring instrument 59. In place of the cutter, the spinning unit 2 may stop supply of air to the spinning device 9 and interrupt generation of the spun yarn 10 to cut the spun yarn 10.

[0042] Next, a description will be made on the configuration of the yarn joining vehicle (service vehicle) 3.

[0043] As illustrated in FIG. 1, a yarn joining vehicle travelling rail 41 is laid along the direction, in which the spinning units 2 are arranged, on a frame 6 of the fine spinning machine 1. The yarn joining vehicle 3 is configured to travel on such yarn joining vehicle travelling rail 41. Specifically, the yarn joining vehicle 3 includes travelling wheels, and a vehicle driving section (not illustrated) adapted to drive the travelling wheels. The yarn joining vehicle 3 can travel with respect to the plurality of the spinning units 2 (along the spinning units 2). The yarn joining vehicle 3 travels to the spinning unit 2 that is a servicing unit and stops at such a position, and then performs a predetermined service (yarn joining operation in the present embodiment) on the spinning unit 2 that is the servicing unit. The fine spinning machine 1 of the present embodiment includes one yarn joining vehicle 3, and is configured capable of carrying out the service with respect to any one of the spinning units 2 with the yarn joining vehicle 3. That is, the yarn joining vehicle 3 of the present embodiment is assigned to all of the plurality of the spinning units 2 arranged in the fine spinning machine 1 as an assigned range.

[0044] As illustrated FIGS. 1 and 2, the yarn joining vehicle 3 mainly includes a yarn joining device 43, a yarn catching section (suction pipe 44 and suction mouth 46), a reverse rotation drive mechanism 49, and a yarn guide (yarn guiding member) 75. The yarn joining vehicle 3 includes a vehicle control section (control section) (not illustrated) adapted to control each component of the yarn joining vehicle 3.

[0045] The suction pipe 44 and the suction mouth 46 are respectively configured to be vertically swingable with an axis as a center. The suction pipe 44 is configured to generate a suction airflow at its distal end to suck and catch the spun yarn 10 fed from the spinning device 9 (see FIG. 8). The suction mouth 46 is configured to generate a suction airflow at its distal end to suck and catch the spun yarn 10 from the cross-wound package 45 supported by the winding device 13 (see FIG. 8). Each of the suction pipe 44 and the suction mouth 46 is swung while sucking and catching the spun yarn 10 to guide the spun yarn 10 to a position where the spun yarn 10 faces the front side of the yarn joining device 43 (state of FIG. 9). The movement of the suction pipe 44 and the suction mouth 46 is controlled by the vehicle control section.

[0046] The yarn joining device 43 is configured to join the spun yarn 10 from the spinning device 9 guided by the suction pipe 44 and the spun yarn 10 from the cross-wound package 45 guided by the suction mouth 46. The yarn joining device 43 is configured as a splicer device adapted to form a joint by applying twists on the yarn ends by whirling airflow. The configuration of the yarn

joining device 43 is not limited thereto, and for example, may be a mechanical knitter. The yarn joining operation by the yarn joining device 43 is controlled by the vehicle control section. The yarn joining device 43 is located between the winding device 13 and the yarn accumulating device 12 in the travelling direction of the spun yarn 10 when the yarn joining vehicle 3 is stopped at the spinning unit 2.

[0047] The yarn joining device 43 of the present embodiment is configured to be movable in a direction of approaching to or receding from a yarn path (travelling path of the spun yarn 10) at the time of the normal winding. The yarn joining device 43 performs the yarn joining operation at a position (e.g., position illustrated in FIG. 10) located close to the yarn path at the time of the normal winding. When the yarn joining device 43 does not perform the yarn joining operation, the yarn joining device 43 is receded to and maintained at a position (e.g., position illustrated in FIG. 2) located away from the yarn path at the time of the normal winding. The yarn joining vehicle 3 includes a moving means 30 adapted to move the yarn joining device 43 as described above.

[0048] The yarn guide 35 is arranged downstream of the yarn joining device 43. The yarn guide 35 is configured to be movable between a "guiding position" and a "standby position" by being swung about a swing shaft 32. When the yarn guide 35 is moved to the "standby position", the yarn guide 35 does not make contact with the spun yarn 10 (state of FIG. 2). When the yarn guide 35 is moved to the "guiding position", the yarn guide 35 is located at a position where the yarn guide 35 interferes with the yarn path of the spun yarn 10 at the time of the normal winding. The yarn guide 35 thus can guide the spun yarn 10 to the position where the spun yarn 10 does not make contact with the traverse guide 76 (state of FIG. 11).

[0049] The yarn joining vehicle 3 includes a cam mechanism (second driving section) including a cam 33 adapted to move the yarn guide 35 between the "guiding position" and the "standby position". Although the detailed illustration of the cam mechanism are omitted, the cam 33 is configured to be driven and swung with an axis parallel to the swing shaft 32 of the yarn guide 35 as a center, as illustrated in FIG. 2, etc. The yarn guide 35 is configured to be able to (directly or indirectly) make contact with a circumferential surface of the cam 33. According to such configuration, when the cam 33 is rotationally driven, the yarn guide 35 can be swung about the swing shaft 32 to move between the "guiding position" and the "standby position". The rotation of the cam 33 is controlled by the vehicle control section described above.

[0050] As illustrated in FIG. 2, etc., the reverse rotation drive mechanism 49 includes a first link 61 and a second link 62, a reverse rotating roller (driving roller) 63, and a reverse rotating roller drive motor (not illustrated) which is a drive source of the reverse rotating roller 63.

[0051] The reverse rotating roller 63 is rotationally driven by a drive force from the reverse rotating roller drive

motor (not illustrated). The operation of the reverse rotating roller drive motor is controlled by the vehicle control section.

[0052] One end of the first link 61 is swingably attached to a housing main body of the yarn joining vehicle 3. The second link 62 is swingably attached to the other end of the first link 61. The reverse rotating roller 63 is rotatably mounted on a distal end of the second link 62. The yarn joining vehicle 3 includes an air cylinder (first driving section) 66 for driving the first link 61 and the second link 62. The distal end of a cylinder rod 64 of the air cylinder 66 is coupled to the first link 61.

[0053] As described above, the first link 61, the second link 62, and the cylinder rod 64 configure a link mechanism. When the air cylinder 66 is controlled to advance/recede, the reverse rotating roller 63 can be moved in a direction of approaching to or receding from the cross-wound package 45. The air cylinder 66 can move the reverse rotating roller 63 between a "receded position" (e.g., position illustrated in FIG. 2) where the reverse rotating roller 63 does not make contact with the cross-wound package 45, and a "contacting position" (e.g., position illustrated in FIG. 8) where the reverse rotating roller 63 can make contact with the cross-wound package 45. The movement of the air cylinder 66 is controlled by the vehicle control section.

[0054] Characteristic structures of the invention of the present application will now be described.

[0055] When performing maintenance, etc. of the yarn joining vehicle 3, the yarn joining vehicle 3 may be switched to a "non-operation" state. The "non-operation" state of the yarn joining vehicle 3 refers to a state in which the yarn joining vehicle 3 does not carry out the yarn joining operation and does not travel, and does not, even if a yarn breakage (disconnected state of the yarn) occurred in one of the spinning units 2, travel in response to the yarn breakage. Specifically, the "non-operation" state of the yarn joining vehicle 3 includes a state in which the power of the yarn joining vehicle 3 is turned OFF and/or a state in which the yarn joining vehicle 3 is brought to an emergency stop for some reason, etc.

[0056] During the non-operation of the yarn joining vehicle 3, the supply of air to the air cylinder 66 is sometimes stopped. In such a case, the cylinder rod 64 of the air cylinder 66 is in a free state, and hence the reverse rotating roller 63 cannot be held at the receded position by the air cylinder 66. The reverse rotating roller 63 thus may project out toward the contacting position (position close to the cross-wound package 45) than the receded position by the own weight of the reverse rotating roller 63. As described above, when the reverse rotating roller 63 unintentionally (against an intension of the operator) projects out, the workability of the maintenance, and the like becomes poor.

[0057] In the present embodiment, the yarn joining vehicle 3 includes a stopper (holding section) 36 adapted to hold the reverse rotating roller 63 at a predetermined position independently from the air cylinder 66. With the

stopper 36 arranged independently from the air cylinder 66, the reverse rotating roller 63 can be prevented from unintentionally (against the intension of the operator) projecting out toward the contacting position (position close to the cross-wound package 45) even when the supply of air to the air cylinder 66 is stopped.

[0058] FIG. 3 illustrates a state in which the stopper 36 holds the reverse rotating roller 63. The position of the reverse rotating roller 63 when held by the stopper 36 is referred to as a "held position". The stopper 36 is configured to hold the reverse rotating roller 63 at substantially the same position as the receded position. The receded position coincides with the held position in the present embodiment. The following description will be made assuming that the stopper 36 holds the reverse rotating roller 63 at the "receded position".

[0059] A description will be made on the configuration of holding the reverse rotating roller 63 by the stopper 36 with reference to FIGS. 3 to 5. In FIGS. 3 to 5, the configuration not required in the explanation is appropriately omitted.

[0060] The stopper 36 is mounted on a main body side of the yarn joining vehicle 3. The "main body side" is a concept that refers to a configuration that does not move in mechanical conjunction with the movement of the reverse rotating roller 63 among the configurations of the yarn joining vehicle 3. For example, since the yarn guide 35 is driven by a drive source (cam mechanism) different from the reverse rotating roller 63, the yarn guide 35 and the reverse rotating roller 63 do not move in mechanical conjunction. Thus, the yarn guide 35 is included in the configuration of the "main body side". In the present embodiment, the stopper 36 is mounted on the yarn guide 35. More specifically, the stopper 36 is a plate spring fixedly mounted on the yarn guide 35.

[0061] A contacted portion 37 that makes contact with the stopper 36 is mounted on the reverse rotating roller 63 side. The phrase "mounted on the reverse rotating roller side" means being mounted to move in mechanical conjunction with the movement of the reverse rotating roller 63 by the air cylinder 66. Specifically, the contacted portion 37 is mounted on the first link 61. Thus, the contacted portion 37 moves in mechanical conjunction with the movement of the reverse rotating roller 63. The contacted portion 37 is a roller-like member that is freely rotatable with an axis parallel to a rotation axis of the reverse rotating roller 63 as a center, and that is supported by the first link 61.

[0062] As illustrated in FIGS. 3 to 5, the contacted portion 37 is arranged at a position located away from a swing supporting shaft 61a of the first link 61. Therefore, when the reverse rotating roller 63 is moved between the receded position and the contacting position, the contacted portion 37 moves in a predetermined arcuate movement trajectory with the swing supporting shaft 61a as a center. The movement trajectory of the contacted portion 37 is indicated with a reference numeral 38 in FIG. 3, etc.

[0063] As described above, the stopper 36 of the present embodiment is configured as a plate spring. As illustrated in FIGS. 3 to 5, the plate spring includes a bent portion bent to form an "L" shape when seen in the axial direction of the reverse rotating roller 63. The L-shaped bent portion is arranged to project out toward the movement trajectory 38 of the contacted portion 37.

[0064] The stopper 36 is fixedly mounted on the yarn guide 35, as mentioned earlier. The yarn guide 35 is swung with the swing shaft 32 as a center so as to be movable between the "standby position" and the "guiding position". Thus, the stopper 36 also moves when the yarn guide 35 is swung with the swing shaft 32 as the center. The stopper 36 is arranged so that when the yarn guide 35 is located at the "standby position", the L-shaped bent portion is located at the position interfering with the movement trajectory 38 of the contacted portion 37. FIGS. 3 and 4 illustrate a state in which the yarn guide 35 is located at the "standby position".

[0065] According to the above configuration, the stopper 36 can be brought into contact with the contacted portion 37 by positioning the yarn guide 35 at the "standby position". FIG. 3 illustrates a state in which the contacted portion 37 is brought into contact with the stopper 36. When the stopper 36 is brought into contact with the contacted portion 37, the contacted portion 37 can be held at a predetermined position by the stopper 36. Since the contacted portion 37 is configured to move in mechanical conjunction with the movement of the reverse rotating roller 63, if the contacted portion 37 is held at a predetermined position, the reverse rotating roller 63 is also held at a predetermined position. Accordingly, the reverse rotating roller 63 can be held at the held position (receded position in the present embodiment) by the stopper 36.

[0066] As described earlier, the stopper 36 is configured to hold the reverse rotating roller 63 at the "receded position". That is, the stopper 36 is arranged to make contact with the contacted portion 37 when the air cylinder 66 is holding the reverse rotating roller 63 at the "receded position" (state of FIG. 3).

[0067] The reverse rotating roller 63 can be held at the held position (receded position in the present embodiment) by the stopper 36 configured as described above. The stopper 36 is provided separately from and independent of the air cylinder 66. Even when the supply of air to the air cylinder 66 is stopped during the non-operation of the yarn joining vehicle 3, and the like, and the reverse rotating roller 63 cannot be held at the receded position by the air cylinder 66, the reverse rotating roller 63 can be held at the receded position by the stopper 36. Thus, according to the present embodiment, even when the supply of air to the air cylinder 66 is stopped, the reverse rotating roller 63 can be prevented by the stopper 36 from projecting out toward the contacting position (position close to the cross-wound package 45) by its own weight.

[0068] The stopper 36 is arranged so that when the

yarn guide 35 is located at the "guiding position" (state of FIG. 5), the stopper 36 does not interfere with the movement trajectory 38 of the contacted portion 37. Therefore, if the yarn guide 35 is located at the "guiding position", the reverse rotating roller 63 can be freely moved. Thus, the holding of the reverse rotating roller 63 by the stopper 36 can be released by positioning the yarn guide 35 at the "guiding position".

[0069] As described above, the yarn guide 35 on which the stopper 36 is mounted is configured to be driven by the cam mechanism. The cam 33 of the cam mechanism is configured to be rotationally driven by an electric motor (not illustrated). Even if the supply of power to the electric motor of the cam mechanism is stopped, the cam 33 does not unintentionally rotate due to rotation resistance, and the like of a shaft of the electric motor. Therefore, even if the supply of power to the cam mechanism is stopped, the yarn guide 35 does not unintentionally move (against the intension of the operator) from the "standby position" to the "guiding position". Thus, even if the supply of power to the cam mechanism is stopped, the holding of the reverse rotating roller 63 by the stopper 36 is not unintentionally released.

[0070] According to the present embodiment, a state in which the holding of the reverse rotating roller 63 by the stopper 36 is activated can be maintained even under a situation where the supply of power to the yarn joining vehicle 3 is stopped. Therefore, according to such configuration, even when the supply of air to the air cylinder 66 (first driving section) and the supply of power to the cam mechanism (second driving section) are respectively stopped during the non-operation (during maintenance and/or during emergency stop, etc.) of the yarn joining vehicle 3, the reverse rotating roller 63 can be held at the receded position.

[0071] As described above, the stopper 36 is configured from a plate spring, and hence the stopper 36 can elastically make contact with the contacted portion 37. Even when the yarn guide 35 is located at the "standby position" (even when the stopper 36 is located at the position where the stopper 36 makes contact with the contacted portion 37), by applying a force of a certain extent to the contacted portion 37, the contacted portion 37 can push away the stopper 36 (elastically deform the stopper 36 (plate spring)) and move.

[0072] According to such configuration, the operator can move the reverse rotating roller 63 by applying a force of a certain extent to the reverse rotating roller 63 even when the yarn guide 35 is located at the "standby position" (even when the holding of the reverse rotating roller 63 by the stopper 36 is activated). For example, the operator can pull the reverse rotating roller 63 held at the receded position as illustrated in FIG. 3 by the stopper 36 toward the contacting position (toward the left side of FIG. 3). The force is thereby applied on the stopper 36 (plate spring), thus elastically deforming the stopper 36. As a result, the contacted portion 37 can push away the stopper 36 (the contacted portion 37 can override the

stopper 36), and the reverse rotating roller 63 can be pulled out toward the contacting position (outside of a housing of the yarn joining vehicle 3) (state of FIG. 4).

[0073] On the contrary, the operator can push in the reverse rotating roller 63 toward the receded position (toward the right side of FIG. 4) (toward inside of the housing of the yarn joining vehicle 3) from the state of FIG. 4. As the reverse rotating roller 63 is pushed in, the contacted portion 37 makes contact with the stopper 36 at a certain time point. When the operator applies a force to further push in the reverse rotating roller 63 from this state, the contacted portion 27 can elastically deform the stopper 36 and push away the stopper 36 (the contacted portion 37 overrides the stopper 36). When the contacted portion 37 completely overrides the stopper 36, the reverse rotating roller 63 can be held at the receded position by the stopper 36 (state of FIG. 3).

[0074] As described above, in the present embodiment, the stopper 36 is configured by a plate spring, and hence the operator can move the reverse rotating roller 63 by applying a force of a certain extent on the reverse rotating roller 63 even when the holding of the reverse rotating roller 63 by the stopper 36 is activated (even when the yarn guide 35 is located at the "standby position"). The operator thus can easily pull out the reverse rotating roller 63 held by the stopper 36 during the maintenance, etc., and can easily carry out the maintenance, etc. of the reverse rotating roller 63. When the maintenance of the reverse rotating roller 63 is finished, the operator can push in the reverse rotating roller 63 to return the reverse rotating roller 63 to the state in which the reverse rotating roller 63 is held by the stopper 36.

[0075] In the present embodiment, the contacted portion 37 is a rotatable roller member. The resistance when the contacted portion 37 pushes away the stopper 36 (when the contacted portion 37 overrides the stopper 36) is thereby reduced. The operator can pull out the reverse rotating roller 63 with a smaller force.

[0076] In the present embodiment, the yarn guide 35 is configured to be driven by the cam 33 of the cam mechanism, and the yarn guide 35 is configured to make contact (directly or indirectly) with the peripheral surface of the cam 33. A predetermined urging force is applied on the yarn guide 35 in order to maintain the state in which the yarn guide 35 is making contact with the peripheral surface of the cam 33. When the force is applied on the yarn guide 35 to work against the urging force, the yarn guide 35 can be moved away from the cam 33 and swung with the swing shaft 32 as the center. That is, the yarn guide 35 can be moved irrespective of the cam mechanism by applying the force on the yarn guide 35. For example, when the operator applies force to push down the yarn guide 35 with the yarn guide 35 located at the "standby position" (state of FIG. 3), the yarn guide 35 can be swung to the "guiding position" and the holding of the reverse rotating roller 63 by the stopper 36 can be released (state of FIG. 5).

[0077] When the pushing down on the yarn guide 35

is stopped, the yarn guide 35 is returned to the original "standby position" by the urging force mentioned above. When the pushing down on the yarn guide 35 is stopped from the state of FIG. 5, the state can be returned to the state (state of FIG. 3) in which the holding of the reverse rotating roller 63 by the stopper 36 is activated.

[0078] As described above, according to the present embodiment, the holding of the reverse rotating roller 63 by the stopper 36 can be temporarily released through a simple operation of pushing down the yarn guide 35. The operator can freely release the holding of the reverse rotating roller 63 by the stopper 36 by pushing down the yarn guide 35 as needed during the maintenance, etc.

[0079] Further advantages of mounting the stopper 36 on the yarn guide 35 in the present embodiment will now be described.

[0080] According to the stopper 36 of the present embodiment, the reverse rotating roller 63 can be held at the retracted position even during the non-operation of the yarn joining vehicle 3. However, during the normal operation of the yarn joining vehicle 3, the reverse rotating roller 63 needs to be moved between the retracted position and the contacting position by the air cylinder 66, and hence the holding of the reverse rotating roller 63 by the stopper 36 needs to be released.

[0081] In the yarn joining vehicle 3 of the present embodiment, the stopper 36 is mounted on the yarn guide 35, and thus the switching of the release/activation of the holding of the reverse rotating roller 63 by the stopper 36 can be realized by the swinging of the yarn guide 35. In other words, the configuration for switching the release/activation of the holding by the stopper 36 does not need to be separately provided. The yarn joining vehicle 3 can be configured simply.

[0082] A description will be made on the switching of the release/activation of the holding by the stopper 36 along the flow of the yarn joining operation by the yarn joining vehicle 3.

[0083] The yarn joining operation by the yarn joining vehicle 3 is carried out in a certain spinning unit 2 when the spun yarn 10 between the spinning device 9 and the cross-wound package 45 becomes disconnected for some reason. When the spun yarn 10 between the spinning device 9 and the cross-wound package 45 becomes disconnected in a certain spinning unit 2 as illustrated in FIG. 6 as an example, the unit controller of such spinning unit 2 swingably drives the cradle arm 71 to perform the control to move the cross-wound package 45 away from the winding drum 72 and operates a brake mechanism (not illustrated) arranged in the winding device 13. The cross-wound package 45 thereby stops the rotation.

[0084] Then, the unit controller transmits a control signal to the yarn joining vehicle 3. The yarn joining vehicle 3 that has received the control signal travels on the yarn joining vehicle travelling rail 41 to the spinning unit 2 (spinning unit to be serviced or servicing unit) and stops thereat. Before the yarn joining vehicle 3 travels with respect to the plurality of spinning units 2, the vehicle con-

trol section of the yarn joining vehicle 3 controls the moving means 30 such that the yarn joining device 43 is retracted to and maintained at a position located away from the yarn path. The vehicle control section controls the air cylinder 66 such that the reverse rotating roller 63 is retracted to and maintained at the retracted position. Similarly, the vehicle control section controls the cam mechanism such that the yarn guide 35 is moved to and held at the standby position. Since each of the components is moved to and maintained at a position located away from the yarn path of the spun yarn 10 (position accommodated in the yarn joining vehicle 3) before the yarn joining vehicle 3 travels, each of the components is prevented from colliding with peripheral members during the travelling of the yarn joining vehicle 3.

[0085] In a state immediately after the yarn joining vehicle 3 stops at the spinning unit 2 to be serviced, the yarn guide 35 is located at the "standby position" as described above, and thus the stopper 36 is located at a position where the stopper 36 can make contact with the contacted portion 37. That is, the holding of the reverse rotating roller 63 by the stopper 36 is activated.

[0086] Next, the vehicle control section controls the cam mechanism to move the yarn guide 35 to the guiding position as illustrated in FIG. 7. Accompanying the movement of the yarn guide 35, the stopper 36 is moved to the position where the stopper 36 does not interfere with the movement trajectory of the contacted portion 37. That is, the holding of the reverse rotating roller 63 by the stopper 36 is released. The step of moving the yarn guide 35 to the guiding position as described above is referred to as "releasing step". The normal operation of the yarn joining vehicle 3 is described herein, where the air is supplied to the air cylinder 66 as per normal, and the reverse rotating roller 63 can be held at the retracted position by the air cylinder 66. Therefore, even when the holding by the stopper 36 is released, the reverse rotating roller 63 does not unintentionally project out toward the contacting position (position close to the cross-wound package 45).

[0087] Then, the vehicle control section swings the suction pipe 44 to the position where the suction pipe 44 can suck and catch the spun yarn 10 from the spinning device 9, and also swings the suction mouth 46 to the position where the suction mouth 46 can suck the spun yarn 10 from the cross-wound package 45, as illustrated in FIG. 8. Almost simultaneously with such operation, the vehicle control section controls the air cylinder 66 to advance the reverse rotating roller 63 to the contacting position (roller advancing step, state of FIG. 8). As described earlier, the holding of the reverse rotating roller 63 by the stopper 36 is released at this time point. Therefore, the air cylinder 66 can advance the reverse rotating roller 63 to the contacting position.

[0088] Then, the vehicle control section rotationally drives the reverse rotating roller 63 in a direction opposite to the rotational direction of the winding drum 72. The cross-wound package 45 is rotationally driven in a direction opposite to the winding direction (hereinafter referred

to as unwinding direction) (package driving step). Under this state, by sucking the spun yarn 10 at the surface of the cross-wound package 45 by the suction mouth 46, the spun yarn 10 is pulled out from the cross-wound package 45 and caught by the suction mouth 46.

[0089] The vehicle control section then swings the suction pipe 44 and the suction mouth 46 with the spun yarn 10 caught thereby to guide the caught spun yarn 10 to a position where the spun yarn 10 faces the front side of the yarn joining device 43 (yarn end guiding step, state of FIG. 9).

[0090] At this time, the spun yarn 10 from the cross-wound package 45 guided by the suction mouth 46 passes through a region in proximity to the traverse guide 76 (see FIG. 9). If the spun yarn 10 makes contact with the traverse guide 76, the spun yarn 10 is swung around by the traverse guide 76 and the guiding of the spun yarn 10 by the suction mouth 46 may possibly fail. As described earlier, the yarn guide 35 is located at the "guiding position" (state of FIG. 9), and thus even when the spun yarn 10 from the cross-wound package 45 is about to make contact with the traverse guide 76, the yarn guide 35 prevents the contact of the spun yarn 10 and the traverse guide 76. As described above, when the cross-wound package 45 is rotationally driven by the reverse rotating roller 63, the spun yarn 10 is guided by the yarn guide 35 to prevent the spun yarn 10 from the cross-wound package 45 from making contact with the traverse guide 76.

[0091] After the guiding of the spun yarn 10 by the suction pipe 44 and the suction mouth 46 is finished, the vehicle control section stops the rotation of the reverse rotating roller 63.

[0092] Next, the vehicle control section drives the moving means 30 to move the yarn joining device 43 in a direction of approaching the yarn path. The spun yarn 10 from the spinning device 9 caught by the suction pipe 44 and the spun yarn 10 from the cross-wound package 45 caught by the suction mouth 46 are thereby introduced to the yarn joining device 43 (state of FIG. 10). The vehicle control section operates the yarn joining device 43 in this state to connect the spun yarn 10 from the spinning device 9 and the spun yarn 10 from the cross-wound package 45 (servicing step).

[0093] After the yarn joining operation by the yarn joining device 43 is finished, the vehicle control section drives the moving means 30 to move the yarn joining device 43 in a direction of moving away from the yarn path and also controls the air cylinder 66 to move the reverse rotating roller 63 to the retracted position (roller retracting step, state of FIG. 11). At this time point, the holding of the reverse rotating roller 63 by the stopper 36 remains released. Therefore, when the reverse rotating roller 63 is moved to the retracted position, the contacted portion 37 does not make contact with the stopper 36. The air cylinder 66 thus can retract the reverse rotating roller 63 to the retracted position.

[0094] Almost simultaneously with such operation, the

unit controller of the spinning unit 2 swings the cradle arm 71 to bring the outer circumferential surface of the cross-wound package 45 into contact with the rotating winding drum 72 again (state of FIG. 11). The cross-wound package 45 that has been stopped thus resumes the rotation in the winding direction, whereby the winding of the spun yarn 10 is resumed. In such a state, the yarn guide 35 is located at the "guiding position", and hence the spun yarn 10 does not make contact with the traverse guide 76.

[0095] Lastly, the vehicle control section of the yarn joining vehicle 3 drives the cam mechanism to move the yarn guide 35 to the "standby position". The spun yarn 10 to be wound around the cross-wound package 45 thus is caught by the traverse guide 76. The state thereby returns to the state before the occurrence of yarn breakage (state of FIG. 2), whereby the normal winding can be resumed. Accompanying the movement of the yarn guide 35 to the "standby position", the stopper 36 is moved to the position where the stopper 36 can make contact with the contacted portion 37. In other words, the holding of the reverse rotating roller 63 by the stopper 36 is activated (state of FIG. 2). The step of moving the yarn guide 35 to the standby position is referred to as the "activation step".

[0096] As described above, the yarn joining vehicle 3 is configured to position the yarn guide 35 at the "guiding position" to prevent the spun yarn 10 from making contact with the traverse guide 76 when rotating the cross-wound package 45 in the unwinding direction by the reverse rotating roller 63. After the yarn joining operation by the yarn joining device 43 is finished, the reverse rotating roller 63 is retracted to the retracted position and the yarn guide 35 is positioned at the "standby position". As described above, the yarn joining vehicle 3 is configured to move the yarn guide 35 in conjunction with the movement of the reverse rotating roller 63.

[0097] In the present embodiment, the stopper 36 is mounted on the yarn guide 35 so as to be movable in conjunction with the movement of the reverse rotating roller 63. In other words, when the reverse rotating roller 63 needs to be moved by the air cylinder 66, the yarn guide 35 is moved to the "guiding position" and the holding of the reverse rotating roller 63 by the stopper 36 is released in conjunction with the movement of the yarn guide 35. Accordingly, the reverse rotating roller 63 can be moved by the air cylinder 66. Under a state in which the reverse rotating roller 63 is retracted to the retracted position by the air cylinder 66, the yarn guide 35 is moved to the "standby position" and the holding by the stopper 36 can be activated in conjunction with the movement of the yarn guide 35. Therefore, even when the supply of air to the air cylinder 66 is stopped in such state, the reverse rotating roller 63 can be held at the retracted position by the stopper 36. In the present embodiment, since the stopper 36 is mounted on the yarn guide 35 configured to move in conjunction with the movement of the reverse rotating roller 63, the rational operation in which

the stopper 36 and the reverse rotating roller 63 are operated in conjunction with each other can be easily realized.

[0098] The yarn joining vehicle 3 includes the reverse rotating roller 63, the air cylinder 66, and the stopper 36. The reverse rotating roller 63 is adapted to rotate while making contact with the cross-wound package 45 to rotationally drive the cross-wound package 45. The air cylinder 66 is adapted to move the reverse rotating roller 63 between the contacting position where the reverse rotating roller 63 can make contact with the cross-wound package 45, and the receded position where the reverse rotating roller 63 is receded from the cross-wound package 45. The stopper 36 is provided independent of the air cylinder 66 and adapted to hold the reverse rotating roller 63 at the held position located away from the cross-wound package 45.

[0099] Thus, by arranging the stopper 36 adapted to hold the reverse rotating roller 63 at the held position separately from the air cylinder 66, the reverse rotating roller 63 can be held at the held position even when the supply of air to the air cylinder 66 is stopped.

[0100] The yarn joining vehicle 3 includes the contacted portion 37 provided to move in a mechanical conjunction with the movement of the reverse rotating roller 63. The stopper 36 is adapted to make contact with the contacted portion 37. The stopper 36 is adapted to elastically make contact with the contacted portion 37. Thus, the holding by the stopper 36 can be released by applying a force of a certain extent.

[0101] In the yarn joining vehicle 3, the reverse rotating roller 63 can be held at the held position by the stopper 36 during the non-operation of the yarn joining vehicle 3. Thus, the reverse rotating roller 63 can be held at the held position even when supply of air to the air cylinder 66 is stopped during maintenance, etc.

[0102] In the yarn joining vehicle 3, the stopper 36 releases the holding of the reverse rotating roller 63 when the air cylinder 66 moves the reverse rotating roller 63. The air cylinder 66 is thus able to move the reverse rotating roller 63.

[0103] The yarn joining vehicle 3 includes the yarn guide 35 adapted to guide the spun yarn 10 so as to prevent the spun yarn 10 from the cross-wound package 45 from making contact with the traverse guide 76 when the cross-wound package 45 is rotationally driven by the reverse rotating roller 63. The stopper 36 is configured to move in conjunction with the movement the yarn guide 35. The number of components thus can be reduced compared to when the stopper 36 is driven alone.

[0104] The yarn joining vehicle 3 includes the cam mechanism adapted to move the yarn guide 35 to the standby position and the guiding position, the standby position being the position where the yarn guide 35 is located away from the spun yarn 10 to be wound around the cross-wound package 45, and the guiding position being the position where the yarn guide 35 guides the spun yarn 10 from the cross-wound package 45 to pre-

vent the spun yarn 10 from making contact with the traverse guide 76. The stopper 36 releases holding of the reverse rotating roller 63 when the cam mechanism moves the yarn guide 35 from the standby position to the guiding position.

[0105] By moving the yarn guide 35 to the guiding position so that the spun yarn 10 from the cross-wound package 45 is prevented from being traversed by the traverse guide 76, the cross-wound package 45 can be rotated by the reverse rotating roller 63. Therefore, by providing the stopper 36 and the yarn guide 35 to be movable in conjunction with each other, the stopper 36 can release the holding if the reverse rotating roller 63 needs to be moved.

[0106] The yarn joining vehicle 3 includes the link mechanism adapted to move the reverse rotating roller 63, and the contacted portion 37 mounted on the link mechanism and adapted to move accompanying movement of the reverse rotating roller 63 in the movement trajectory 38. The stopper 36 is mounted on the yarn guide 35 and is adapted to move in conjunction with the movement of the yarn guide 35. When the yarn guide 35 is located at the standby position, the stopper 36 is positioned at the position where the stopper 36 interferes with the movement trajectory 38 of the contacted portion 37. When the yarn guide 35 is located at the guiding position, the stopper 36 is positioned at the position where the stopper 36 does not interfere with the movement trajectory 38 of the contacted portion 37. The reverse rotating roller 63 is adapted to be held at the held position by the stopper 36 making contact with the contacted portion 37.

[0107] Since the stopper 36 is mounted on the yarn guide 25, the stopper 36 can be rationally moved in conjunction with the movement of the yarn guide 35.

[0108] The vehicle control section of the yarn joining vehicle 3 sequentially executes the releasing step, the roller advancing step, the package driving step, the roller receding step, and the activation step in such order. In the releasing step, the yarn guide 35 is moved from the standby position to the guiding position. In the roller advancing step, the reverse rotating roller 63 is moved to the contacting position. In the package driving step, the cross-wound package 45 is rotationally driven by the reverse rotating roller 63. In the roller receding step, the reverse rotating roller 63 is moved from the contacting position to the receded position. In the activation step, the yarn guide 35 is moved from the guiding position to the standby position.

[0109] If the cross-wound package 45 needs to be rotationally driven by the reverse rotating roller 63, the yarn guide 35 is moved to the guiding position so that the spun yarn 10 from the cross-wound package 45 does not make contact with the traverse guide 76. The holding of the reverse rotating roller 63 by the stopper 36 is released accompanying the movement of the yarn guide 35, and thus the reverse rotating roller 63 can be moved to the contacting position and the cross-wound package 45 can

be rotationally driven. The yarn guide 35, the stopper 36, and the reverse rotating roller 63 can be rationally moved in conjunction with each other.

[0110] The fine spinning machine 1 includes the yarn joining vehicle 3, and a plurality of spinning units 2, each of which is adapted to wind the spun yarn 10 to form the cross-wound package 45. In the fine spinning machine 1, the yarn joining vehicle 3 is adapted to be assigned with all of the plurality of the spinning units 2 as an assigned range, and is adapted to perform the yarn joining operation with respect to the servicing unit, the servicing unit being one of the yarn winding units 2 belonging to the assigned range. The reverse rotating roller 63 is adapted to rotationally drive the cross-wound package 45 of the servicing unit 2 in the unwinding direction. The configuration for driving the cross-wound package 45 in the unwinding direction does not need to be provided in each spinning unit 2, and thus the configuration of the entire fine spinning machine 1 can be simplified.

[0111] In the fine spinning machine 1, the yarn joining vehicle 3 includes the yarn joining device 43 adapted to perform the yarn joining operation with respect to the target servicing unit 2. The air cylinder 66 is adapted to move the reverse rotating roller 63 to the contacting position prior to performance of the yarn joining operation by the yarn joining device 43.

[0112] In order to perform the yarn joining operation, the cross-wound package 45 needs to be rotated in the unwinding direction to pull out the spun yarn 10 from the cross-wound package 45. According to the above-described configuration, the cross-wound package 45 can be rotated in the unwinding direction, as needed, by the reverse rotating roller 63 of the yarn joining vehicle 3.

[0113] The preferred embodiments of the present invention have been described above, but the configurations may be modified as below, for example.

[0114] The invention of the present application is not limited to the fine spinning machine, and can also be applied to other types of textile machines including the service vehicle (yarn joining vehicle).

[0115] In the embodiment described above, the holding section (stopper) 36 is a plate spring. The stopper 36 thus can be elastically brought into contact with the contacted portion 37. The holding section 36 is not limited to the plate spring, and for example, the stopper 36 may be urged toward the contacted portion 37 with a torsion spring, and the like. In place of or in addition to the configuration of elastically bringing the stopper 36 into contact with the contacted portion 37, the contacted portion 37 may be elastically brought into contact with the stopper 36. For example, the contacted portion 37 may be configured to be urged toward the stopper 36 by a compression coil spring.

[0116] The configuration of elastically bringing the holding section (stopper) 36 and the contacted portion 37 into contact with each other can be omitted.

[0117] In the embodiment described above, the stopper 36 is mounted on the yarn guiding member (yarn

guide) 35. However, the stopper 36 may be separately provided, independent of the yarn guiding member 35. In this case, the yarn guiding member may be omitted.

[0118] The shape and/or the position, and the like of the stopper 36 is not limited to those described in the above description and illustrated in the drawings, and can be appropriately modified.

[0119] In the embodiment described above, the contacted portion 37 is provided separately from the reverse rotating roller 63, but the reverse rotating roller 63 may also serve as the contacted portion 37. In other words, the reverse rotating roller 63 may directly make contact with the stopper 36.

[0120] In the embodiment described above, the position (held position) where the stopper 36 holds the reverse rotating roller 63 coincides with the receded position. However, the held position may not coincide with the receded position. The held position where the stopper 36 holds the reverse rotating roller 63 merely needs to be a position where the reverse rotating roller 63 is receded from the cross-wound package 45 (position closer to the yarn joining vehicle 3 than the contacting position).

[0121] The fine spinning machine 1 of the embodiment described above includes one yarn joining vehicle 3, but the textile machine may include a plurality of service vehicles. In this case, the plurality of service vehicles can be assigned to the yarn winding units to be serviced. That is, each service vehicle may be adapted to be assigned to only a portion of the plurality of the yarn winding units arranged in the textile machine as an assigned range.

Claims

1. A service vehicle (3) comprising:

a driving roller (63) adapted to rotate while making contact with a cross-wound package (45) to rotationally drive the cross-wound package (45); a first driving section (66) adapted to move the driving roller (63) between a contacting position where the driving roller (63) can make contact with the cross-wound package (45), and a receded position where the driving roller (63) is receded from the cross-wound package (45); and

a holding section (36) provided independently from the first driving section (66) and adapted to hold the driving roller (63) at a held position where the driving roller (63) is receded from the cross-wound package (45).

2. The service vehicle (3) according to claim 1, wherein the first driving section (66) is an air cylinder.

3. The service vehicle (3) according to claim 1 or claim 2, further comprising a contacted portion (37) provided to move in a mechanical conjunction with a

- movement of the driving roller (63),
 wherein the holding section (36) is a stopper (36)
 adapted to make contact with the contacted portion
 (37), and
 at least one of the contacted portion (37) and the
 stopper (36) is adapted to elastically make contact
 with another of the contacted portion (37) and the
 stopper (36).
4. The service vehicle (3) according to any one of claim
 1 through claim 3, wherein the holding section (36)
 is adapted to hold the driving roller (63) at the held
 position during non-operation of the service vehicle
 (3).
5. The service vehicle (3) according to any one of claim
 1 through claim 4, wherein the holding section (36)
 is adapted to release holding of the driving roller (63)
 when the first driving section (66) moves the driving
 roller (63) toward the contacting position.
6. The service vehicle (3) according to any one of claim
 1 through claim 5, further comprising a yarn guiding
 member (35) adapted to guide a yarn (10) from the
 cross-wound package (45) to prevent the yarn (10)
 from making contact with a traverse guide (76) when
 rotationally driving the cross-wound package (45) by
 the driving roller (63),
 wherein the holding section (36) is adapted to move
 in conjunction with a movement of the yarn guiding
 member (35).
7. The service vehicle (3) according to claim 6, further
 comprising a second driving section (33) adapted to
 move the yarn guiding member (35) to a standby
 position and a guiding position, the standby position
 being a position where the yarn guiding member (35)
 is located away from a yarn (10) to be wound around
 the cross-wound package (45), and the guiding po-
 sition being a position where the yarn guiding mem-
 ber (35) guides the yarn (10) from the cross-wound
 package (45) to prevent the yarn (10) from making
 contact with the traverse guide (76),
 wherein the holding section (36) is adapted to re-
 lease holding of the driving roller (63) when the sec-
 ond driving section (33) moves the yarn guiding
 member (35) from the standby position to the guiding
 position.
8. The service vehicle (3) according to claim 7, further
 comprising:
 a link mechanism (61, 62, 64) adapted to move
 the driving roller (63); and
 a contacted portion (37) mounted on the link
 mechanism (61, 62, 64) and adapted to move
 with the movement of the driving roller (63) along
 a movement trajectory;
- wherein the holding section (36) is a stopper (36)
 mounted on the yarn guiding member (35) and
 adapted to move in conjunction with the move-
 ment of the yarn guiding member (35),
 when the yarn guiding member (35) is located
 at the standby position, the stopper (36) is po-
 sitioned at a position where the stopper (36) in-
 terferes with the movement trajectory of the con-
 tacted portion (37),
 when the yarn guiding member (35) is located
 at the guiding position, the stopper (36) is po-
 sitioned at a position where the stopper (36) does
 not interfere with the movement trajectory of the
 contacted portion (37), and
 the driving roller (63) is adapted to be held at
 the held position by the stopper (36) making con-
 tact with the contacted portion (37).
9. The service vehicle (3) according to claim 7 or claim
 8, further comprising a control section adapted to
 control movements of the yarn guiding member (35)
 and the driving roller (63),
 wherein the control section is adapted to perform a
 control to sequentially execute a releasing step, a
 roller advancing step, a package driving step, a roller
 receding step, and an activation step, wherein the
 releasing step being a step in which the yarn guiding
 member (35) is moved from the standby position to
 the guiding position, the roller advancing step being
 a step in which the driving roller (63) is moved to the
 contacting position, the package driving step being
 a step in which the cross-wound package (45) is ro-
 tationally driven by the driving roller (63), the roller
 receding position being a step in which the driving
 roller (63) is moved from the contacting position to
 the receded position, and the activation step being
 a step in which the yarn guiding member (35) is
 moved from the guiding position to the standby po-
 sition.
10. The service vehicle (3) according to any one of claim
 1 through claim 9, further comprising a travelling
 wheel, and a vehicle driving section adapted to drive
 the travelling wheel.
11. A textile machine (1) comprising:
 the service vehicle (3) according to any one of
 claim 1 through claim 10; and
 a plurality of yarn winding units (2), each of which
 is adapted to wind a yarn (10) to form a cross-
 wound package (45),
 wherein the service vehicle (3) is adapted to be
 assigned with all or a portion of the plurality of
 the yarn winding units (2) as an assigned range,
 and is adapted to perform service with respect
 to a serving unit (2), the servicing unit (2) being
 one of the yarn winding units (2) belonging to

the assigned range, and
the driving roller (63) is adapted to rotationally
drive the cross-wound package (45) of the serv-
icing unit (2) in an unwinding direction.

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- 12.** The textile machine (1) according to claim 11, where-
in the service vehicle (3) includes a yarn joining de-
vice (43) adapted to perform a yarn joining operation
with respect to the servicing unit (2), and
the first driving section (66) is adapted to move the
driving roller (63) to the contacting position prior to
performance of the yarn joining operation by the yarn
joining device (43).

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THE

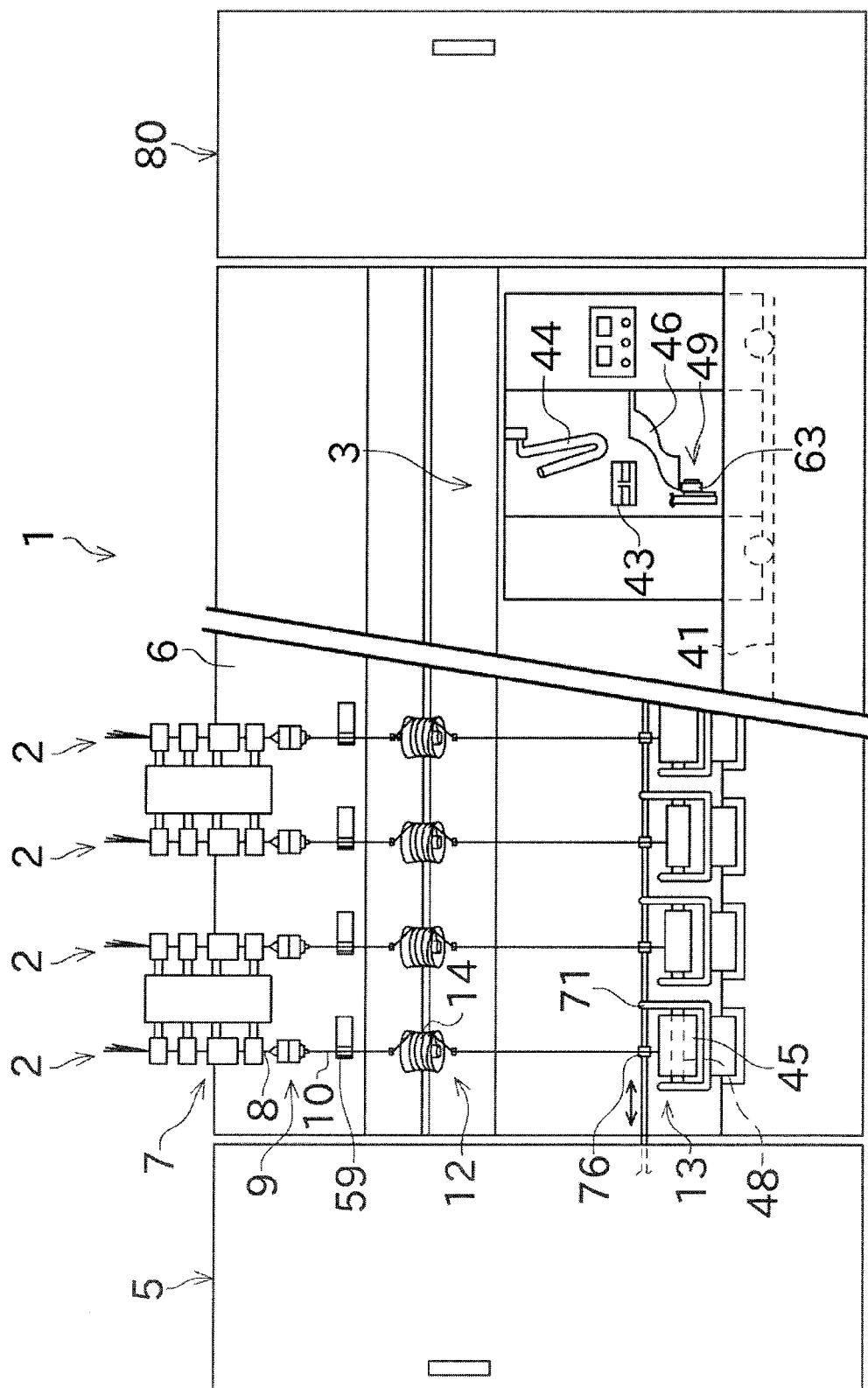


FIG. 2

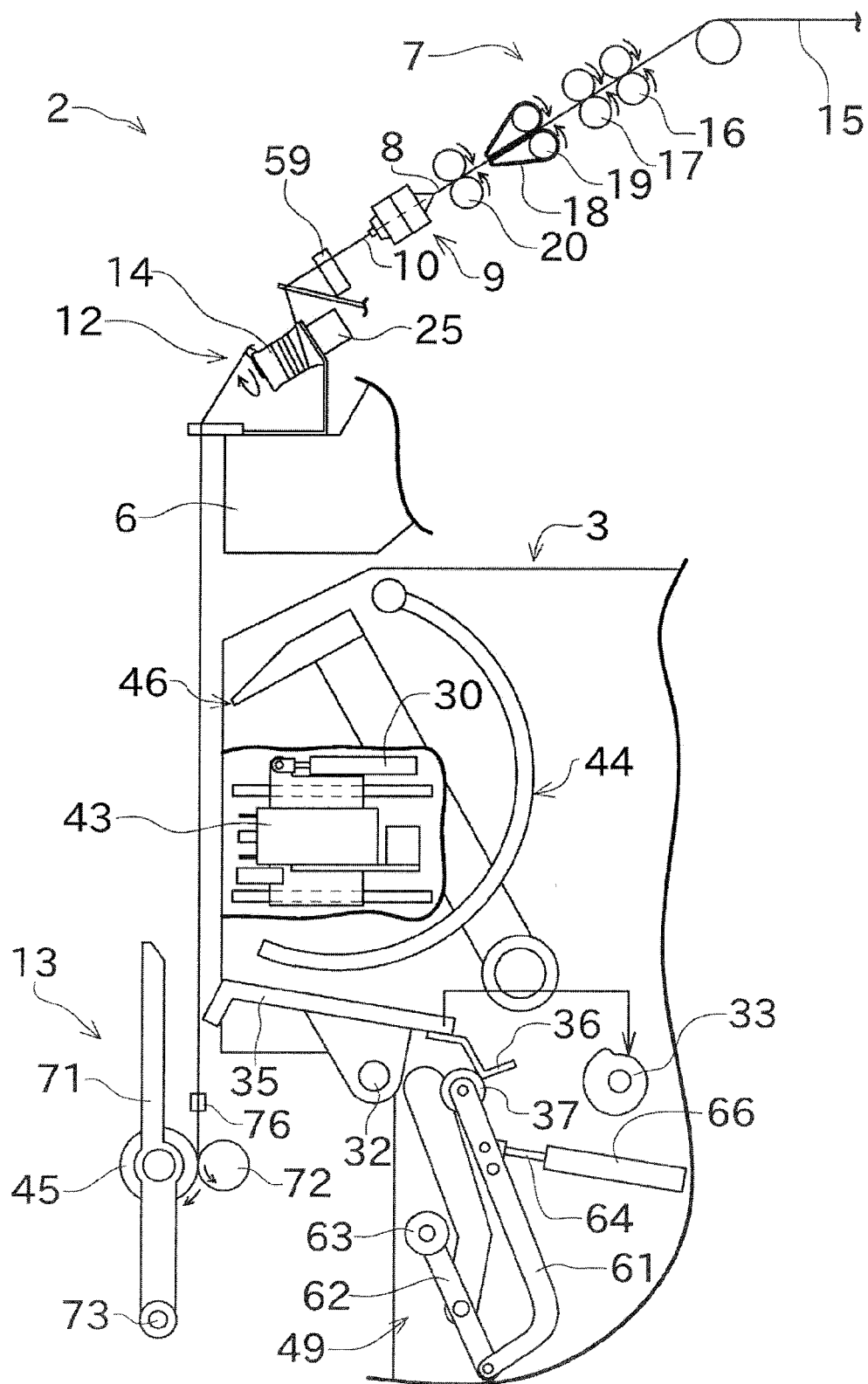


FIG. 3

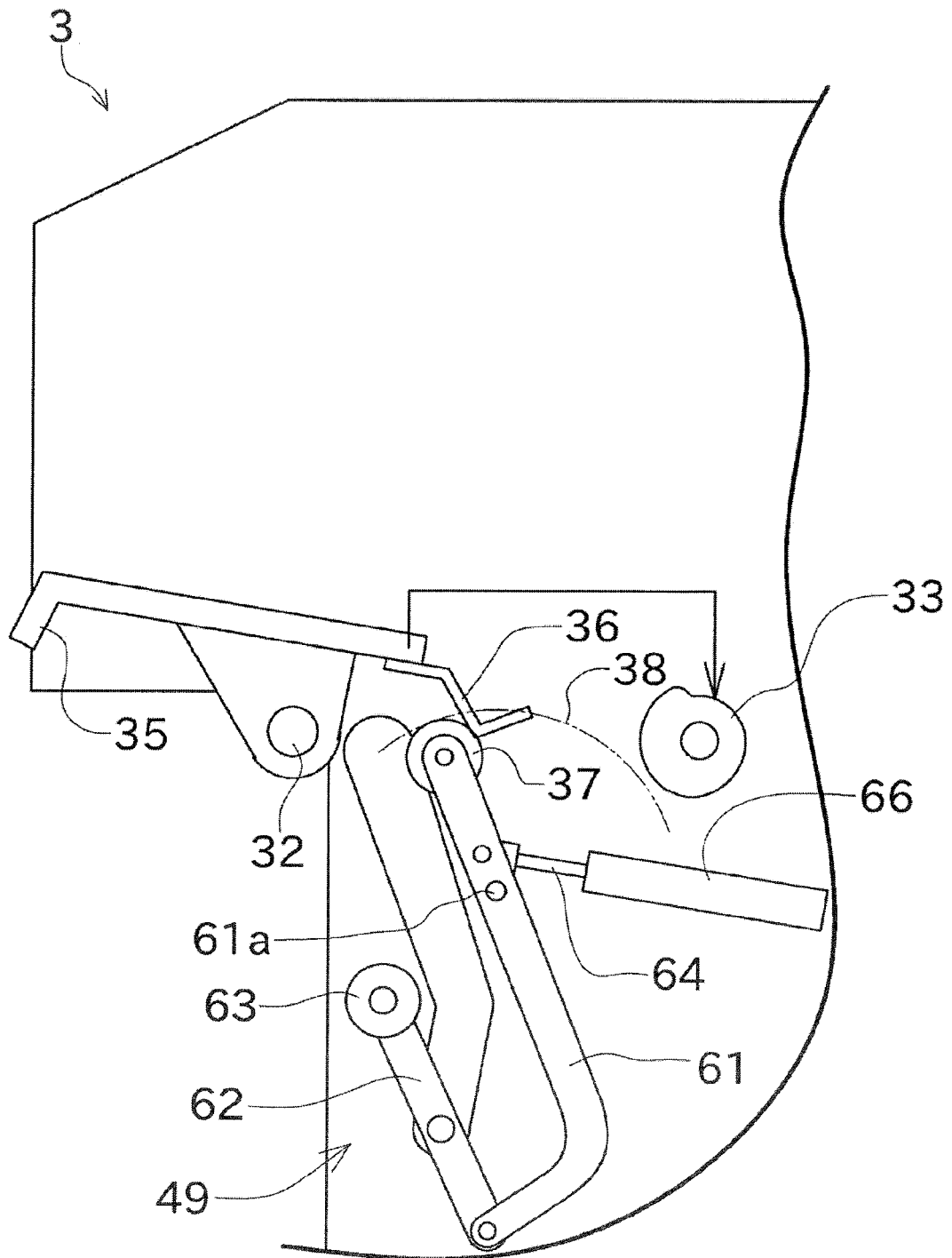


FIG. 4

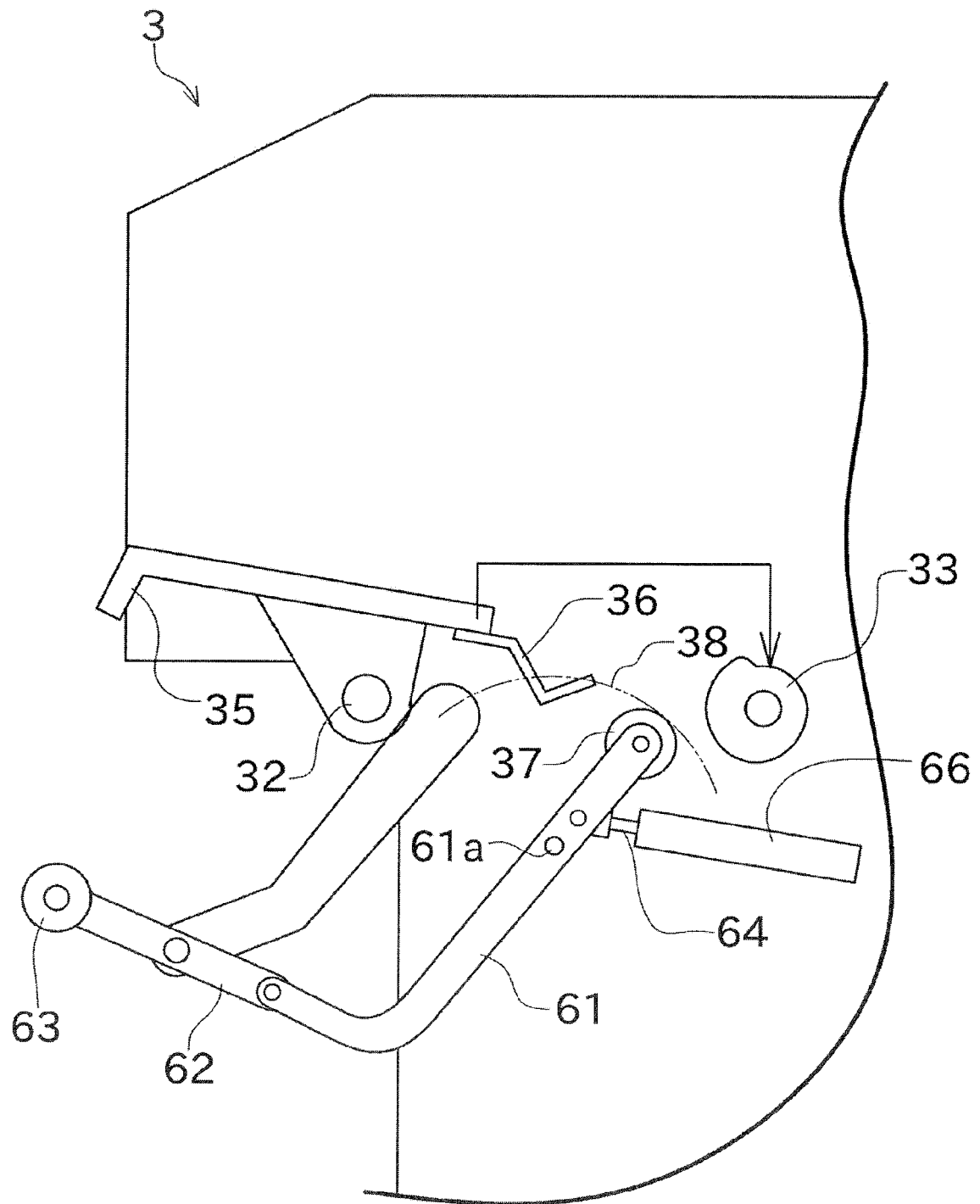


FIG. 5

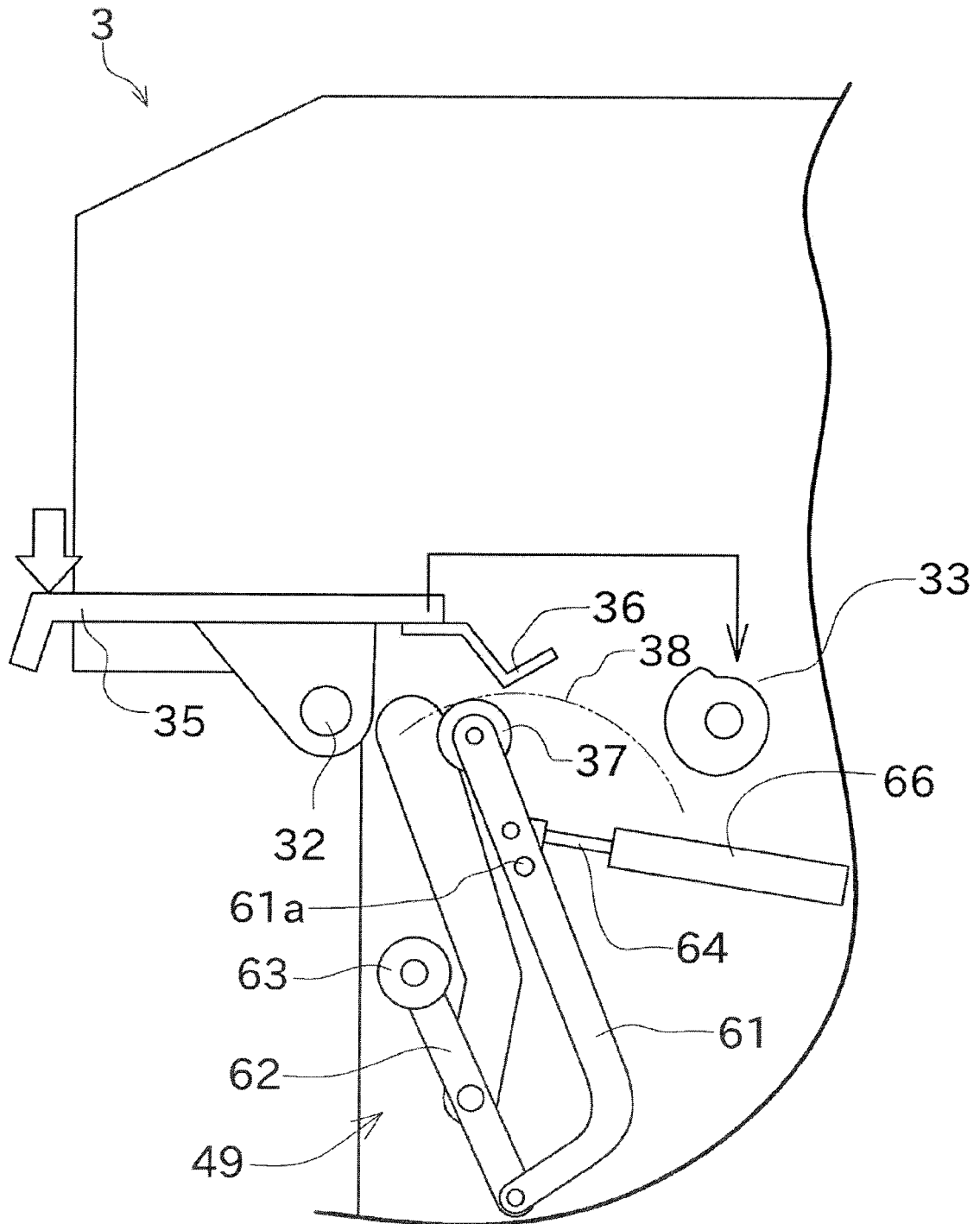


FIG. 6

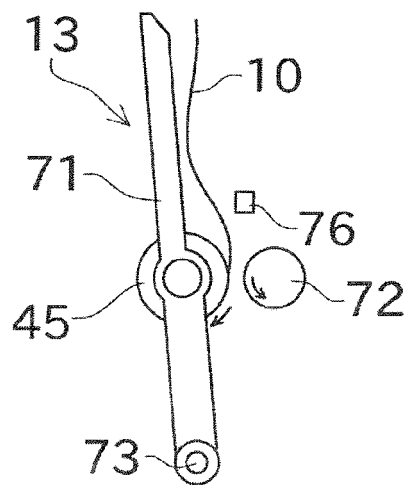
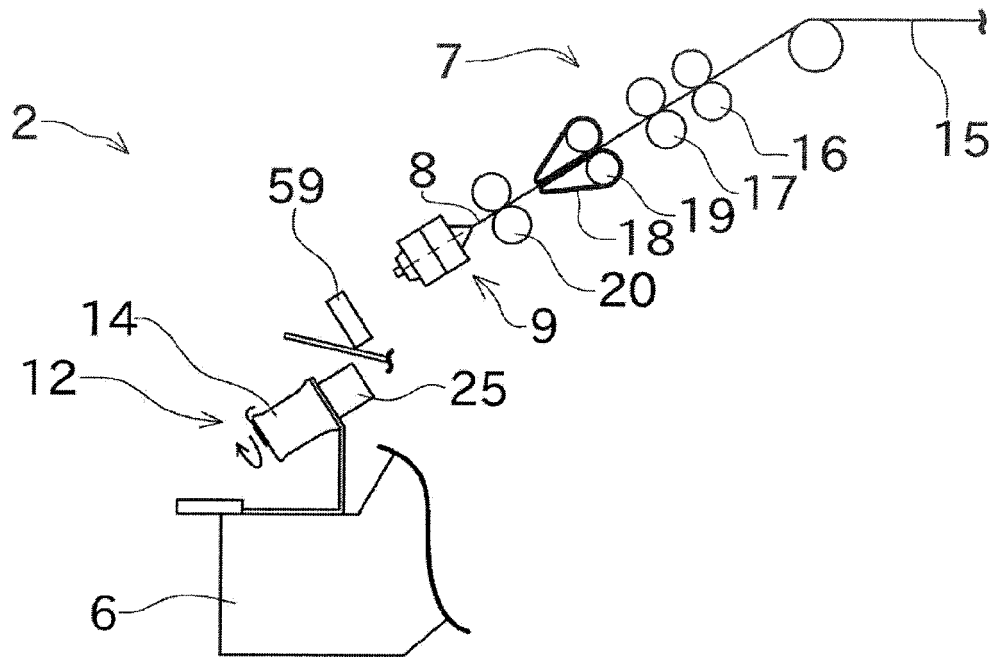


FIG. 7

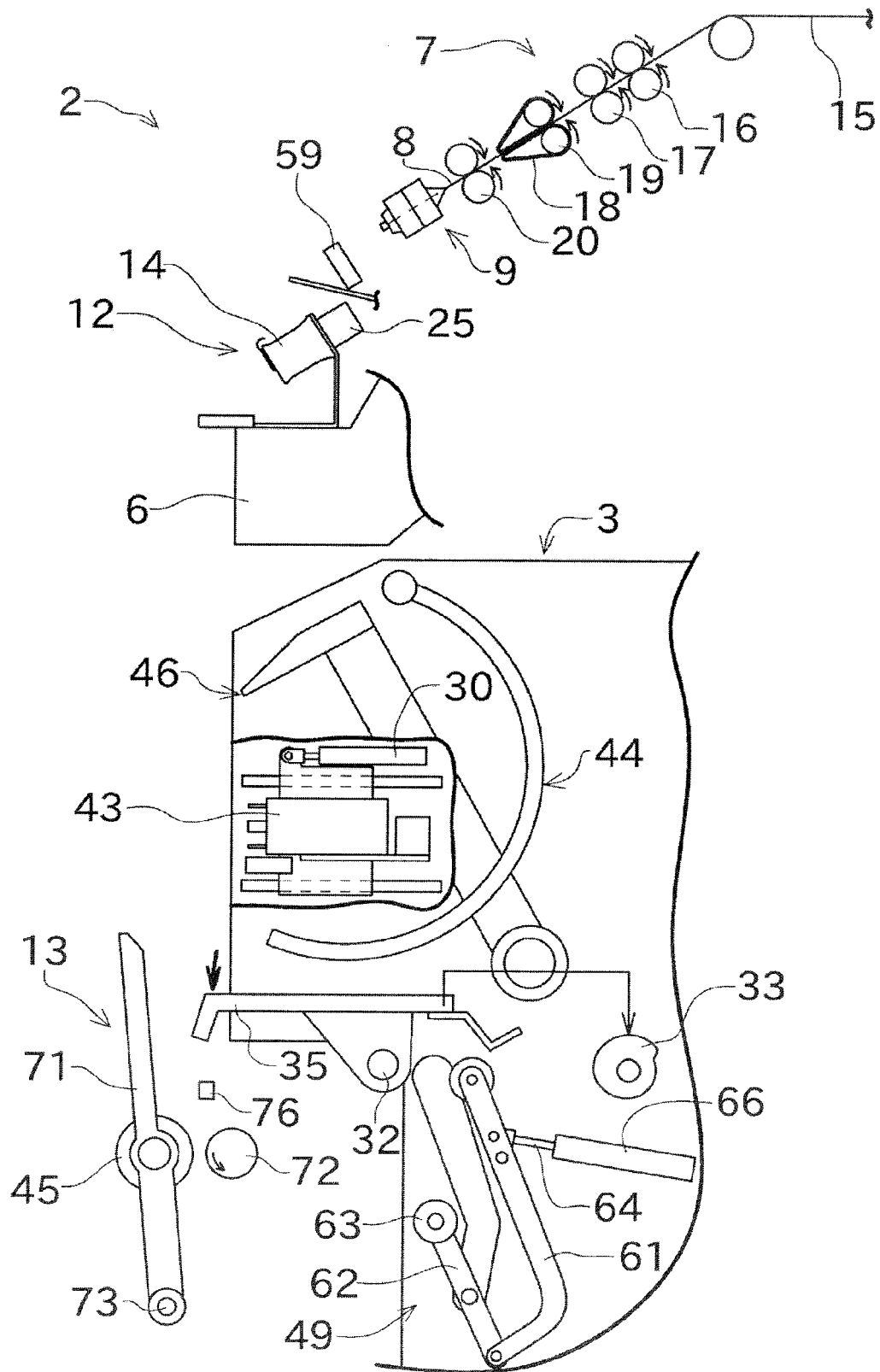


FIG. 8

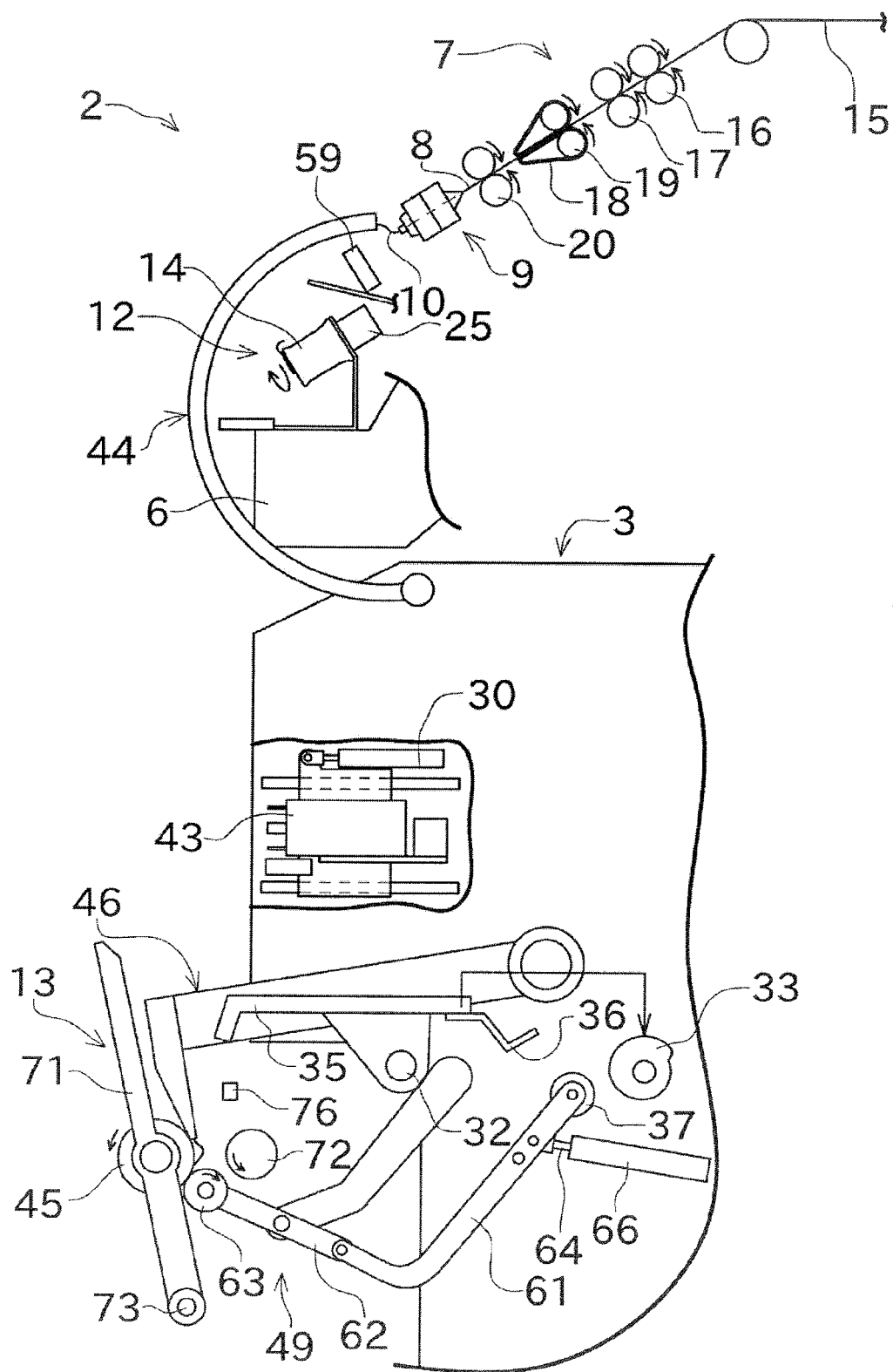


FIG. 9

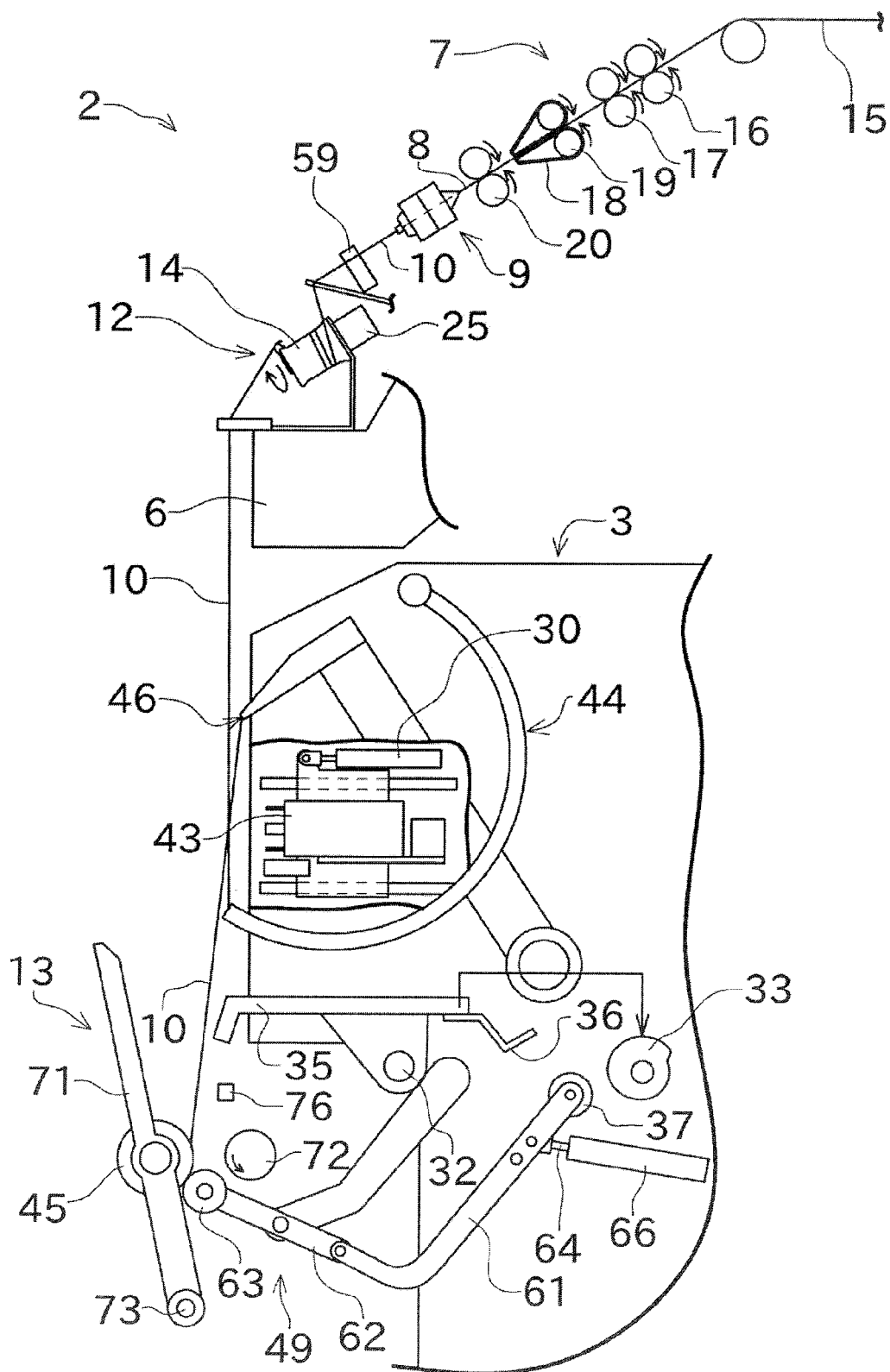


FIG. 10

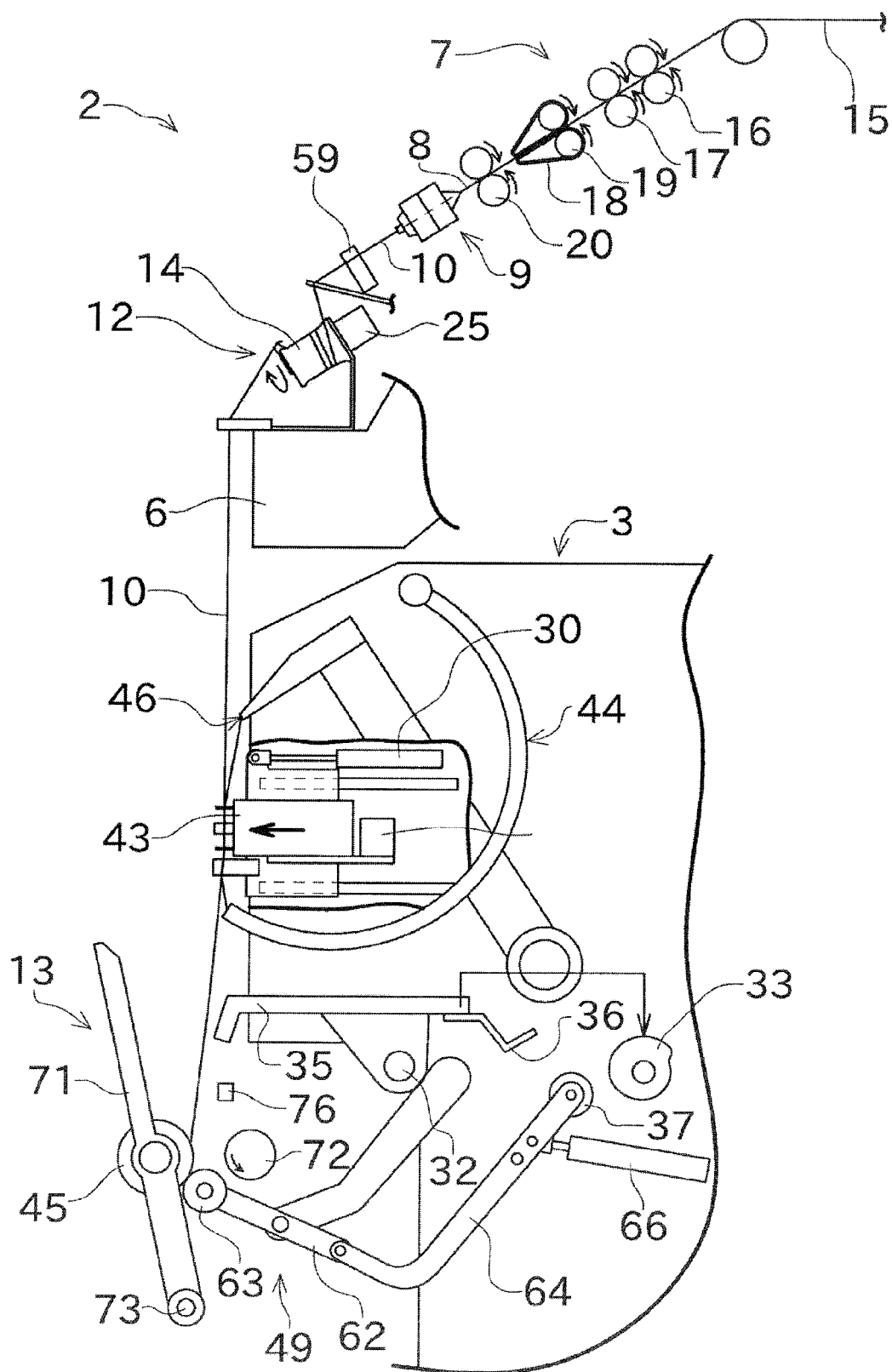
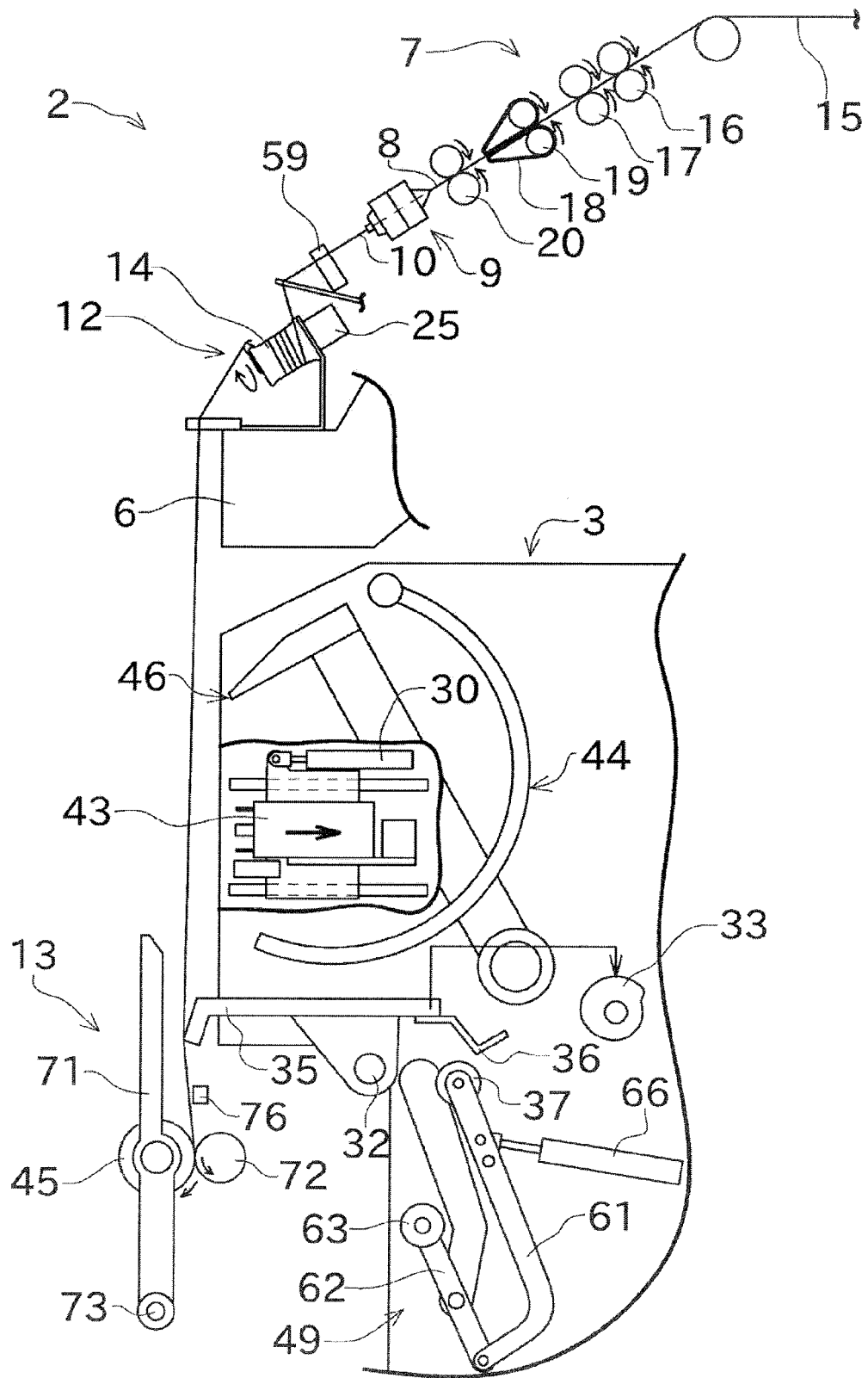


FIG. 11





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Y	* column 3, line 13 - line 18 * * column 5, line 37 - column 6, line 24 * * column 1, line 14 - line 15 * * column 1, line 43 - line 44 * * figures 1,2 *	2,6,7,12	
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			D01H B65H
Place of search		Date of completion of the search	Examiner
Munich		22 January 2015	Humbert, Thomas
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