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(54) **Draft device and spinning machine**

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a draft device, and a spinning machine provided with the draft device.

2. Description of the Related Art

[0002] Conventionally, there are known a spinning unit and a spinning machine adapted to draft a fiber bundle by a draft device and twist the drafted fiber bundle to produce a spun yarn.

[0003] The draft device includes a plurality of roller pairs such as a back roller pair, a middle roller pair, and a front roller pair, which are arranged in this order from upstream towards downstream in a drafting direction of the fiber bundle. Each of the roller pairs includes a bottom roller, which is a driving roller, and a top roller, which makes contact with the bottom roller and rotates accompanying rotation of the bottom roller. Each of the top rollers is integrally held by a draft cradle (hereinafter simply referred to as a cradle). Each of the bottom rollers is integrally held by a device frame.

[0004] An apron belt is wound around the middle bottom roller and the middle top roller, respectively. Tension and position of the apron belt (a position in a direction parallel to a drafting direction, and a position in a direction orthogonal to the drafting direction) are regulated by a tensor bar. Thus, a mounting state of the tensor bar influences the tension and the position of the apron belt. When the tension and the position of the apron belt change, a drafting state changes, and thickness unevenness or the like occurs in the fiber bundle drafted by the draft device to influence quality of the fiber bundle.

[0005] Conventionally, as a structure for mounting the bottom-roller side tensor bar in the draft device, a structure for mounting a bracket to the device frame of the draft device and mounting the tensor bar to the bracket is known (see e.g., Japanese Unexamined Patent Publication No. 2008-81865 (Patent Document 1)). In Patent Document 1, the tensor bar has a length extending over two adjacent spinning units, and a central portion of the tensor bar is supported by the bracket. Apron belts for the two adjacent spinning units are wound around both ends of the tensor bar.

[0006] However, in the structure of Patent Document 1, the tensor bar has the central part supported but the both ends are free ends, and a length of the tensor bar is long. Thus, when the apron belt is provided, the bracket supporting the tensor bar may bend or the tensor bar itself may bend. If there is a difference in the tension of the apron belts of the two adjacent spinning units, the apron belts may be positioned at different positions in the respective spinning unit. Therefore, with the structure of Patent Document 1, it is difficult to ensure positioning accuracy of the tensor bar with respect to the middle bottom roller.

[0007] There is also known a structure in which both ends, rather than the central part, of the tensor bar are supported (see e.g., Japanese Unexamined Patent Publication No. 10-158942 (Patent Document 2)). In the structure of Patent Document 2, a projection is formed at both ends of the tensor bar. Although not clearly described in Patent Document 2, the projection formed at both ends of the tensor bar is fitted into a concave provided between the middle bottom roller and the middle top roller to position and fix the tensor bar.

[0008] In the structure of Patent Document 2, the concave provided between the middle bottom roller and the middle top roller requires a size enabling the projection at both ends of the tensor bar to be fitted thereto. Therefore, a supporting member forming the concave inevitably becomes larger than the projection. That is, in the structure of Patent Document 2, a space for arranging the supporting member larger than the projection is necessary between the middle bottom roller and the middle top roller.

[0009] Generally, in a roving frame or a (ring) spinning machine, a diameter of each draft roller is small since a drafting speed is slow. With such a draft device, since there is a margin in space between the middle bottom roller and the middle top roller, the space for arranging the supporting member larger than the projection can be easily ensured. However, if the drafting speed is high as with a draft device of a pneumatic spinning machine, for example, the diameter of each draft roller inevitably becomes larger than the diameter of the draft roller of the ring spinning machine and the like. If the diameter of the draft roller is made large, there is no margin in the space between the middle bottom roller and the middle top roller, and the space for arranging the supporting member provided with the concave cannot be easily ensured. Therefore, the structure of Patent Document 2 is difficult to be adopted in the draft device in which the drafting speed is high.

[0010] The nearest state of the art regarding the present invention is disclosed in EP 1801270 A1 and JP 2010144297 A.

EP 1801270 A1 already discloses a draft device with a first supporting section adapted to rotatably support a front bottom roller,

a second supporting section adapted to rotatably support a middle bottom roller,

a tensor bar adapted to regulate tension and position of an apron belt wound around the middle bottom roller.

JP 2010144297 A already discloses a spinning machine with a draft device, a pneumatic spinning section adapted to produce a spun yarn by applying twists by air to the fiber bundle drafted by the draft device, and a winding section adapted to wind the spun yarn produced by the pneumatic spinning section into a package.

BRIEF SUMMARY OF THE INVENTION

[0011] An object of the present invention is to provide a draft device and a spinning machine in which positioning accuracy of a tensor bar with respect to a middle bottom roller is high.

[0012] A draft device according to a first aspect of the invention includes a first supporting section, a second supporting section, a tensor bar, and a third supporting section. The first supporting section is adapted to rotatably support a front bottom roller. The second supporting section is adapted to rotatably support a middle bottom roller. The tensor bar is adapted to regulate tension and position of an apron belt wound around the middle bottom roller. The third supporting section is arranged on at least one of the first supporting section and the second supporting section, and includes a protrusion adapted to support the tensor bar by being fitted in a concave formed on the tensor bar.

[0013] The draft device according to a second aspect of the invention relates to the draft device according to the first aspect, wherein the third supporting section is integrally formed with the second supporting section.

[0014] The draft device according to a third aspect of the invention relates to the draft device according to the first aspect, wherein the third supporting section is integrally formed with the first supporting section.

[0015] The draft device according to a fourth aspect of the invention relates to the draft device according to the first aspect, wherein the first supporting section, the second supporting section, and the third supporting section are integrally formed.

[0016] The draft device according to a fifth aspect of the invention relates to the draft device according to any one of the first to fourth aspects, wherein the third supporting section includes a first divided supporting section and a second divided supporting section. The first divided supporting section and the second divided supporting section support both ends of the tensor bar.

[0017] A sixth aspect of the invention includes the draft device according to any one of the first to fifth aspects, a pneumatic spinning section, and a winding section. The pneumatic spinning section is adapted to produce a spun yarn by applying twists by air to a fiber bundle drafted by the draft device. The winding section is adapted to wind the spun yarn produced by the pneumatic spinning section into a package.

[0018] According to the first aspect, since the positioning accuracy of the tensor bar and the middle bottom roller, which are important elements in drafting, is improved, stability in drafting is improved. Even if an installation space of the draft device is limited, the tensor bar can be reliably supported.

[0019] According to the second aspect, the positioning accuracy of the tensor bar with respect to the middle bottom roller is improved.

[0020] According to the third aspect, even if the first supporting section is large and the third supporting section cannot be formed near the second supporting section, the third supporting section can be provided, and the positioning accuracy of the tensor bar with respect to the middle bottom roller can be improved.

[0021] According to the fourth aspect, a position adjustment operation between the middle bottom roller and the front bottom roller is not required, and the positioning accuracy is improved. The positioning accuracy of the tensor bar with respect to the middle bottom roller is thus improved. Therefore, a stable fiber bundle can be produced by the draft device.

[0022] According to the fifth aspect, bending at both ends of the tensor bar can be suppressed, and the position of the tensor bar with respect to the middle bottom roller can be stabilized.

[0023] According to the sixth aspect, since the positioning accuracy of the tensor bar with respect to the middle bottom roller is high, the spun yarn can be produced from the stably drafted fiber bundle, and quality of the spun yarn produced by the spinning machine can be improved.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024]

FIG. 1 is a front view of a spinning machine according to a first embodiment of the present invention;
FIG. 2 is a schematic side view of a spinning unit;
FIG. 3 is a side view of a draft device at a drafting position according to the first embodiment of the present invention;
FIG. 4 is a schematic plan view illustrating a periphery of a middle bottom roller and a front bottom roller of the draft device;
FIG. 5A is a cross-sectional view taken along line A-A of FIG. 4;
FIG. 5B is a cross-sectional view taken along line B-B of FIG. 4;
FIG. 6 is a schematic plan view illustrating a periphery of a middle bottom roller and a front bottom roller of a draft device according to a second embodiment of the present invention;
FIG. 7 is a cross-sectional view taken along line C-C of FIG. 6;
FIG. 8 is a schematic plan view illustrating a periphery of a middle bottom roller and a front bottom roller of a draft device according to a third embodiment of the present invention; and
FIG. 9 is a cross-sectional view taken along line D-D of FIG. 8.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0025] Embodiments of the invention will be hereinafter described with reference to the drawings.

[0026] A draft device D and a spinning machine M ac-

cording to a first embodiment of the present invention will be described with reference to FIG. 1 to FIG. 5B.

[0027] First, an outline of the spinning machine M will be described. "Upstream" and "downstream" respectively refer to upstream and downstream in a travelling direction of a fiber bundle F and a spun yarn Y in a spinning unit U.

[0028] As illustrated in FIG. 1 and FIG. 2, the spinning machine M includes a plurality of spinning units U arranged in line, a yarn joining cart 3, a blower box 4, and a motor box 5. Each spinning unit U includes a draft device D, a spinning device 11, a yarn clearer 12, a yarn slack eliminating device 13, and a winding device 21.

[0029] As illustrated in FIG. 2, the draft device D drafts the fiber bundle (a sliver) F supplied through a trumpet T from a can (not illustrated) arranged at a back of the spinning unit U. The draft device D of the present embodiment includes a plurality of roller pairs R in which a feeding speed gradually becomes faster from the upstream towards the downstream in the travelling direction of the fiber bundle F. Each of the roller pairs R respectively includes top rollers RB1, RT1, RM1, and RF1, and bottom rollers RB2, RT2, RM2, and RF2 (see FIG. 3). The draft device D will be specifically described later.

[0030] The spinning device 11 uses whirling airflow to apply twists to the fiber bundle F to produce the spun yarn Y. Although detailed description and illustration will be omitted, the spinning device 11 includes a fiber guiding section, a whirling airflow generating nozzle, and a hollow guide shaft body. The fiber guiding section guides the fiber bundle F fed from the draft device D to a spinning chamber formed inside the spinning device 11. The whirling airflow generating nozzle is arranged at a periphery of a path of the fiber bundle F to generate the whirling airflow in the spinning chamber. This whirling airflow causes fiber ends of the fiber bundle F in the spinning chamber to be reversed and to whirl. The hollow guide shaft body guides the spun yarn Y from the spinning chamber to outside the spinning device 11. Driving and stopping of the spinning device 11 are controlled by a unit controller (not illustrated) . The spinning device 11 may be a pneumatic spinning device in which a needle-like member is not provided but a function of the needle-like member is realized by a downstream end of the fiber guiding section, or a pneumatic spinning device including a pair of air-jet nozzles for applying twists in directions opposite to each other.

[0031] The yarn clearer 12 monitors thickness abnormality of the spun yarn Y fed from the spinning device 11 and/or presence or absence of foreign materials contained in the spun yarn Y. When a yarn defect of the spun yarn Y is detected, the yarn clearer 12 transmits a yarn defect detection signal to the unit controller (not illustrated).

[0032] The yarn slack eliminating device 13 applies a predetermined tension on the spun yarn Y to pull out the spun yarn Y from the spinning device 11. The yarn slack eliminating device 13 adjusts the tension such that a fluctuation of tension from the winding device 21 is not transmitted towards the spinning device 11. During operation by the yarn joining cart 3, the yarn slack eliminating device 13 accumulates the spun yarn Y fed from the spinning device 11 to prevent slackening of the spun yarn Y.

[0033] The winding device 21 winds the spun yarn Y fed from the spinning device 11 to form a package P. The winding device 21 includes a cradle arm 22, a winding drum 23, and a traverse device 24. The cradle arm 22 rotatably supports the package P (a bobbin). The winding drum 23 makes contact with an outer peripheral surface of the package P (the bobbin) to rotate the package P (the bobbin). The traverse device 24 traverses the spun yarn Y. The winding device 21 rotates the winding drum 23 while traversing the spun yarn Y by the traverse device 24 to rotate the package P (the bobbin) and wind the spun yarn Y.

[0034] When receiving the yarn defect detection signal from the yarn clearer 12, the unit controller immediately cuts the spun yarn Y with a cutter 14, and stops the draft device D, the spinning device 11, and the like. The unit controller transmits a control signal to the yarn joining cart 3, and the yarn joining cart 3 travels to front of the spinning unit U. Thereafter, the unit controller drives the spinning device 11 or the like again, the yarn joining cart 3 performs a yarn joining operation, and winding is resumed. Instead of using the cutter 14, the spinning unit U may stop supply of air to the spinning device 11 and cut the spun yarn Y by stopping the production of the spun yarn Y.

[0035] As illustrated in FIG. 1 and FIG. 2, the yarn joining cart 3 includes a cart section 25, and a splicer 26, a suction pipe 27, and a suction mouth 28 which are mounted on the cart section 25. When yarn breakage or yarn cut occurs in a spinning unit U, the yarn joining cart 3 travels to the relevant spinning unit U. The suction pipe 27 sucks and catches a yarn end fed from the spinning device 11 and guides the yarn end to the splicer 26. The suction mouth 28 sucks and catches a yarn end from the package P and guides the yarn end to the splicer 26. The splicer 26 joins the guided yarn ends.

[0036] The blower box 4 includes a blower (suction source) . A main piping (not illustrated) which is a common suction transportation pipe for the spinning units U is connected to the blower box 4. The main piping is arranged at a rear portion of the spinning units U (upstream in the drafting direction). The blower box 4 sucks, transports, and collects the fiber dusts or the like generated in each spinning unit U through the main piping.

[0037] The motor box 5 includes a motor as a driving source of the spinning machine M, a decelerator for transmitting power to each section of the spinning machine M, and the like.

[0038] Next, the draft device D will be described in detail. As illustrated in FIG. 3 to FIG. 5B, the draft device D includes a plurality of roller pairs R, a cradle 31, and a device frame 32.

[0039] As illustrated in FIG. 3, in the present embodi-

ment, the plurality of roller pairs R include a back roller pair RB, a third roller pair RT, a middle roller pair RM, and a front roller pair RF. The roller pairs RB, RT, RM, and RF are arranged at a predetermined interval from the upstream towards the downstream in the travelling direction of the fiber bundle F. Each of the roller pairs RB, RT, RM, and RF respectively includes top rollers RB1, RT1, RM1, and RF1 on an upper side, and bottom rollers RB2, RT2, RM2, and RF2 on a lower side. The bottom rollers RB2, RT2, RM2, and RF2 are driving rollers. The top rollers RB1, RT1, RM1, and RF1 are driven rollers that respectively make contact with the bottom rollers RB2, RT2, RM2, and RF2 and rotate accompanying the rotation of the bottom rollers RB2, RT2, RM2, and RF2. A rotation speed of each of the roller pairs RB, RT, RM, and RF gradually increases from the upstream towards the downstream. The spinning device 11 is arranged downstream of the front roller pair RF.

[0040] The back top roller RB1, the third top roller RT1, the middle top roller RM1, and the front top roller RF1 are integrally and swingably attached to the cradle 31. Each of the top rollers RB1, RT1, RM1, and RF1 for two adjacent spinning units U is attached to the cradle 31 (see FIG. 1) . The back bottom roller RB2, the third bottom roller RT2, the middle bottom roller RM2, and the front bottom roller RF2 are respectively provided in the device frame 32 in correspondence with each of the top rollers RB1, RT1, RM1, and RF1 of the cradle 31. Each of the bottom rollers RB2, RT2, RM2, and RF2 for two adjacent spinning units U is provided in the device frame 32.

[0041] A tensor bar TB1 is arranged between the middle top roller RM1 and the front top roller RF1. The tensor bar TB1 regulates tension and position of an apron belt E1 wound around the middle top roller RM1 and the tensor bar TB1 (see FIG. 3). The tensor bar TB1 is provided in the cradle 31.

[0042] A tensor bar TB2 is arranged between the middle bottom roller RM2 and the front bottom roller RF2. The tensor bar TB2 regulates tension and position of an apron belt E2 wound around the middle bottom roller RM2 and the tensor bar TB2 (see FIG. 3). The tensor bar TB2 is supported by the device frame 32. A mounting structure of the front bottom roller RF2, the middle bottom roller RM2, and the tensor bar TB2 to the device frame 32 will be specifically described later.

[0043] The cradle 31 is swingable with respect to the device frame 32 with a swing shaft 33 as a center. The swing shaft 33 is provided in an upstream portion of the cradle 31. When the cradle 31 is swung, each of the top rollers RB1, RT1, RM1, and RF1 moves closer to or moves away from each of the bottom rollers RB2, RT2, RM2, and RF2. A position where the cradle 31 is closed and each of the top rollers RB1, RT1, RM1, and RF1 makes contact with each of the bottom rollers RB2, RT2, RM2, and RF2 is a drafting position. A position where the cradle 31 is opened for maintenance or the like and each of the top rollers RB1, RT1, RM1, and RF1 is separated from each of the bottom rollers RB2, RT2, RM2, and RF2 is a non-drafting position. The cradle 31 can switch each of the top rollers RB1, RT1, RM1, and RF1 and each of the bottom rollers RB2, RT2, RM2, and RF2 to the drafting position and the non-drafting position.

[0044] The operator operates a handle 34 to perform a swinging operation of the cradle 31. When the cradle 31 is closed to the drafting position, a hook section 35 at a tip-end of a lower part of the handle 34 is engaged with a fixed roller 36 on the device frame 32 side, and a pressure contacting state of each of the top rollers RB1, RT1, RM1, and RF1 and each of the bottom rollers RB2, RT2, RM2, and RF2 is maintained.

[0045] Since a distance between each of the roller pairs RB, RT, RM, and RF is determined by a fiber length of the fiber bundle (the sliver) F to be drafted, the distance is reviewed every time a type of the fiber bundle (the sliver) F as a material is changed. The middle bottom roller RM2 and the front bottom roller RF2 are fixed to the device frame 32, but the back bottom roller RB2 and the third bottom roller RT2 are respectively configured such that the position can be changed towards the upstream and/or downstream with respect to the device frame 32.

[0046] Next, the mounting structure of the front bottom roller RF2, the middle bottom roller RM2, and the tensor bar TB2 to the device frame 32 will be described.

[0047] As illustrated in FIG. 4, and FIG. 5A and FIG. 5B, the front bottom roller RF2 is mounted on a front bottom roller shaft SF2. The front bottom roller shaft SF2 has a length extending over two adjacent spinning units U. The front bottom rollers RF2 for two adjacent spinning units U are mounted on the front bottom roller shaft SF2. Both ends of the front bottom roller shaft SF2 are rotatably supported by a first supporting section 41. Although the illustration is omitted in FIG. 4 and FIG. 5A and FIG. 5B, since the front bottom roller RF2 is a driving roller, a driving device adapted to drive the front bottom roller RF2 is connected to the front bottom roller shaft SF2.

[0048] As illustrated in FIG. 5A, the first supporting section 41 includes a first base portion 42 and a first cover portion 43. The first base portion 42 constitutes a main body of the first supporting section 41. The first base portion 42 is fixed to the device frame 32. The first cover portion 43 is fixed to the first base portion 42. The first base portion 42 and the first cover portion 43 are respectively provided with semicircular concaves 44 and 45 corresponding to the front bottom roller shaft SF2. The first cover portion 43 is fixed to the first base portion 42 such that the concaves 44 and 45 are combined, and a shaft hole 46 adapted to rotatably support the front bottom roller shaft SF2 is formed. The first cover portion 43 is fixed to the first base portion 42 with a bolt 47. Although the illustration is omitted, a bearing and the like are assembled to the shaft hole 46.

[0049] As illustrated in FIG. 4, and FIG. 5A and FIG. 5B, the middle bottom roller RM2 is mounted on a middle bottom roller shaft SM2. The middle bottom roller shaft

SM2 has a length extending over two adjacent spinning units U. The middle bottom rollers RM2 for two adjacent spinning units U are mounted on the middle bottom roller shaft SM2. Both ends of the middle bottom roller shaft SM2 are rotatably supported by a second supporting section 51. Although the illustration is omitted in FIG. 4 and FIG. 5A and FIG. 5B, since the middle bottom roller RM2 is a driving roller, a driving device adapted to drive the middle bottom roller RM2 is connected to the middle bottom roller shaft SM2.

[0050] As illustrated in FIG. 5A and FIG. 5B, the second supporting section 51 includes a second base portion 52 and a second cover portion 53. The second base portion 52 constitutes a main body of the second supporting section 51. The second base portion 52 is fixed to the device frame 32 . The second cover portion 53 is fixed to the second base portion 52. The second base portion 52 and the second cover portion 53 are respectively provided with semicircular concaves 54 and 55 corresponding to the middle bottom roller shaft SM2. The second cover portion 53 is fixed to the second base portion 52 such that the concaves 54 and 55 are combined, and a shaft hole 56 adapted to rotatably support the middle bottom roller shaft SM2 is formed. The second cover portion 53 is fixed to the second base portion 52 with a bolt 57. Although the illustration is omitted, a bearing and the like are assembled to the shaft hole 56.

[0051] As illustrated in FIG. 4, the tensor bar TB2 has a length extending over two adjacent spinning units U. An apron belt E2 each is wound around the tensor bar TB2 and each of the middle bottom rollers RM2 for the two adjacent spinning units U. Both ends of the tensor bar TB2 are supported by a third supporting section 61 integrally formed with the second supporting section 51.

[0052] Specifically, the third supporting section 61 adapted to support the tensor bar TB2 includes a first divided supporting section 61A and a second divided supporting section 61B. The first divided supporting section 61A and the second divided supporting section 61B are respectively integrally formed with the second cover portion 53 of the second supporting section 51. The first divided supporting section 61A and the second divided supporting section 61B are formed facing the second cover portion 53 of the second supporting section 51. The first divided supporting section 61A and the second divided supporting section 61B are symmetric, and have substantially the same shape. Hereinafter, even when describing the first divided supporting section 61A and the second divided supporting section 61B, the first divided supporting section 61A and the second divided supporting section 61B will be described as the third supporting section 61 unless there is a particular need to describe separately.

[0053] The third supporting section 61 is formed at a position located downstream of the middle bottom roller shaft SM2 in the drafting direction such that the tensor bar TB2 is located between the middle bottom roller RM2 and the front bottom roller RF2. The third supporting section 61 is a protrusion that projects out with respect to the second cover portion 53 of the second supporting section 51. A cross-sectional shape of the third supporting section 61 is a square. In the present embodiment, the tensor bar TB2 is secured to the third supporting section 61 with bolts 63.

[0054] As illustrated in FIG. 5B, a concave 71 corresponding to the third supporting section 61 is formed at both ends of the tensor bar TB2. A bolt hole is formed at both ends of the tensor bar TB2 such that the third supporting section 61 is fitted into the concave 71 to fix the tensor bar TB2 with respect to the third supporting section 61 with the bolts 63.

[0055] When mounting the tensor bar TB2 to the first divided supporting section 61A and the second divided supporting section 61B of the third supporting section 61, the tensor bar TB2 is passed through the apron belts E2 for two adjacent spinning units U, and then each of the apron belts E2 is wound around the respective middle bottom roller RM2 and the tensor bar TB2. Thereafter, the concave 71 at each end of the tensor bar TB2 is respectively fitted with the first divided supporting section 61A and the second divided supporting section 61B, and fixed with the bolt 63. A position of the third supporting section 61 and a position of the concave 71 at both ends of the tensor bar TB2 are set in advance such that appropriate tension and position of the apron belt E2 (a position in a direction parallel to the drafting direction and a position in a direction orthogonal to the drafting direction) are realized.

[0056] The draft device D and the spinning machine M according to the present embodiment described above have the following effects.

[0057] In the draft device D, the third supporting section 61 adapted to support the tensor bar TB2 is integrally formed with the second supporting section 51 adapted to rotatably support the middle bottom roller RM2. Thus, the positioning accuracy of the tensor bar TB2 with respect to the middle bottom roller RM2 is improved.

[0058] The third supporting section 61 arranged in the draft device D is a protrusion adapted to fit into the concave 71 formed on the tensor bar TB2 to support the tensor bar TB2. The third supporting section 61, which is the protrusion, is provided on the second supporting section 51 to support the tensor bar TB2 with the third supporting section 61. The tensor bar TB2 can be reliably supported even if an installation space of the draft device D is limited.

[0059] The third supporting section 61 includes a first divided supporting section 61A and a second divided supporting section 61B. Both ends of the tensor bar TB2 are supported by the first divided supporting section 61A and the second divided supporting section 61B. The bending of both ends of the tensor bar TB2 can be suppressed, and the position of the tensor bar TB2 with respect to the middle bottom roller RM2 can be stabilized.

[0060] If the positioning accuracy of the tensor bar TB2 is not satisfactory, the fiber bundle F cannot be satisfac-

torily guided to the front roller pair RF. As a result, the fiber bundle F may fall off (fiber loss) without being guided to the spinning device 11, or spinning operation may not be normally carried out in the spinning device 11 and the spun yarn Y may not be spun from the spinning device 11. Even if the spun yarn Y is spun from the spinning device 11, the spun yarn Y may have thickness unevenness and/or twist unevenness, which may lower the quality of the spun yarn Y. The spinning machine M of the first embodiment includes the draft device D, the spinning device 11, and the winding device 21, and the positioning accuracy of the tensor bar TB2 with respect to the middle bottom roller RM2 is high. Therefore, the spinning machine M can produce the spun yarn Y from the stably drafted fiber bundle F, and the quality of the spun yarn Y produced by the spinning machine M is improved.

[0061] The draft device D and the spinning machine M according to a second embodiment of the present invention will be described with reference to FIG. 6 and FIG. 7. The second embodiment greatly differs from the first embodiment in that the third supporting section 61 adapted to support the tensor bar TB2 is integrally formed with the first supporting section 41. Since the configuration other than the mounting structure of the front bottom roller RF2, the middle bottom roller RM2, and the tensor bar TB2 to the device frame 32 is the same as the first embodiment, the detailed description will be omitted.

[0062] As illustrated in FIG. 6 and FIG. 7, both ends of the tensor bar TB2 are supported by the first divided supporting section 61A and the second divided supporting section 61B of the third supporting section 61 integrally formed with the first supporting section 41.

[0063] Specifically, the third supporting section 61 adapted to support the tensor bar TB2 is integrally formed with the first cover portion 43 of the first supporting section 41. The third supporting section 61 is formed at a position located upstream of the front bottom roller shaft SF2 in the drafting direction such that the tensor bar TB2 is located between the middle bottom roller RM2 and the front bottom roller RF2. The third supporting section 61 is a protrusion projecting out with respect to the first cover portion 43 of the first supporting section 41. A cross-sectional shape of the third supporting section 61 is a square.

[0064] When mounting the tensor bar TB2 to the third supporting section 61, the tensor bar TB2 is first passed through each of the apron belts E2 for the two adjacent spinning units U , and then each of the apron belts E2 is respectively wound around the middle bottom roller RM2 and the tensor bar TB2. Thereafter, the concave 71 at both ends of the tensor bar TB2 is fitted to the first divided supporting section 61A and the second divided supporting section 61B, and fixed with the bolt 63. The position of the third supporting section 61 and the position of the concave 71 at both ends of the tensor bar TB2 are set in advance such that the appropriate tension and position of the apron belt E2 (the position in the direction parallel to the drafting direction and the position in the direction orthogonal to the drafting direction) are realized.

[0065] The draft device D and the spinning machine M according to the present embodiment described above have the following effects.

[0066] In the draft device D and the spinning machine M, the third supporting section 61 adapted to support the tensor bar TB2 is integrally formed with the first supporting section 41 adapted to rotatably support the front bottom roller RF2. Thus, even if the first supporting section 41 is large and the third supporting section 61 cannot be formed near the second supporting section 51, the third supporting section 61 can be provided on the first supporting section 41, and the positioning accuracy of the tensor bar TB2 with respect to the middle bottom roller RM2 can be improved.

[0067] The draft device D and the spinning machine M according to a third embodiment of the present invention will be described with reference to FIG. 8 and FIG. 9. The third embodiment greatly differs from the first embodiment and the second embodiment in that the first supporting section 41, the second supporting section 51, and the third supporting section 61 are integrally formed. The configuration other than the mounting structure of the front bottom roller RF2, the middle bottom roller RM2, and the tensor bar TB2 to the device frame 32 is the same as the first embodiment, and thus the detailed description will be omitted.

[0068] As illustrated in FIG. 8 and FIG. 9, the first base portion 42 of the first supporting section 41 and the second base portion 52 of the second supporting section 51 are integrally formed. The first cover portion 43 of the first supporting section 41 and the second cover portion 53 of the second supporting section 51 are integrally formed. Both ends of the tensor bar TB2 are supported by the first divided supporting section 61A and the second divided supporting section 61B of the third supporting section 61 integrally formed with the first supporting section 41. The third supporting section 61 is formed at a position located upstream of the front bottom roller shaft SF2 in the drafting direction such that the tensor bar TB2 is located between the middle bottom roller RM2 and the front bottom roller RF2. The third supporting section 61 is a protrusion projecting out with respect to the first cover portion 43 of the first supporting section 41. A cross-sectional shape of the third supporting section 61 is a square.

[0069] When mounting the tensor bar TB2 to the third supporting section 61, the tensor bar TB2 is passed through each of the apron belts E2 for the two adjacent spinning units U, and then each of the apron belts E2 is wound around the middle bottom roller RM2 and the tensor bar TB2. Thereafter, the concave 71 at both ends of the tensor bar TB2 is fitted to the first divided supporting section 61A and the second divided supporting section 61B, and fixed with the bolt 63. The position of the third supporting section 61 and the position of the concave 71 at both ends of the tensor bar TB2 are set in advance such that the appropriate tension and position of the apron belt E2 (the position in the direction parallel to the drafting direction and the position in the direction orthog-

onal to the drafting direction) are realized.

[0070] The draft device D and the spinning machine M according to the present embodiment described above have the following effects.

[0071] In the draft device D and the spinning machine M, the first supporting section 41 adapted to rotatably support the front bottom roller RF2, the second supporting section 51 adapted to rotatably support the middle bottom roller RM2, and the third supporting section 61 adapted to support the tensor bar TB2 are integrally formed. Thus, the position adjustment operation between the middle bottom roller RM2 and the front bottom roller RF2 is not required, and the positioning accuracy is improved. The positioning accuracy of the tensor bar TB2 with respect to the middle bottom roller RM2 is thus improved. Accordingly, a stable fiber bundle F can be produced by the draft device D.

[0072] The embodiments of the present invention have been described above, but the present invention is not limited to the above embodiments and various modifications may be made. For example, in the present embodiment, the spinning unit U of the spinning machine M pulls out the spun yarn Y from the spinning device 11 by the yarn slack eliminating device 13. A delivery roller and a nip roller may be arranged between the spinning device 11 and the yarn slack eliminating device 13, and the spun yarn Y may be pulled out with such rollers.

[0073] The shapes of the first supporting section 41, the second supporting section 51, and the third supporting section 61 are not limited to the shapes of the present embodiment, and may adopt various shapes.

Claims

1. A draft device (D) comprising:

   a first supporting section (41) adapted to rotatably support a front bottom roller (RF2),
   a second supporting section (51) adapted to rotatably support a middle bottom roller (RM2),
   a tensor bar (TB2) adapted to regulate tension and position of an apron belt wound (E2) around the middle bottom roller (RM2), **characterized by**
   a third supporting section (61) arranged on and projecting from at least one of the first supporting section (41) and the second supporting section (51), and adapted to support the tensor bar (TB2), wherein
   the third supporting section (61)is adapted to support the tensor bar (TB2) by being fitted in a concave (71) formed in the tensor bar (TB2).

2. The draft device (D) according to claim 1, **characterized in that** the third supporting section (61) is integrally formed with the second supporting section (51).

3. The draft device (D) according to claim 1, **characterized in that** the third supporting section (61) is integrally formed with the first supporting section (41).

4. The draft device (D) according to claim 1, **characterized in that** the first supporting section (41), the second supporting section (51), and the third supporting section (61) are integrally formed.

5. The draft device (D) according to any one of claim 1 through claim 4, **characterized in that** the third supporting section (61) includes a first divided supporting section (61A) and a second divided supporting section (61B) that are adapted to support both ends of the tensor bar (TB2).

6. A spinning machine (M) comprising:

   the draft device (D) according to any one of claim 1 through claim 5,
   a pneumatic spinning section (11) adapted to produce a spun yarn (Y) by applying twists by air to the fiber bundle (F) drafted by the draft device (D), and
   a winding section (21) adapted to wind the spun yarn (Y) produced by the pneumatic spinning section (11) into a package (P).

Patentansprüche

1. Streckvorrichtung (D), welche aufweist:

   einen ersten Trägerabschnitt (41), der dazu ausgelegt ist, eine vordere untere Rolle (RF2) drehbar zu tragen,
   einen zweiten Trägerabschnitt (51), der dazu ausgelegt ist, eine mittlere untere Rolle (RM2) drehbar zu tragen,
   eine Zugstange (TB2), die dazu ausgelegt ist, eine Spannung und Position eines Laufriemens (E2) zu regulieren, der um die mittlere untere Rolle (RM2) herum gelegt ist, **gekennzeichnet durch**
   einen dritten Trägerabschnitt (61), der an zumindest einem des ersten Trägerabschnitts (41) und des zweiten Trägerabschnitts (51) angeordnet ist und davon vorsteht und dazu ausgelegt ist, die Zugstange (TB2) zu tragen, wobei der dritte Trägerabschnitt (61) dazu ausgelegt ist, die Zugstange (TB2) zu tragen, dem er in eine der Zugstange (TB2) ausgebildete Vertiefung (71) eingesetzt ist.

2. Die Streckvorrichtung (D) nach Anspruch 1, **dadurch gekennzeichnet, dass** der dritte Trägerabschnitt (61) mit dem zweiten Trägerabschnitt (51)

integriert ausgebildet ist.

3. Die Streckvorrichtung (D) nach Anspruch 1, **dadurch gekennzeichnet, dass** der dritte Trägerabschnitt (61) mit dem ersten Trägerabschnitt (41) integriert ausgebildet ist.

4. Die Streckvorrichtung (D) nach Anspruch 1, **dadurch gekennzeichnet, dass** der erste Trägerabschnitt (41), der zweite Trägerabschnitt (51) und der dritte Trägerabschnitt (61) integriert ausgebildet sind.

5. Die Streckvorrichtung (D) nach einem der Ansprüche 1 bis 4, **dadurch gekennzeichnet, dass** der dritte Trägerabschnitt (61) einen ersten geteilten Trägerabschnitt (61A) und einen zweiten geteilten Trägerabschnitt (61B) enthält, die dazu ausgelegt sind, beide Enden der Zugstange (TB2) zu tragen.

6. Spinnmaschine (M), welche aufweist:

die Streckvorrichtung (D) nach einem der Ansprüche 1 bis 5,
einen pneumatischen Spinnabschnitt (11), der dazu ausgelegt ist, durch Anwenden von Luftwirbeln an das von der Streckvorrichtung (D) gestreckte Faserbündel (F) ein gesponnenes Garn (Y) herzustellen, und
einen Wickelabschnitt (21), der dazu ausgelegt ist, das von dem pneumatischen Spinnabschnitt (11) hergestellte gesponnene Garn (Y) zu einer Packung (P) zu wickeln.

Revendications

1. Un dispositif de tirage (D), comprenant :

une première section supportant (41) adaptée pour supporter de manière rotative un rouleau inférieur avant (RF2),
une deuxième section supportant (51) adaptée pour supporter de manière rotative un rouleau inférieur central (RM2),
une tige tenseur (TB2) adaptée pour régler la tension et la position d'une ceinture de tablier (E2) enroulée autour du rouleau inférieur central (RM2), **caractérisé par** une troisième section supportant (61) arrangée sur et projetant d'au moins un parmi la première section supportant (41) et la deuxième section supportant (51) et adaptée pour supporter la tige tenseur (TB2), où la troisième section supportant (61) est adaptée pour supporter la tige tenseur (TB2) en étant intégrée dans un concave (71) formé dans la tige tenseur (TB2).

2. Le dispositif de tirage (D) selon la revendication 1, **caractérisé en ce que** la troisième section supportant (61) est formée intégralement avec la deuxième section supportant (51).

3. Le dispositif de tirage (D) selon la revendication 1, **caractérisé en ce que** la troisième section supportant (61) est formée intégralement avec la première section supportant (41).

4. Le dispositif de tirage (D) selon la revendication 1, **caractérisé en ce que** la première section supportant (41), la deuxième section supportant (51) et la troisième section supportant (61) sont formées intégralement.

5. Le dispositif de tirage (D) selon une des revendications 1 à 4, **caractérisé en ce que** la troisième section supportant (61) comprend une première section supportant divisée (61A) et une deuxième section supportant devisée (61B) qui sont adaptées pour supporter les deux extrémités de la tige tenseur (TB2).

6. Une machine à filer (M), comprenant :

le dispositif de tirage (D) selon une des revendications 1 à 5,
une section de filature pneumatique (11) adaptée pour produire un fil filé (Y) en appliquant des torsions a l'air au faisceau de fibres (F) tiré par le dispositif de tirage (D), et
une section de bobinage (21) adaptée pour enrouler le fil filé (Y) produit par la section de filature pneumatique (11) en un paquet (P).

FIG. 1

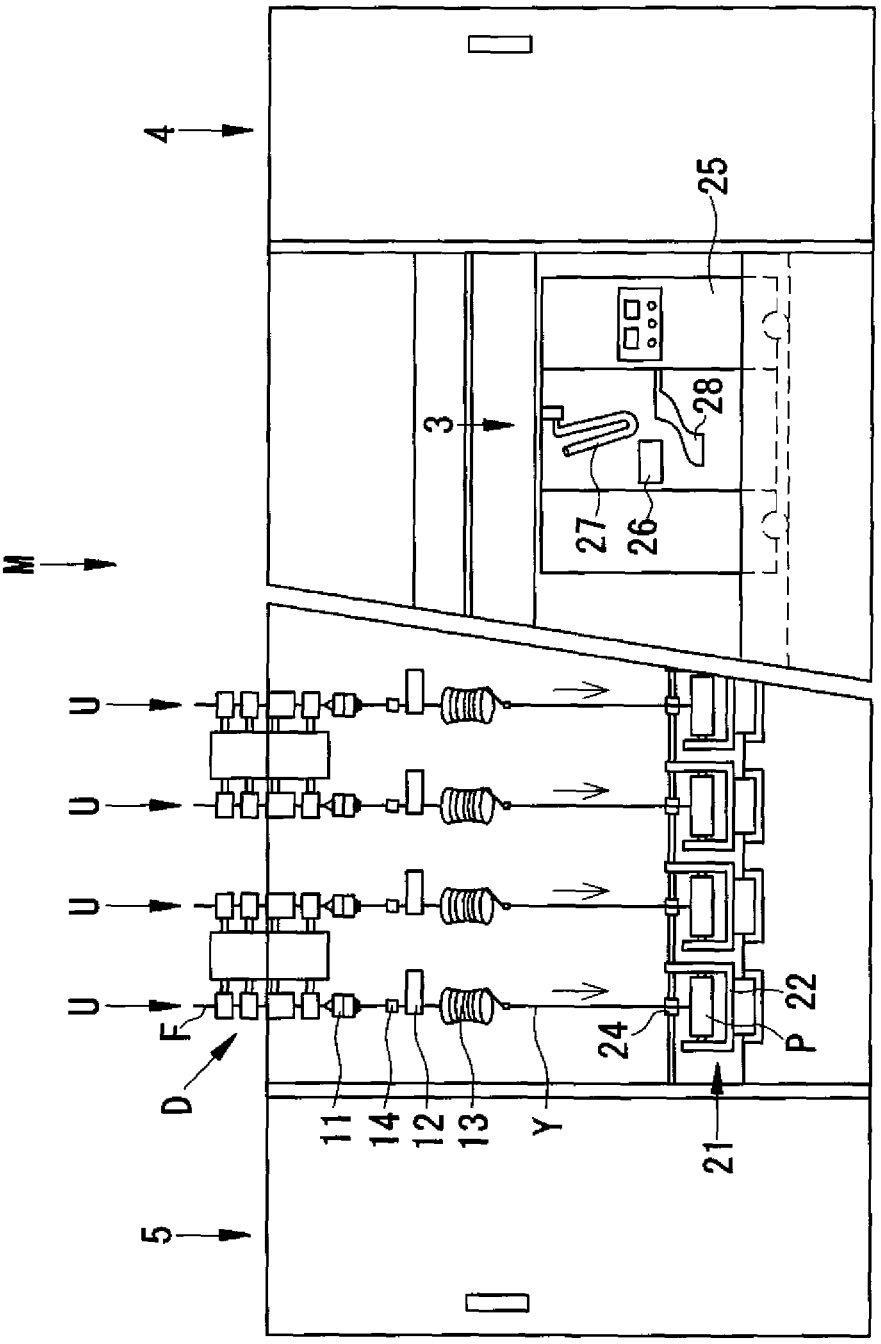


FIG. 2

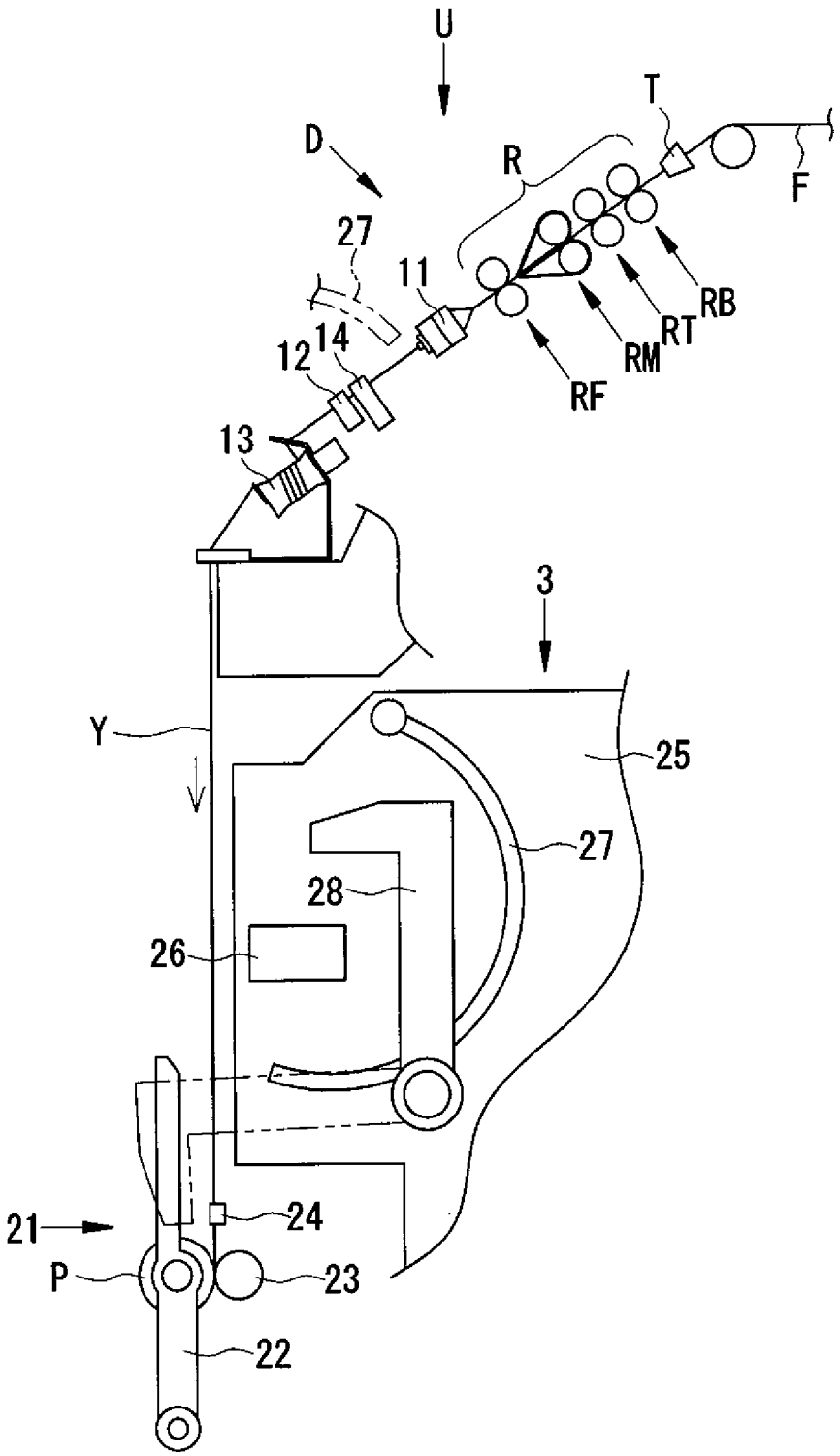


FIG. 3

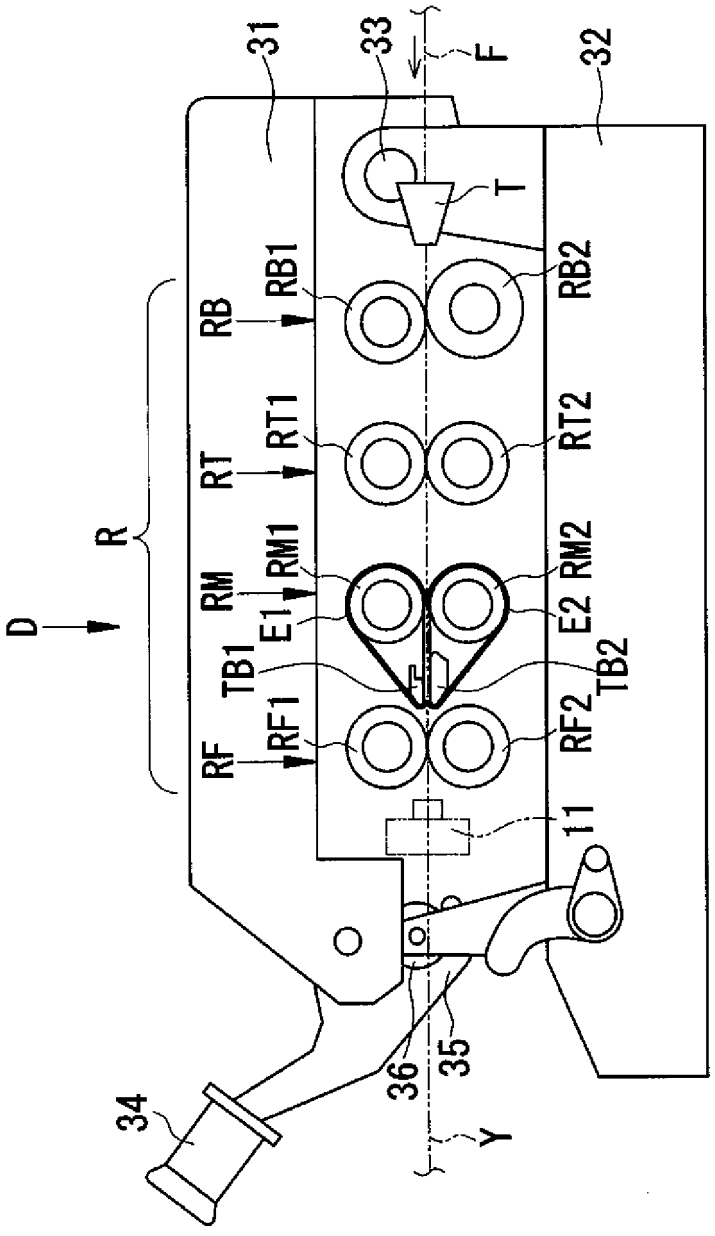
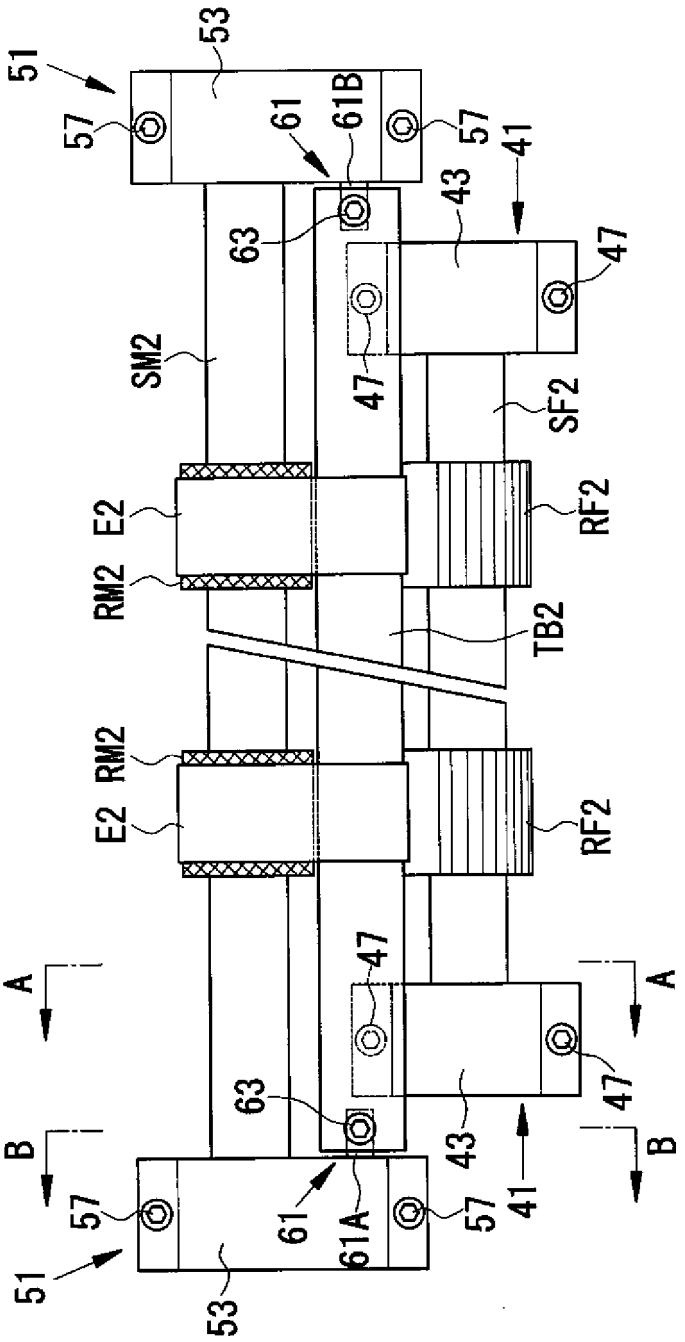

31
33
F
32
T
RB1
RB
RB2
RT1
RT
RT2
RM1
RM
E1
E2
RM2
TB1
TB2
RF1
RF
RF2
11
D
R
34
36
35
Y

FIG. 4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61B
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63
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SM2
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SF2
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RF2
RM2
TB2
RM2
E2
RF2
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A
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B
43
B
57
61
61A
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41
51
53

FIG. 5A

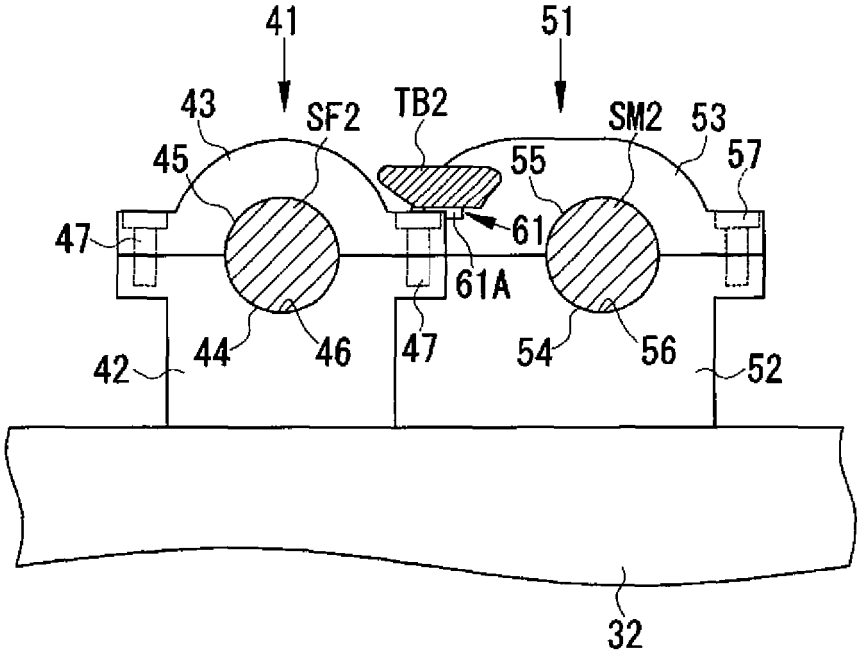
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FIG. 5B

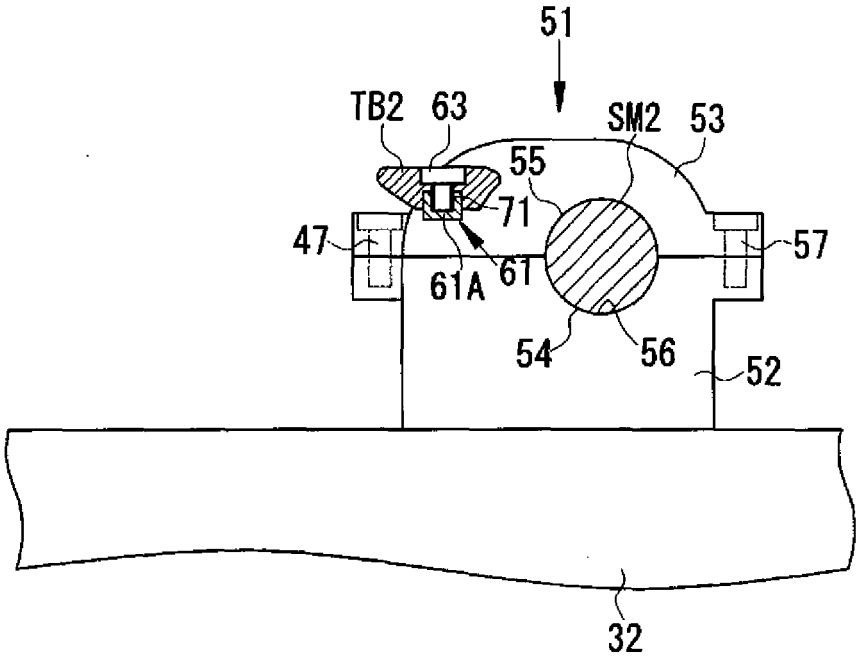
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FIG. 6

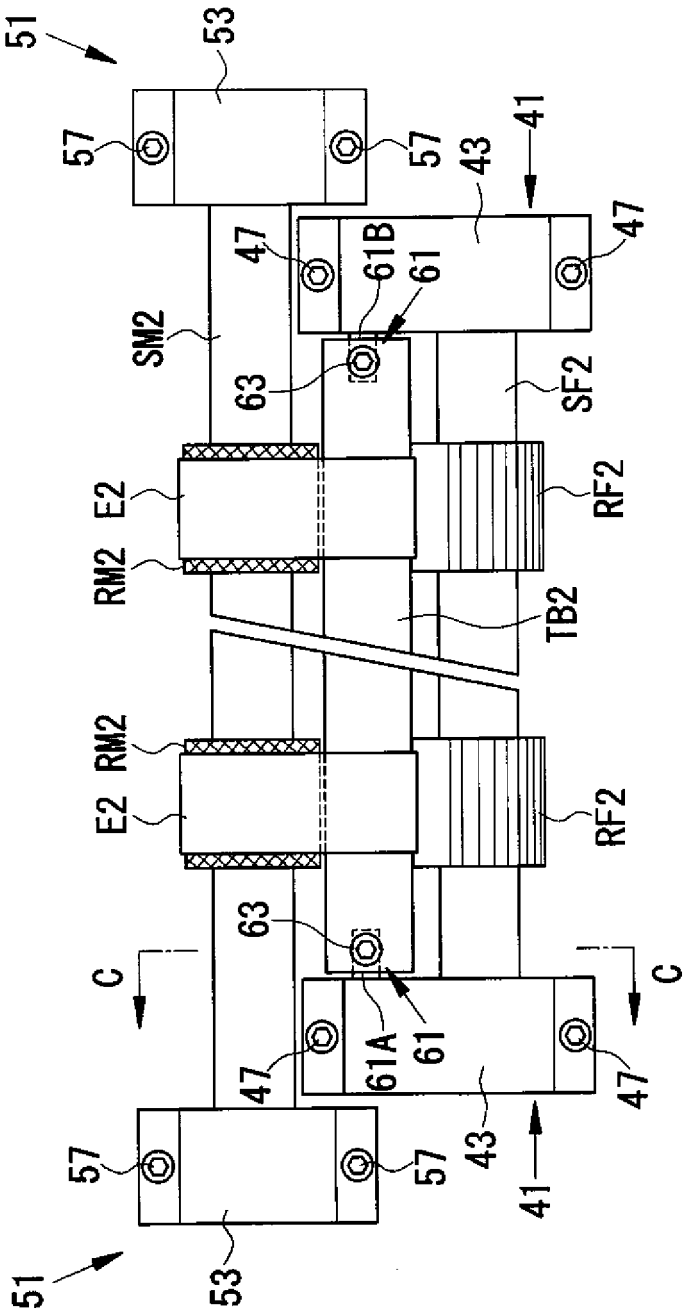
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FIG. 7

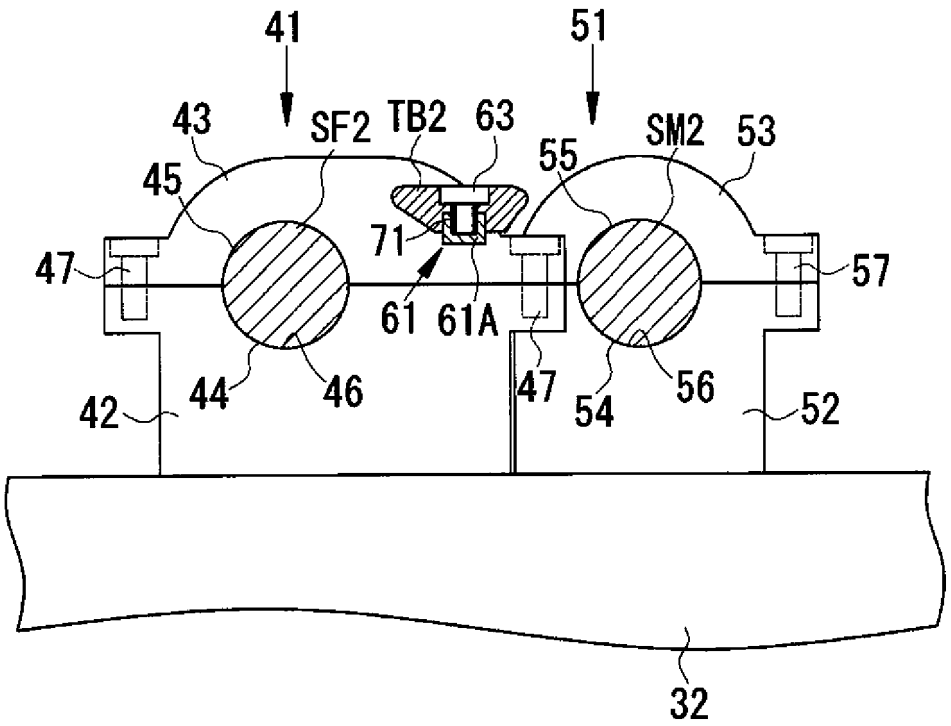
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FIG. 8

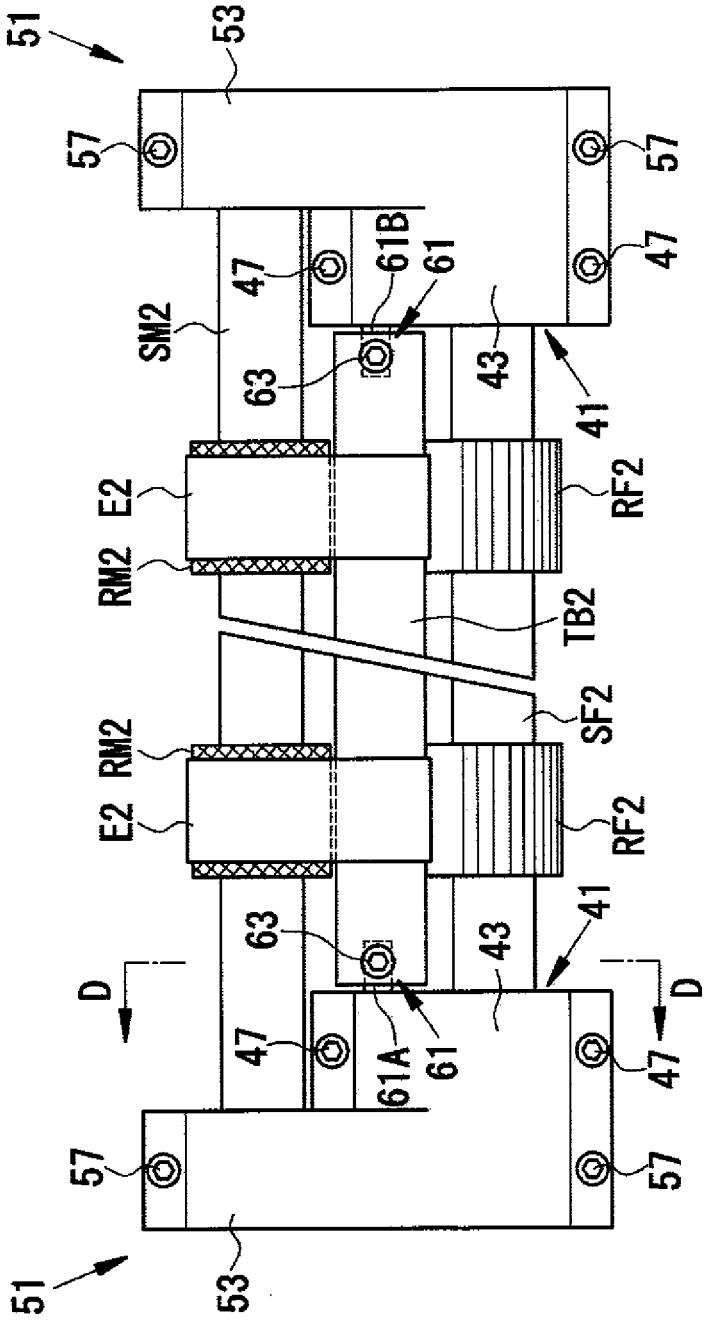
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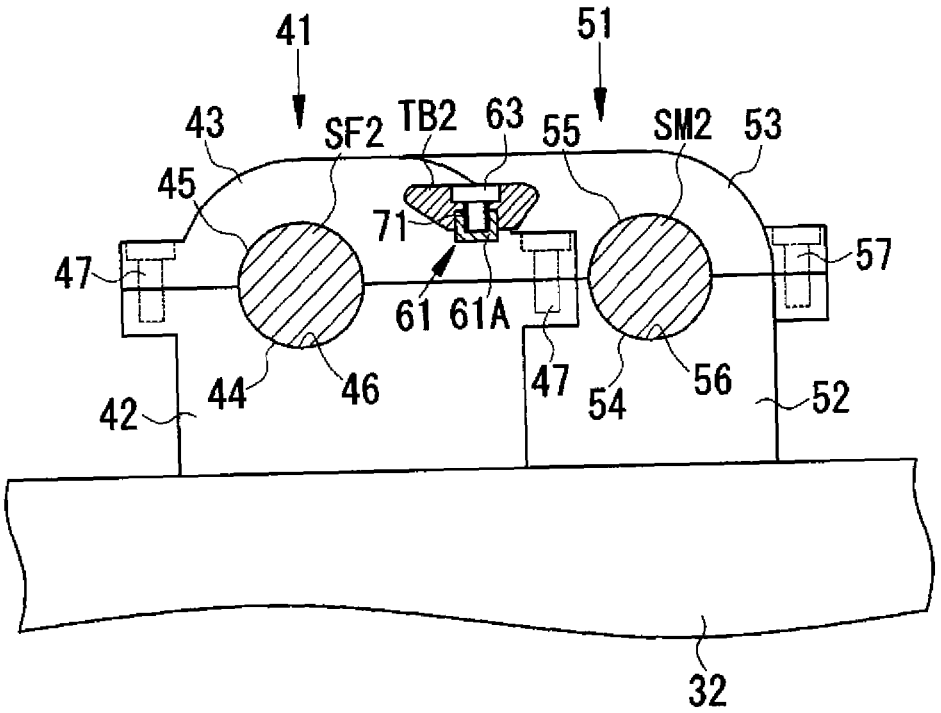
FIG. 9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TB2
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REFERENCES CITED IN THE DESCRIPTION

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- JP 10158942 A **[0007]**
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- JP 2010144297 A **[0010]**