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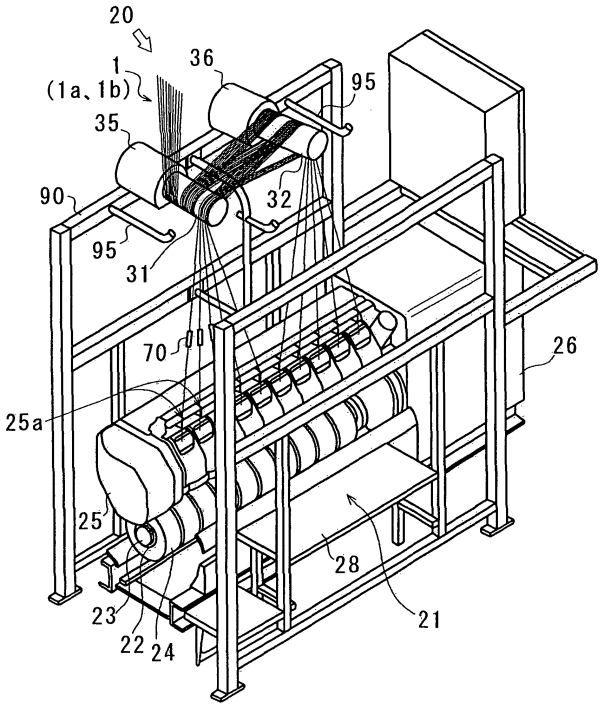
(54) **Take-up winding facility**

(57) An object of the present invention is to provide a take-up winding facility having a simple structure and which can be miniaturized. The present invention provides a take-up winding facility feeding a plurality of filament yarns 1 spun out by a spinning machine 10, from above to below to simultaneously wind the plurality of filament yarns 1 around respective plural bobbins 22 installed on a bobbin holder shaft 23 in one take-up winding machine, wherein a plurality of yarn feeding rollers 31, ... are arranged above the take-up winding machine 21, and one of the plurality of yarn feeding rollers 31, ... takes off all of the plurality of filament yarns and winds around the respective bobbins 22 via the said yarn feeding roller and other yarn feeding rollers.

FIGURE 2



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Description

Field of the Invention

[0001] The present invention relates to a take-up winding facility in which a winding machine winds a plurality of filament yarns (hereinafter simply referred to as yarns) spun out by a spinning machine, via a plurality of rollers.

Background of the Invention

[0002] In a conventional take-up winding facility, one yarn feeding roller is located immediately before each take-up winding machine so that all of a plurality of yarns spun out by a spinning machine are guided from the yarn feeding roller to a plurality of bobbins installed in the take-up winding machine (see the Unexamined Japanese Patent Application Publication (Tokkai) No. 2003-285972).

[0003] On the other hand, in another example of conventional take-up winding facility, two yarn feeding rollers are located immediately before each take-up winding machine so that a plurality of yarns spun out by a spinning machine are divisionally guided from the yarn feeding rollers to bobbins installed in the take-up winding machine and the number of which is the same as that of the plurality of yarns (see PCT National Publication No. 2005-534825).

[0004] However, in the take-up winding facility disclosed in the Unexamined Japanese Patent Application Publication (Tokkai) No. 2003-285972, when throughput is increased, that is, the number of yarns spun out by a spinning machine and the number of bobbins installed on a bobbin holder shaft are increased, the length of the bobbin holder shaft increases. This makes the angle between a yarn path from the yarn feeding roller to the bobbin and the vertical direction larger than a predetermined value. Consequently, tension or friction applied to each yarn may be varied, affecting the quality of the yarns. Thus, in the take-up winding facility disclosed in the Unexamined Japanese Patent Application Publication (Tokkai) No. 2003-285972, the distance from the take-up winding machine to the yarn feeding roller located immediately before the take-up winding machine has to be increased in order to set the angle between the yarn path from the yarn feeding roller to the bobbin and the vertical direction to at most the predetermined value. Thus, the height of the take-up winding device increases, resulting in a larger take-up winding facility. This disadvantageously increases building costs, degrades the operability of, for example, hooking of yarns on the rollers, and increases costs for air conditioning in the building.

[0005] Furthermore, in the take-up winding facility disclosed in PCT National Publication No. 2005-534825, the plurality of spun yarns are divisionally guided from the yarn feeding rollers to the bobbins in one take-up winding machine. Thus, even with increased throughput, the angle between the yarn path from the yarn feeding roller to the bobbin and the vertical direction can be set to at most the predetermined value. This eliminates the need to increase the distance from the take-up winding machine to the yarn feeding roller located immediately before the take-up winding machine, thus enabling the take-up winding facility itself to be miniaturized. However, a separate yarn feeding roller needs to be provided which withdraws the yarns spun out by the spinning machine. Disadvantageously, the take-up winding device may be complicated.

[0006] The present invention has been developed in order to solve the problems. An object of the present invention is to reduce the height of the take-up winding device to miniaturize the take-up winding facility itself, providing a simplified take-up winding facility.

Summary of the Invention

[0007] Now, means for solving the problems will be described.

[0008] A first invention provides a take-up winding facility feeding a plurality of yarns spun out by a spinning machine, from above to below to simultaneously wind the plurality of yarns around respective plural bobbins installed on a bobbin holder shaft in one take-up winding machine, wherein a plurality of yarn feeding rollers are arranged above the take-up winding machine, and one of the plurality of yarn feeding rollers takes off and winds all of the plurality of yarns around the respective bobbins via the yarn feeding roller and other yarn feeding rollers.

[0009] A second invention corresponds to the first invention wherein the plurality of yarn feeding rollers include at least a first yarn feeding roller and a second yarn feeding roller arranged at a distance from each other in an axial direction of the bobbin holder shaft to feed a first yarn group and a second yarn group including all or a part of the plurality of yarns, to the take-up winding machine, wherein the first yarn feeding roller rotates so as to take off the first yarn group and the second yarn group from the spinning machine to feed out the first yarn group and the second yarn group to the second yarn feeding roller and to take off the second yarn group fed out from the second yarn feeding roller to feed out the second yarn group to the take-up winding machine, wherein the second yarn feeding roller rotates so as to take off the first yarn group and the second yarn group fed out from the first yarn feeding roller to feed out the second yarn group included in the taken-off first yarn group and second yarn group to the first yarn feeding roller, while feeding out the first yarn group to the take-up winding machine, and wherein the take-up winding machine winds the second yarn group fed out from the first yarn feeding roller and the first yarn group fed out from the second yarn feeding roller, around the bobbins.

[0010] A third invention corresponds to the first invention wherein the plurality of yarn feeding rollers include at least a first yarn feeding roller and a second yarn feeding roller arranged at a distance from each other in an axial direction of the bobbin holder shaft to feed a first

yarn group and a second yarn group comprising all or a part of the plurality of yarns, to the take-up winding machine, wherein the first yarn feeding roller rotates so as to take off the first yarn group and the second yarn group from the spinning machine to feed out the second yarn group to the second yarn feeding roller and to take off the first yarn group and the second yarn group fed out from the second yarn feeding roller to feed out the second yarn group to the second yarn feeding roller, while feeding out the first yarn group to the take-up winding machine, wherein the second yarn feeding roller rotates so as to take off the first yarn group and the second yarn group fed out from the first yarn feeding roller to feed out the first yarn group and the second yarn group to the first yarn feeding roller and to take off the second yarn group fed out from the first yarn feeding roller to feed out the second yarn group to the take-up winding machine, and wherein the take-up winding machine winds the first yarn group fed out from the first yarn feeding roller and the second yarn group fed out from the second yarn feeding roller, around the bobbins.

[0011] A fourth invention corresponds to the first invention wherein the plurality of yarn feeding rollers include at least a first yarn feeding roller and a second yarn feeding roller arranged at a distance from each other in an axial direction of the bobbin holder shaft to feed a first yarn group and a second yarn group comprising all or a part of the plurality of yarns, to the take-up winding machine, wherein the first yarn feeding roller rotates so as to take off the first yarn group and the second yarn group from the spinning machine to feed out the first yarn group and the second yarn group to the second yarn feeding roller and to, after performing one or more operations of taking off and feeding out the first yarn group and the second yarn group between the first yarn feeding roller and the second yarn feeding roller, take off the second yarn group fed out from the second yarn feeding roller to feed out the second yarn group to the take-up winding machine, wherein the second yarn feeding roller rotates so as to, after performing one or more operations of taking off and feeding out the first yarn group and the second yarn group between the first yarn feeding roller and the second yarn feeding roller, feed out the second yarn group included in the taken-off first yarn group and second yarn group to the first yarn feeding roller, while feeding out the first yarn group to the take-up winding machine,
and wherein the take-up winding machine winds the second yarn group fed out from the first yarn feeding roller and the first yarn group fed out from the second yarn feeding roller, around the bobbins.

[0012] A fifth invention corresponds to the first invention wherein the plurality of yarn feeding rollers include at least a first yarn feeding roller and a second yarn feeding roller arranged at a distance from each other in an axial direction of the bobbin holder shaft to feed a first yarn group and a second yarn group comprising all or a part of the plurality of yarns, to the take-up winding machine, wherein the first yarn feeding roller rotates so as to take off the first yarn group and the second yarn group from the spinning machine to feed out the first yarn group and the second yarn group to the second yarn feeding roller and to, after performing a plurality of operations of taking off and feeding out the first yarn group and the second yarn group between the first yarn feeding roller and the second yarn feeding roller, take off the first yarn group and the second yarn group fed out from the second yarn feeding roller to feed out the second yarn group to the second yarn feeding roller, while feeding out the first yarn group to the take-up winding machine, wherein the second yarn feeding roller rotates so as to, after performing a plurality of operations of taking off and feeding out the first yarn group and the second yarn group between the first yarn feeding roller and the second yarn feeding roller, take off the second yarn group fed out from the first yarn feeding group to feed out the second yarn group to the take-up winding machine, and wherein the take-up winding machine winds the first yarn group fed out from the first yarn feeding roller and the second yarn group fed out from the second yarn feeding roller, around the bobbins.

[0013] A sixth invention corresponds to the take-up winding facility according to any one of the second to fifth inventions wherein each of the first yarn feeding roller and the second yarn feeding roller has areas formed thereon and corresponding to yarn contact portions each brought into contact with at least one of the first yarn group and the second yarn group, the yarn contact portions exhibiting different friction coefficients.

[0014] A seventh invention corresponds to the take-up winding facility according to any one of the second to sixth inventions, wherein each of the first yarn feeding roller and the second yarn feeding roller has areas formed thereon and corresponding to yarn contact portions each brought into contact with at least one of the first yarn group and the second yarn group, the yarn contact portions having different roller diameters.

[0015] An eighth invention corresponds to the take-up winding facility according to any one of the second to seventh inventions, wherein an interlace is located between the first yarn feeding roller and the second yarn feeding roller.

[0016] A ninth invention corresponds to the take-up winding facility according to any one of the second to seventh inventions, wherein an interlace is located between the first yarn feeding roller and the take-up winding machine, and between the second yarn feeding roller and the take-up winding machine.

[0017] A tenth invention corresponds to the take-up winding facility according to any one of the first to ninth inventions, wherein a yarn hooking assisting guide is provided close to each of the first yarn feeding roller and the second yarn feeding roller so that during yarn hooking, the yarns are temporarily placed on the yarn hooking assisting guide.

[0018] An eleventh invention corresponds to the take-

up winding facility according to any one of the first to tenth inventions, wherein an oiling device is provided below a spin-out section of the spinning machine to apply lubricant to the yarns.

[0019] A twelfth invention corresponds to the take-up winding facility according to the eleventh invention, wherein a migration nozzle is provided below the spin-out section of the spinning machine to uniformly attach the lubricant applied by the oiling device, to the yarns.

[0020] A thirteenth invention corresponds to the take-up winding facility according to any one of the first to twelfth inventions, wherein a shutter is provided below the spin-out section of the spinning machine so that when any yarn is broken, the yarn is prevented from falling.

[0021] A fourteenth invention corresponds to the take-up winding facility according to any one of the first to thirteenth inventions, wherein a common inverter is used to drive the yarn feeding rollers.

[0022] The present invention exerts the following effects.

[0023] According to the first invention, the yarns are fed from the yarn feeding rollers arranged at the positions appropriate to the bobbins installed in the take-up winding machine. Thus, even with an increase in the number of yarns spun out by the spinning machine and in the number of bobbins installed in one take-up winding machine, the angle between a yarn path from the yarn feeding roller to the bobbin and the vertical direction can be set to at most a predetermined value. Consequently, appropriate yarn quality can be ensured, and yarn winding can be stably carried out.

[0024] According to the second invention, even with an increase in the number of yarns spun out by the spinning machine and in the number of bobbins installed in one take-up winding machine, the angle between the yarn path from the yarn feeding roller to the bobbin and the vertical direction can be set to at most the predetermined value. This ensures appropriate yarn quality, and eliminates the need to increase the distance from the take-up winding machine to the yarn feeding roller located immediately before the take-up winding machine. Thus, take-up winding device height can be reduced, resulting in a smaller take-up winding facility. The second invention can therefore reduce building costs, improve the operability of yarn hooking and the like, and reduce costs for air conditioning in the building.

Furthermore, a separate yarn feeding roller need not be provided which takes off the yarns spun out by the spinning machine. Consequently, the structure of the take-up winding facility can be simplified.

[0025] According to the third invention, even with an increase in the number of yarns spun out by the spinning machine and in the number of bobbins installed in one take-up winding machine, the angle between the yarn path from the yarn feeding roller to the bobbin and the vertical direction can be set to at most the predetermined value. Thus, tension applied to the yarns between the yarn feeding rollers is optimized, ensuring appropriate yarn quality and enabling stable yarn winding. This configuration further eliminates the need to increase the distance from the take-up winding machine to the yarn feeding roller located immediately before the take-up winding machine. Consequently, the take-up winding device height can be reduced, resulting in a smaller take-up facility. The third invention can therefore reduce building costs, improve the operability of yarn hooking and the like, and reduce costs for air conditioning in the building.

Furthermore, a separate yarn feeding roller need not be provided which takes off the yarns spun out by the spinning machine. Consequently, the structure of the take-up winding facility can be simplified.

[0026] According to the fourth invention, even with an increase in the number of yarns spun out by the spinning machine and in the number of bobbins installed in one take-up winding machine, the angle between the yarn path from the yarn feeding roller to the bobbin and the vertical direction can be set to at most the predetermined value. Thus, the tension applied to the yarns between the yarn feeding rollers is optimized, ensuring the appropriate yarn quality and enabling stable yarn winding. This configuration further eliminates the need to increase the distance from the take-up winding machine to the yarn feeding roller located immediately before the take-up winding machine. Consequently, the take-up winding device height can be reduced, resulting in a smaller take-up winding facility. The fourth invention can therefore reduce building costs, improve the operability of yarn hooking and the like, and reduce costs for air conditioning in the building.

Furthermore, a separate yarn feeding roller need not be provided which takes off the yarns spun out by the spinning machine. Consequently, the structure of the take-up winding facility can be simplified.

[0027] According to the fifth invention, even with an increase in the number of yarns spun out by the spinning machine and in the number of bobbins installed in one take-up winding machine, the angle between the yarn path from the yarn feeding roller to the bobbin and the vertical direction can be set to at most the predetermined value. Thus, the tension applied to the yarns between the yarn feeding rollers is optimized, ensuring the appropriate yarn quality and enabling stable yarn winding. This configuration further eliminates the need to increase the distance from the take-up winding machine to the yarn feeding roller located immediately before the take-up winding machine. Consequently, the take-up winding device height can be reduced, resulting in a smaller take-up winding facility. The fifth invention can therefore reduce building costs, improve the operability of yarn hooking and the like, and reduce costs for air conditioning in the building.

Furthermore, a separate yarn feeding roller need not be provided which takes off the yarns spun out by the spinning machine. Consequently, the structure of the take-up winding facility can be simplified.

[0028] According to the sixth invention, the friction co-

efficient varies among the yarn contact portions of each of the yarn feeding rollers brought into contact with the yarn group. Thus, the tension applied to the yarns is optimized, ensuring the appropriate yarn quality and enabling stable yarn winding.

[0029] According to the seventh invention, the roller diameter varies among the yarn contact portions of each of the yarn feeding rollers brought into contact with the yarn group. Thus, peripheral speed varies among the yarn contact portions.

Consequently, the tension applied to the yarns is optimized, ensuring the appropriate yarn quality and enabling stable yarn winding.

[0030] According to the eighth invention, the interlace located between the yarn feeding rollers allows the yarn path to be fixed. Thus, the yarns can be stably wound.

[0031] According to the ninth invention, the interlace located between each of the yarn feeding rollers and the take-up winding machine allows the yarn path to be fixed. Thus, the yarns can be stably wound.

[0032] According to the tenth invention, before hooked on each of the yarn feeding rollers, the yarns can be temporarily held. Thus, the yarn hooking operation is facilitated.

[0033] According to the eleventh invention, the vicinity of the take-up winding machine can be simplified. Thus, the yarn hooking operation is facilitated.

[0034] According to the twelfth invention, the vicinity of the take-up winding machine can be simplified. Thus, the yarn hooking operation is facilitated.

[0035] According to the thirteenth invention, the vicinity of the take-up winding machine can be simplified. This prevents a broken yarn from getting entangled with other yarns, the take-up winding machine, or the like.

[0036] According to the fourteenth invention, the yarn feeding rollers can be easily controlled. This enables a reduction in the number of parts required and thus in costs.

Other features, elements, processes, steps, characteristics and advantages of the present invention will become more apparent from the following detailed description of preferred embodiments of the present invention with reference to the attached drawings.

Brief Description of the Drawings

[0037]

Figure 1A is a front view showing the general configuration of a take-up winding facility according to the present invention, and Figure 1B is a side view showing the general configuration of the take-up winding facility according to the present invention.

Figure 2 is a perspective view showing a take-up winding device according to a first embodiment of the present invention.

Figure 3 is a right side view showing the take-up winding device according to the first embodiment of the present invention.

Figure 4 is a front view showing the take-up winding device according to the first embodiment of the present invention.

Figure 5 is a perspective view showing yarn paths according to the first embodiment of the present invention.

Figure 6 is a perspective view showing yarn paths according to a second embodiment of the present invention.

Figure 7 is a perspective view showing yarn paths according to a third embodiment of the present invention.

Figure 8 is a perspective view showing yarn paths according to a fourth embodiment of the present invention.

Figure 9A is a plan view illustrating yarn paths according to a fifth embodiment of the present invention, and Figure 9B is a right side view illustrating the yarn paths according to the fifth embodiment of the present invention.

Figure 10A is a plan view illustrating yarn paths according to a sixth embodiment of the present invention, and Figure 10B is a right side view illustrating the yarn paths according to the sixth embodiment of the present invention.

Detailed Description of the Preferred Embodiments

[0038] First, the general configuration of a take-up winding facility 100 according to the present invention will be described with reference to Figure 1. Figure 1A is a front view of the take-up winding facility 100. Figure 1B is a side view of the take-up winding facility 100. The direction in which gravity acts is defined as the vertical direction. The axial direction of a bobbin holder shaft 23 provided in a take-up winding machine 21 is defined as a front-back direction. A side of the bobbin holder shaft 23 coupled to a driving device 26 is defined as a back side. The other side of the bobbin holder shaft 23 is defined as a front side. Furthermore, when the take-up winding machine 21 is viewed from the front thereof, a direction orthogonal to the vertical direction and the front-back direction is defined as a lateral direction.

[0039] The take-up winding facility 100 is composed mainly of a spinning machine 10 spinning a plurality of yarns 1 and a take-up winding device 20 winding the yarns 1 spun out by the spinning machine 10.

[0040] The spinning machine 10 feeds an introduced synthetic yarn material to a spin-out section 11 via an extruder (not shown in the drawings) and a prefilter (not shown in the drawings). A spinning head 12 included in the spin-out section 11 spins out and feeds a plurality of yarns 1 to a take-up winding device 20.

[0041] As shown in Figures 2, 3, and 4, the take-up winding device 20 is composed mainly of the take-up winding machine 21 winding the plurality of yarns 1, a first yarn feeding roller 31, and a second yarn feeding

roller 32.

[0042] The take-up winding machine 21 includes a bobbin holder shaft 23 on which a plurality of bobbins 22 are installed, a contact roller rotating in contact with packages 24 formed on the respective bobbins 22, a traverse device 25 traversing the yarns 1 wound around the respective bobbins 22, and the driving device 26 driving the bobbin holder shaft 23 and the traverse device 25.

[0043] The yarn feeding rollers 31, 32 are arranged above the take-up winding machine 21 at a distance from each other in the axial direction of the bobbin holder shaft 23. The yarn feeding rollers 31, 32 feed out a first yarn group 1a and a second yarn group 1b forming the plurality of yarns 1 spun out by the spinning head 12, to the take-up winding machine 21.

[0044] The configuration of each of the spinning machine 10 and the take-up winding machine 20 according to a first embodiment will be described along the direction in which the yarns 1 are fed.

[0045] As shown in Figure 1, the spinning machine 10 is located above the take-up winding device 20. An oiling device 40, a migration nozzle 50, and a shutter 60 are provided below the spin-out section 11 included in the spinning machine 10.

[0046] The oiling device 40 supplies the yarns 1 with lubricant, which reduces friction with guides and the like to prevent possible charging and provide the yarns 1 with flexibility and the like. The migration nozzle 50 appropriately disturbs the flow of the yarns 1 in order to uniformly migrate the lubricant applied to the yarns 1 by the oiling device 40. Furthermore, the shutter 60 is moved to prevent any broken yarn 1 from falling. The shutter 60 may push the broken yarn away to an admission port formed close to the shutter 60 for removal or the opening of the shutter may be adjusted according to a variation in outside air temperature to control the temperature of the spin-out section 11.

[0047] The arrangement of the oiling device 40, the migration nozzle 50, and the shutter 60 along the feeding direction of the yarns I is not limited to this order. For functional reasons, it is only necessary that the migration nozzle 50 is located after the oiling device 40. Furthermore, not all of the oiling device 40, the migration nozzle 50, and the shutter 60 are provided below the spin-out section 11. For example, with only the shutter 60 located below the spin-out section 11, the remaining oiling device 40 and migration nozzle 50 may be arranged immediately before the first yarn feeding roller 31.

[0048] The first yarn group 1a is composed of a predetermined number of yarns 1 included in the plurality of yarns 1 spun out by the spinning head 12, and the second yarn group 1b is composed of the remaining yarns 1. The first yarn group 1a and the second yarn group 1b are arranged in a line in the lateral direction (see Figures 1 and 4). The arrangement of the yarn groups depends on the shape and arrangement of the spinning head 12 (spin-out section 11). The first yarn group 1a and the second yarn group 1b are taken off by the first yarn feeding roller 31. That is, the first yarn group 1a and the second group 1b are spun out by the spinning head 12 (spin-out section 11) and then guided in a line in the lateral direction and along the rotating direction of the first yarn feeding roller 31 with the distances between the yarns 1 gradually reduced (see Figures 3 and 4).

[0049] The first yarn feeding roller 31 and the second yarn feeding roller 32 are provided such that the axes thereof are arranged parallel or perpendicular to each other or inclined in a direction corresponding to the synthesis of the parallel direction and the perpendicular direction. In the present embodiment, the first yarn feeding roller 31 is provided perpendicularly to the bobbin holder shaft 23 and in the horizontal direction. The second yarn feeding roller 32 is located behind the first yarn feeding roller 31 so that the right end side thereof is inclined slightly upward from the horizontal direction. This is to allow each of the yarns 1 to be shifted toward the right end side of each of the yarn feeding rollers 31, 32 during each of a plurality of operations in which the first yarn feeding roller 31 receives and feeds out the yarn to the second yarn feeding roller 32, so that the yarn avoids passing through the same yarn path.

[0050] Furthermore, the first yarn feeding roller 31 and the second yarn feeding roller 32 rotate in the opposite directions. The first yarn feeding roller 31 rotates counterclockwise as viewed in a right side view. The second yarn feeding roller 32 rotates clockwise as viewed in a right side view. A common inverter is used to supply power to driving motor units 35, 36 driving the yarn feeding rollers 31, 32, respectively. The yarn feeding rollers 31, 32 rotate at the same rotation speed.

[0051] Now, with reference to Figures 5, 6, 7, and 8, the yarn paths of the first yarn group 1a and second yarn group 1b fed out to the take-up winding machine 21 by the yarn feeding rollers 31, 32.

[0052] Figures 5, 6, 7, and 8 focus on the yarn feeding rollers 31, 32 and the yarn groups 1a, 1b in the first, second, third, and fourth embodiments.

[0053] In the first embodiment, as shown in Figure 5, the first yarn group 1a and the second yarn group 1b each composed of a plurality of the yarns 1 spun put by the spinning head 12 first travel around substantially a quarter of the circumference of the left end side (driving motor unit 35 side) of the first yarn feeding roller 31 along the rotating direction of the first yarn feeding roller 31 (the counterclockwise direction in the figure). The first yarn group 1a and the second yarn group 1b are then fed out to the second yarn feeding roller 32. Thereafter, the first yarn group 1a is fed out to the bobbins 22 in the take-up winding machine 21 via interlaces 70 described below, along the rotating direction of the second yarn feeding roller 32 (the clockwise direction in the figure). The second yarn group 1b travels around substantially a half of the circumference of the second yarn feeding roller 32 along the rotating direction of the second yarn feeding roller 32 (the clockwise direction in the figure). The second yarn group 1b is then fed out along the rotating di-

rection of the first yarn feeding roller 31 (the counterclockwise direction in the figure). The second yarn group 1b is then fed out from the first yarn feeding roller 31 to the bobbins 22 in the take-up winding machine 21 via the interlaces 70 described below.

[0054] In the second embodiment, as shown in Figure 6, the first yarn group 1a and the second yarn group 1b first travel around substantially a quarter of the circumference of the left end side (driving motor unit 35 side) of the first yarn feeding roller 31 along the rotating direction of the first yarn feeding roller 31 (the counterclockwise direction in the figure). The first yarn group 1a and the second yarn group 1b are then fed out to the second yarn feeding roller 32. The first yarn group 1a and the second yarn group 1b then travel around substantially a half of the circumference of the second yarn feeding roller 32 along the rotating direction of the second yarn feeding roller 32 (the clockwise direction in the figure). The first yarn group 1a and the second yarn group 1b are then fed out along the rotating direction of the first yarn feeding roller 31 again. Thereafter, the first yarn group 1a is fed out to the bobbins 22 in the take-up winding machine 21 via the interlaces 70 described below, along the rotating direction of the first yarn feeding roller 31 (the counterclockwise direction in the figure). The second yarn group 1b travels around substantially a half of the circumference of the first yarn feeding roller 31 along the rotating direction of the first yarn feeding roller 31 (the counterclockwise direction in the figure). The second yarn group 1b is then fed out along the rotating direction of the second yarn feeding roller 32 (the clockwise direction in the figure) again. The second yarn group is fed out from the second yarn feeding roller 32 to the bobbins 22 in the take-up winding machine 21 via the interlaces 70 described below.

[0055] In the third embodiment, as shown in Figure 7, the first yarn group 1a and the second yarn group 1b first travel around substantially a quarter of the circumference of the left end side (driving motor unit 35 side) of the first yarn feeding roller 31 along the rotating direction of the first yarn feeding roller 31 (the counterclockwise direction in Figure 5). The first yarn group 1a and the second yarn group 1b are then fed out to the second yarn feeding roller 32. The first yarn group 1a and the second yarn group 1b then travel around substantially a half of the circumference of the second yarn feeding roller 32 along the rotating direction of the second yarn feeding roller 32 (the clockwise direction in the figure). The first yarn group 1a and the second yarn group 1b are then fed out along the rotating direction of the first yarn feeding roller 31 again. Then, one or more operations of the taking off and feeding out the first yarn group 1a and the second yarn group 1b are performed between the first yarn feeding roller 31 and the second yarn feeding roller 32. Thereafter, the first yarn group 1a is fed out to the bobbins 22 in the take-up winding machine 21 via the interlaces 70 described below, along the rotating direction of the second yarn feeding roller 32 (the clockwise direction in the figure). The second yarn group is fed out from the first yarn feeding roller 31 to the bobbins 22 in the take-up winding machine 21 via the interlaces 70 described below.

[0056] In the fourth embodiment, as shown in Figure 8, the first yarn group 1a and the second yarn group 1b first travel around substantially a quarter of the circumference of the left end side (driving motor unit 35 side) of the first yarn feeding roller 31 along the rotating direction of the first yarn feeding roller 31 (the counterclockwise direction in the figure). The first yarn group 1a and the second yarn group 1b are then fed out to the second yarn feeding roller 32. The first yarn group 1a and the second yarn group 1b then travel around substantially a half of the circumference of the second yarn feeding roller 32 along the rotating direction of the second yarn feeding roller 32 (the clockwise direction in the figure). The first yarn group 1a and the second yarn group 1b are then fed out along the rotating direction of the first yarn feeding roller 31 again. Then, one or more operations of the taking off and feeding out the first yarn group 1a and the second yarn group 1b are performed between the first yarn feeding roller 31 and the second yarn feeding roller 32. Thereafter, the first yarn group 1a is fed out to the bobbins 22 in the take-up winding machine 21 via the interlaces 70 described below, along the rotating direction of the first yarn feeding roller 31 (the counterclockwise direction in figure). The second yarn group is fed out from the second yarn feeding roller 32 to the bobbins 22 in the take-up winding machine 21 via the interlaces 70 described below.

[0057] According to the present invention, even if the yarns 1 are passed around the yarn feeding rollers 31, 32 a number of times (see, for example, Figure 8), the yarns 1 are prevented from interfering with one another by means of the inclined second yarn feeding roller 32 as described above. That is, the yarns 1 fed from the spinning head 12 to the left end side (driving motor unit 35 side) of the first yarn feeding roller 31 shifts naturally toward the right end side (the right side of the figure) every time a taking-off and feeding out operation is performed. This prevents the yarns 1 from interfering with one another.

[0058] For example, in the first embodiment, the total number of times that the first yarn group 1a comes into contact with the yarn feeding rollers 31, 32 is two; the first yarn group 1a comes into contact with each of the yarn feeding rollers 31, 32 once. The total number of times that the second yarn group 1b comes into contact with the yarn feeding rollers 31, 32 is three; the first yarn group 1a comes into contact with the first yarn feeding roller 31 twice and with the second yarn feeding roller 32 once. Thus, the ratio of the number of times the first yarn group 1a comes into contact with the yarn feeding rollers 31, 32 to the number of times the second yarn group 1b comes into contact with the yarn feeding rollers 31, 32 is 2:3. In contract, for example, in a fourth embodiment, the ratio of the number of times the first yarn group 1a comes into contact with the yarn feeding rollers 31, 32 to the

number of times the second yarn group 1b comes into contact with the yarn feeding rollers 31, 32 is at least 5: 6. That is, an increase in the number of times the yarns are passed around the yarn feeding rollers 31, 32 reduces the rate of the difference in the number of contacts between the first yarn group 1a and the second yarn group 1b. This enables a reduction in variations in yarn quality.

[0059] The interlaces 70 are arranged between both the yarn feeding rollers 31, 32 and the take-up winding machine 21 in the vertical direction. Each of the yarns 1 is provided in the yarn path extending from the corresponding yarn feeding roller 31, 32 to the corresponding bobbin 22.

[0060] Each of the interlaces 70 uses a liquid ejecting nozzle to entangle yarns forming the yarn 1 with one another so as to converge the yarns. The interlace 70 thus inhibits the yarns from being spread or separated from one another.

[0061] Processing with the interlaces 70 is carried out after the yarn 1 is tensed. Thus, instead of being provided in the yarn path extending from the corresponding yarn feeding roller 31, 32 to the corresponding bobbin 22, the yarn 1 can be provided in a yarn path extending from the first yarn feeding roller 31 to the second yarn feeding roller 32 or a yarn path extending from the second yarn feeding roller 32 to the first yarn feeding roller 31.

[0062] The reason for the availability of these yarn paths is as follows. The yarns 1 can be tensed during earlier ones of the plurality of operations of taking off and feeding out the yarns 1 between the spinning head 12 and the first yarn feeding roller 31 and between the yarn feeding rollers 31 and 32. Thus, during the later operations of taking off and feeding out the yarns 1, the processing with the interlaces 70 can be carried out without posing any problem.

[0063] Thus, not only the processing with the interlaces 70 can be carried out on the yarns 1 but also the interlaces 70 can be utilized as yarn path guides. The yarn paths are thus fixed to enable the yarns 1 to be stably wound.

[0064] Moreover, the take-up winding machine 21 is located below the yarn feeding rollers 31, 32. The take-up winding machine 21 uses the driving device 26 to rotate the bobbin holder shaft 23 on which the bobbins 22 are installed, to wind the yarns 1.

[0065] A plurality of the bobbins 22 are installed on the bobbin holder shaft 23. When wound around the corresponding bobbin 22, each of the yarns 1 is traversed by a traverse support point guide 25a included in the traverse device 25, as described above. The yarn 1 is thus wound without being biased.

[0066] In this configuration, since the plurality of yarns 1 spun out by the spinning head 12 are divisionally fed from the yarn feeding rollers 31, 32 for winding, the following is possible. Even with an increase in the number of yarns 1 spun out by the spinning machine and in the number of bobbins installed on the bobbin holder shaft 23, the angle A (see Figure 3) between the vertical direction and the yarn path of the outermost yarn 1 fed out from each of the yarn feeding rollers 31, 32 can be maintained at, for example, at most 20 degrees. This eliminates the need to increase the distance from the take-up winding machine to the yarn feeding roller located immediately before the take-up winding machine. The take-up winding facility itself can thus be miniaturized. Consequently, this configuration enables a reduction in building costs, improvement of the operability of yarn hooking and the like, and a reduction in costs for air conditioning in the building. Furthermore, the present embodiment requires only two yarn feeding rollers, allowing the structure of the take-up winding facility to be simplified. This results in a cost reduction and the improved operability of yarn hooking and the like.

[0067] Now, a take-up winding device 20 according to a fifth embodiment of the present invention will be described. However, the same components as those in the above-described configuration are denoted by the same reference numerals. Differences from the above-described configuration will mainly be described.

[0068] In the fifth embodiment, as shown in Figure 9, the first yarn feeding roller 31 is subjected to surface treatment such that the first yarn feeding roller 31 includes yarn contact portions 31a, 31b, ... each brought into contact with at least one of the first yarn group 1a and the second yarn group 1b. The second yarn feeding roller 32 is subjected to surface treatment such that the second yarn feeding roller 32 includes yarn contact portions 32a, 32b, ... each brought into contact with at least one of the first yarn group 1a and the second yarn group 1b.

[0069] Figure 9A is a plan view focusing on the yarn feeding rollers 31, 32 and the yarns 1. Figure 9B is a side view of the yarn feeding rollers 31, 32 and the yarns 1.

[0070] The surface treatment of the yarn contact portions 31a, ... of the first yarn feeding roller 31 and the yarn contact portions 32a, ... of the second yarn feeding roller 32 is normally a chromium plating treatment or formation of a ceramic film. However, the present invention does not limit the treatment method. Any treatment method may be used provided that the method allows the yarn contact portions of each of the yarn feeding rollers 31, 32 to have different friction coefficients. Consequently, the appropriate treatment can also be achieved by varying a polishing process or a polishing duration.

[0071] The take-up winding facility according to the present invention has no withdraw roller as provided in conventional take-up winding facilities to withdraw the yarns 1 from the spinning head 12. However, by increasing the friction coefficient of the yarn contact portion 31a of the first yarn feeding roller 31, the first yarn feeding roller 31 can serve as a yarn withdrawing roller. Furthermore, by varying the friction coefficient among the yarn contact portions 31a, ... of the yarn feeding roller 31, with which the yarns 1 come into contact and among the yarn contact portions 32a, ... of the yarn feeding roller 32, brought into contact with the yarns 1, the appropriate tension can be applied to the yarns 1 even while the taken-off yarns 1 are being fed out from the first yarn feeding

roller 31 to the second yarn feeding roller 32 or from the second yarn feeding roller 32 to the first yarn feeding roller 31. Thus, with the desired quality ensured, the yarns 1 can be stably wound.

[0072] In the present embodiment, the yarn contact portion 31a of the first yarn feeding roller 31, serving as a yarn withdrawing roller, exhibits the greatest friction coefficient. The friction coefficient of the yarn contact portions 31a, ..., 32a, ... decreases sequentially in conjunction with each operation of taking off and feeding out the yarns 1. Thus, the friction coefficients of the yarn contact portions have the following relationship.

Friction coefficient: 31a > 32a > 31b > 32b ...

Furthermore, for the specific values of the friction coefficient, applicable optimum values are determined depending on the desired yarn quality or the like. Thus, the numerical values of the friction coefficient are not limited. However, the friction coefficient may be sequentially increased depending on the yarn type.

[0073] Now, a take-up winding device 20 according to a sixth embodiment of the present invention will be described. However, the same components as those in the above-described configuration are denoted by the same reference numerals. Differences from the above-described configuration will mainly be described.

[0074] In the sixth embodiment, as shown in Figure 10, the first yarn feeding roller 31 has yarn contact portions each brought into contact with at least one of the first yarn group 1a and the second yarn group 1b and having different roller diameters 31A, ... The second yarn feeding roller 32 has yarn contact portions each brought into contact with at least one of the first yarn group 1a and the second yarn group 1b and having different roller diameters 32A, ...

[0075] Figure 10A is a plan view focusing on the yarn feeding rollers 31, 32 and the yarns 1. Figure 10B is a side view of the yarn feed i ng rollers 31, 32 and the yarns 1.

[0076] Thus, by varying the peripheral speed among the yarn contact portions 31a, ... of the yarn feeding roller 31 and among the yarn contact portions 32a, ... of the yarn feeding roller 32, the appropriate tension can be applied to the yarns 1 even while the taken-off yarns 1 are being fed out from the first yarn feeding roller 31 to the second yarn feeding roller 32 or from the second yarn feeding roller 32 to the first yarn feeding roller 31. Thus, with the desired quality ensured, the yarns 1 can be stably wound.

[0077] In the present embodiment, the roller diameter 31A of the first yarn feeding roller 31, to which the yarns 1 are first fed from the spinning head 12, is smallest. The roller diameters 31A, .., and 32A, ... of the yarn contact portions, brought into contact with the yarns 1, increase sequentially in conjunction with each operation of taking off and feeding out the yarns. Thus, the roller diameters have the following relationship.

Roller diameter: 31A < 32A < 31B < 32B ...

Furthermore, for the specific values of the roller diameter, applicable optimum values are determined depending on the desired yarn quality or the like. Thus, the numerical values of the friction coefficient are not limited.

[0078] Now, hooking, on each of the bobbins 22, of the corresponding yarn 1 from the spinning machine 10 will be described with reference to the fourth embodiment.

[0079] The operator holds all of the plurality of yarns 1 spun out by the spinning head 12 while simultaneously using a suction device to suck the yarns 1. The operator thus hooks the yarns 1 on each of the yarn feeding rollers 31, 32 and the like.

[0080] First, the operator stands on a working step 28. The operator operates the suction device holding the plurality of yarns 1 spun out by the spinning head 12, to hook the yarns 1 on the first yarn feeding roller 31. The operator then passes the yarns 1 directly to the second yarn feeding roller 32 so that the yarns 1 extend in S form. Then, the operator temporarily places the yarn 1 group on a yarn hooking assisting guide 95 provided on a frame 90 located behind the second yarn feeding roller 32. Thereafter, the operator sucks and holds the yarns 1 and passes the yarns 1 from the second yarn feeding roller 32 to the first yarn feeding roller 31 so that the yarns 1 extend in S form. The operator places the yarns 1 on a yarn hooking assisting guide 95 positioned in front of the first yarn feeding roller 31. Thereafter, the operator similarly passes the yarns 1 of the first yarn group 1a around the yarn feeding rollers 31, 32 so that the yarns 1 are guided from the first yarn feeding roller 31 to the traverse support point guides 25a, included in the traverse device 25, via the interlaces 70. The second yarn group 1b is passed around the second yarn feeding roller 32 again and then guided to the traverse support point guides 25a via the interlaces 70.

[0081] As described above, when the take-up winding facility 100 includes the yarn hooking assisting guides 95, the first yarn group 1a or the second yarn group 1b can be temporarily hooked on the yarn hooking assisting guides 95. This facilitates the yarn hooking operation even when each of the yarn feeding rollers 31, 32 feeds out the yarns 1 as is the case with the embodiments according to the present invention.

[0082] Each of the yarn hooking assisting guides 95 is desirably located close to one of the yarn feeding rollers 31, 32. However, the positions of the yarn hooking assisting guides 95 are determined depending on the shape of the suction device and the like. The specific positions of the yarn hooking assisting guides 95 are not limited. Therefore, the yarn hooking assisting guides 95 may be arranged in front of and behind the yarn feeding rollers 31, 32, respectively, as is the case with the present embodiment, or between the yarn feeding rollers 31, 32.

While the present invention has been described with respect to preferred embodiments thereof, it will be apparent to those skilled in the art that the disclosed invention may be modified in numerous ways and may assume many embodiments other than those specifically set out and described above. Accordingly, it is intended by the

appended claims to cover all modifications of the present invention that fall within the scope of the invention.

Claims

1. A take-up winding facility feeding a plurality of filament yarns spun out by a spinning machine, from above to below to simultaneously wind the plurality of filament yarns around respective plural bobbins installed on a bobbin holder shaft in one take-up winding machine, the take-up winding facility take-up winding being **characterized in that**:

   a plurality of yarn feeding rollers are arranged above the take-up winding machine, and one of the plurality of yarn feeding rollers takes off all of the plurality of filament yarns and winds around the respective bobbins via the said yarn feeding roller and other yarn feeding rollers.

2. The take-up winding facility according to Claim 1, **characterized in that**:

   the plurality of yarn feeding rollers include at least a first yarn feeding roller and a second yarn feeding roller arranged at a distance from each other in an axial direction of the bobbin holder shaft to feed a first yarn group and a second yarn group comprising all or a part of the plurality of filament yarns, to the take-up winding machine,
   the first yarn feeding roller rotates so as to take off the first yarn group and the second yarn group from the spinning machine to feed out the first yarn group and the second yarn group to the second yarn feeding roller and to take off the second yarn group fed out from the second yarn feeding roller to feed out the second yarn group to the take-up winding machine,
   the second yarn feeding roller rotates so as to take off the first yarn group and the second yarn group fed out from the first yarn feeding roller to feed out the second yarn group included in the taken-off first yarn group and second yarn group to the first yarn feeding roller, while feeding out the first yarn group to the take-up winding machine, and
   the take-up winding machine winds the second yarn group fed out from the first yarn feeding roller and the first yarn group fed out from the second yarn feeding roller, around the bobbins.

3. The take-up winding facility according to Claim 1, **characterized in that**:

   the plurality of yarn feeding rollers include at least a first yarn feeding roller and a second yarn feeding roller arranged at a distance from each other in an axial direction of the bobbin holder shaft to feed a first yarn group and a second yarn group comprising all or a part of the plurality of filament yarns, to the take-up winding machine,
   the first yarn feeding roller rotates so as to take off the first yarn group and the second yarn group from the spinning machine to feed out the second yarn group to the second yarn feeding roller and to take off the first yarn group and the second yarn group fed out from the second yarn feeding roller to feed out the second yarn group to the second yarn feeding roller, while feeding out the first yarn group to the take-up winding machine,
   the second yarn feeding roller rotates so as to take off the first yarn group and the second yarn group fed out from the first yarn feeding roller to feed out the first yarn group and the second yarn group to the first yarn feeding roller and to take off the second yarn group fed out from the first yarn feeding roller to feed out the second yarn group to the take-up winding machine, and
   the take-up winding machine winds the first yarn group fed out from the first yarn feeding roller and the second yarn group fed out from the second yarn feeding roller, around the bobbins.

4. The take-up winding facility according to Claim 1, **characterized in that**:

   the plurality of yarn feeding rollers include at least a first yarn feeding roller and a second yarn feeding roller arranged at a distance from each other in an axial direction of the bobbin holder shaft to feed a first yarn group and a second yarn group comprising all or a part of the plurality of f i l ament yarns, to the take-up winding machine,
   the first yarn feeding roller rotates so as to take off the first yarn group and the second yarn group from the spinning machine to feed out the first yarn group and the second yarn group to the second yarn feeding roller and to, after performing one or more operations of taking off and feeding out the first yarn group and the second yarn group between the first yarn feeding roller and the second yarn feeding roller, take off the second yarn group fed out from the second yarn feeding roller to feed out the second yarn group to the take-up winding mach i ne,
   the second yarn feeding roller rotates so as to, after performing one or more operations of taking off and feeding out the first yarn group and the second yarn group between the first yarn feeding roller and the second yarn feeding roller, feed out the second yarn group included in the

taken-off first yarn group and second yarn group to the first yarn feeding roller, while feeding out the first yarn group to the take-up winding machine,

the take-up winding machine winds the second yarn group fed out from the first yarn feeding roller and the first yarn group fed out from the second yarn feeding roller, around the bobbins.

5. The take-up winding facility according to Claim 1, **characterized in that**:

the plurality of yarn feeding rollers include at least a first yarn feeding roller and a second yarn feeding roller arranged at a distance from each other in an axial direction of the bobbin holder shaft to feed a first yarn group and a second yarn group comprising all or a part of the plurality of filament yarns, to the take-up winding machine,

the first yarn feeding roller rotates so as to take off the first yarn group and the second yarn group from the spinning machine to feed out the first yarn group and the second yarn group to the second yarn feed i ng roller and to, after performing a plurality of operations of taking off and feeding out the first yarn group and the second yarn group between the first yarn feeding roller and the second yarn feeding roller, take off the first yarn group and the second yarn group fed out from the second yarn feeding roller to feed out the second yarn group to the second yarn feeding roller, while feeding out the first yarn group to the take-up winding machine,

the second yarn feeding roller rotates so as to, after performing a plurality of operations of taking off and feeding out the first yarn group and the second yarn group between the first yarn feeding roller and the second yarn feeding roller, take off the second yarn group fed out from the first yarn feeding group to feed out the second yarn group to the take-up winding machine,

the take-up winding machine winds the first yarn group fed out from the first yarn feeding roller and the second yarn group fed out from the second yarn feeding roller, around the bobbins.

6. The take-up winding facility according to any one of Claim 2 to Claim 5, **characterized in that** each of the first yarn feeding roller and the second yarn feeding roller has areas formed thereon and corresponding to yarn contact portions each brought into contact with at least one of the first yarn group and the second yarn group, the yarn contact portions exhibiting different friction coefficients.

7. The take-up winding facility according to any one of Claim 2 to Claim 6, **characterized in that** each of the first yarn feeding roller and the second yarn feeding roller has areas formed thereon and corresponding to yarn contact portions each brought into contact with at least one of the first yarn group and the second yarn group, the yarn contact portions having different roller diameters.

8. The take-up winding facility according to any one of Claim 2 to Claim 7, **characterized in that** an interlace is located between the first yarn feeding roller and the second yarn feeding roller.

9. The take-up winding facility according to any one of Claim 2 to Claim 7, **characterized in that** an interlace is located between the first yarn feeding roller and the take-up winding machine, and between the second yarn feeding roller and the take-up winding machine.

10. The take-up winding facility according to any one of Claim 1 to Claim 9, **characterized in that** a yarn hooking assisting guide is provided close to each of the first yarn feeding roller and the second yarn feeding roller so that during yarn hooking, the filament yarns are temporarily placed on the yarn hooking assisting guide.

11. The take-up winding facility according to any one of Claim 1 to Claim 10, **characterized in that** an oiling device is provided below a spin-out section of the spinning machine to apply lubricant to the filament yarns.

12. The take-up winding facility according to Claim 11, **characterized in that** a migration nozzle is provided below the spin-out section of the spinning machine to uniformly attach the lubricant applied by the oiling device, to the filament yarns.

13. The take-up winding facility according to any one of Claim 1 to Claim 12, **characterized in that** a shutter is provided below the spin-out section of the spinning machine so that when any filament yarn is broken, the filament yarn is prevented from falling.

14. The take-up winding facility according to any one of Claim 1 to Claim 13, **characterized in that** a common inverter is used to drive the yarn feeding rollers.

FIGURE 1A

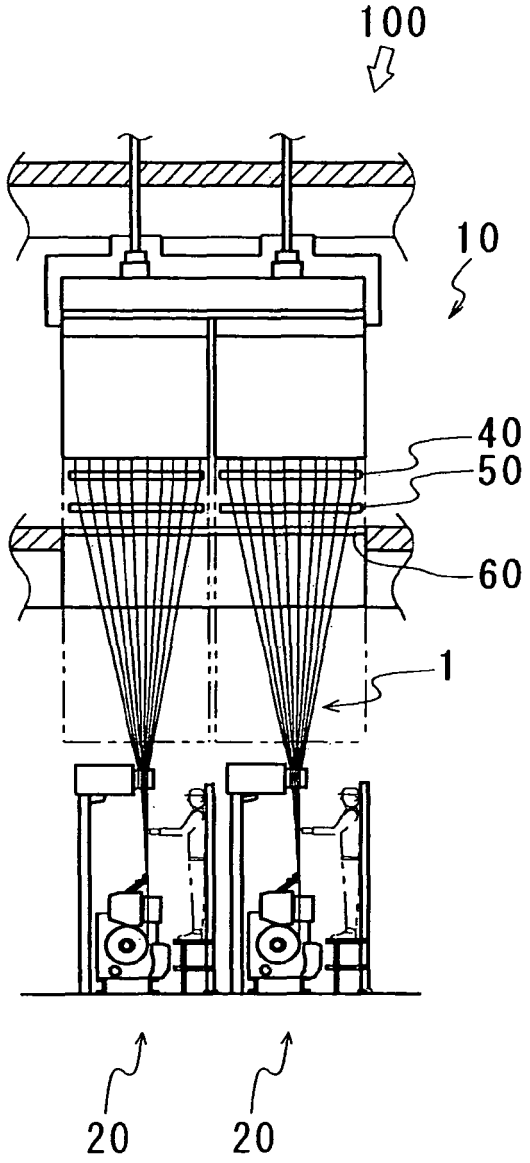


FIGURE 1B

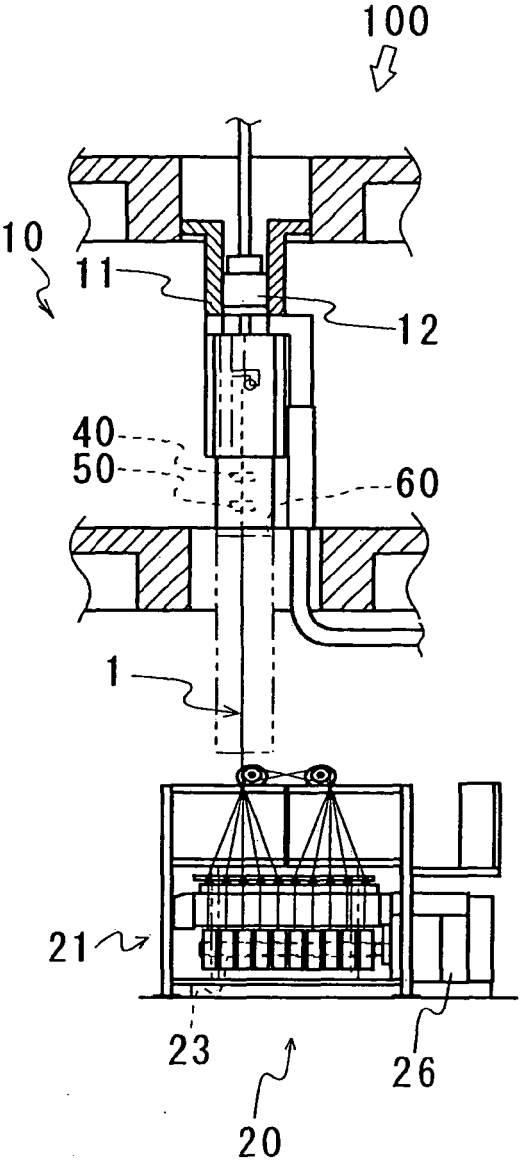


FIGURE 2

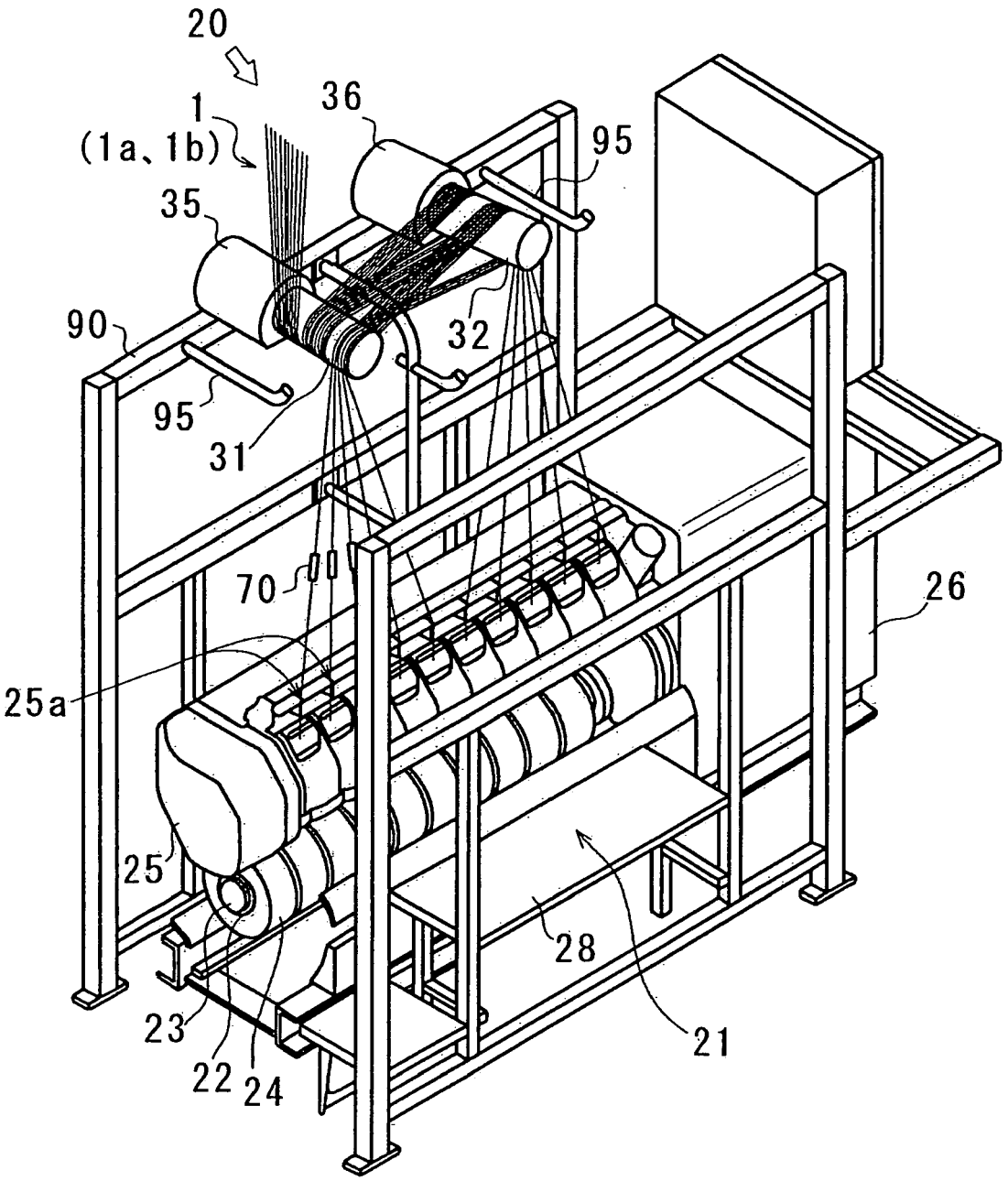


FIGURE 3

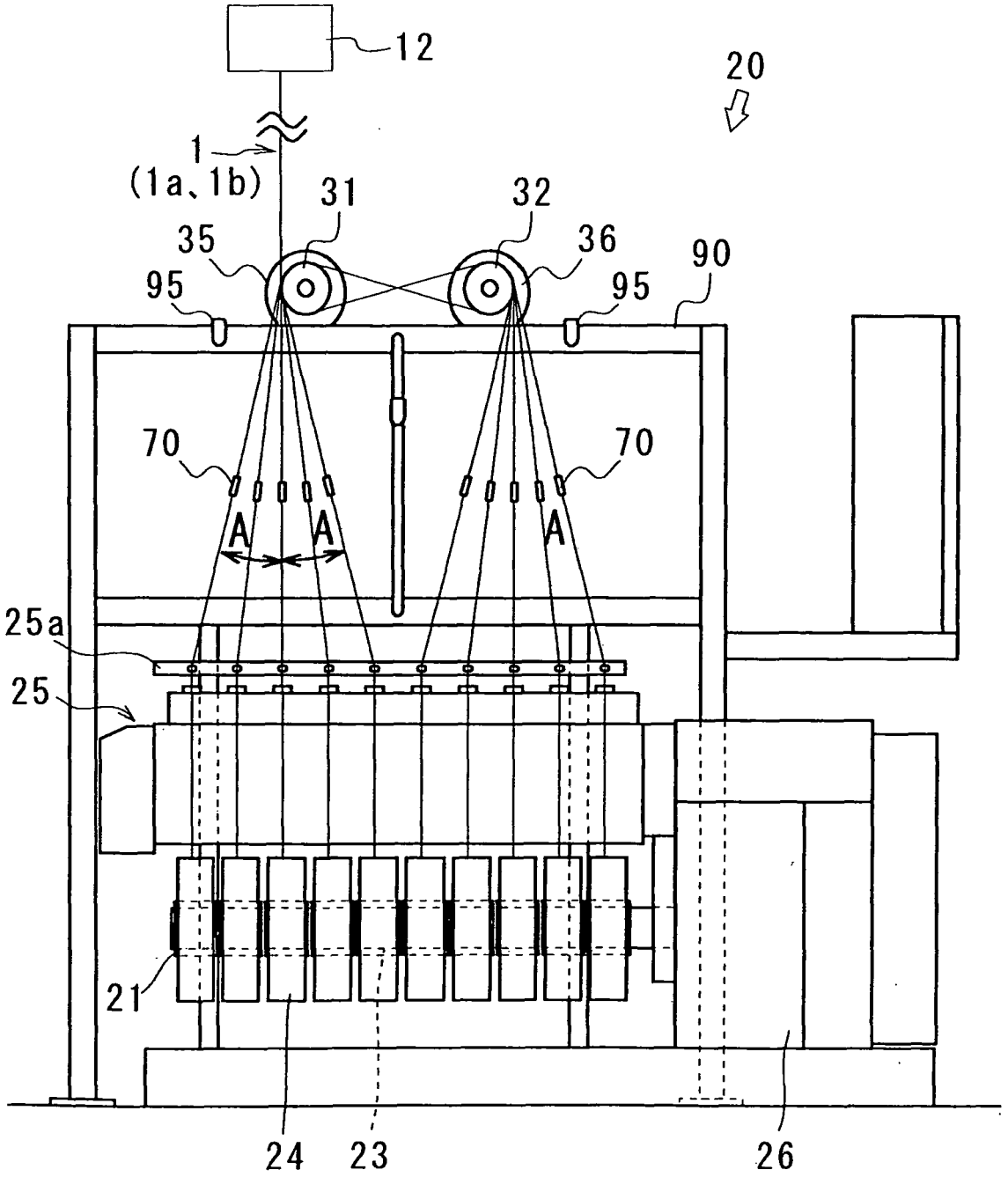


FIGURE 4

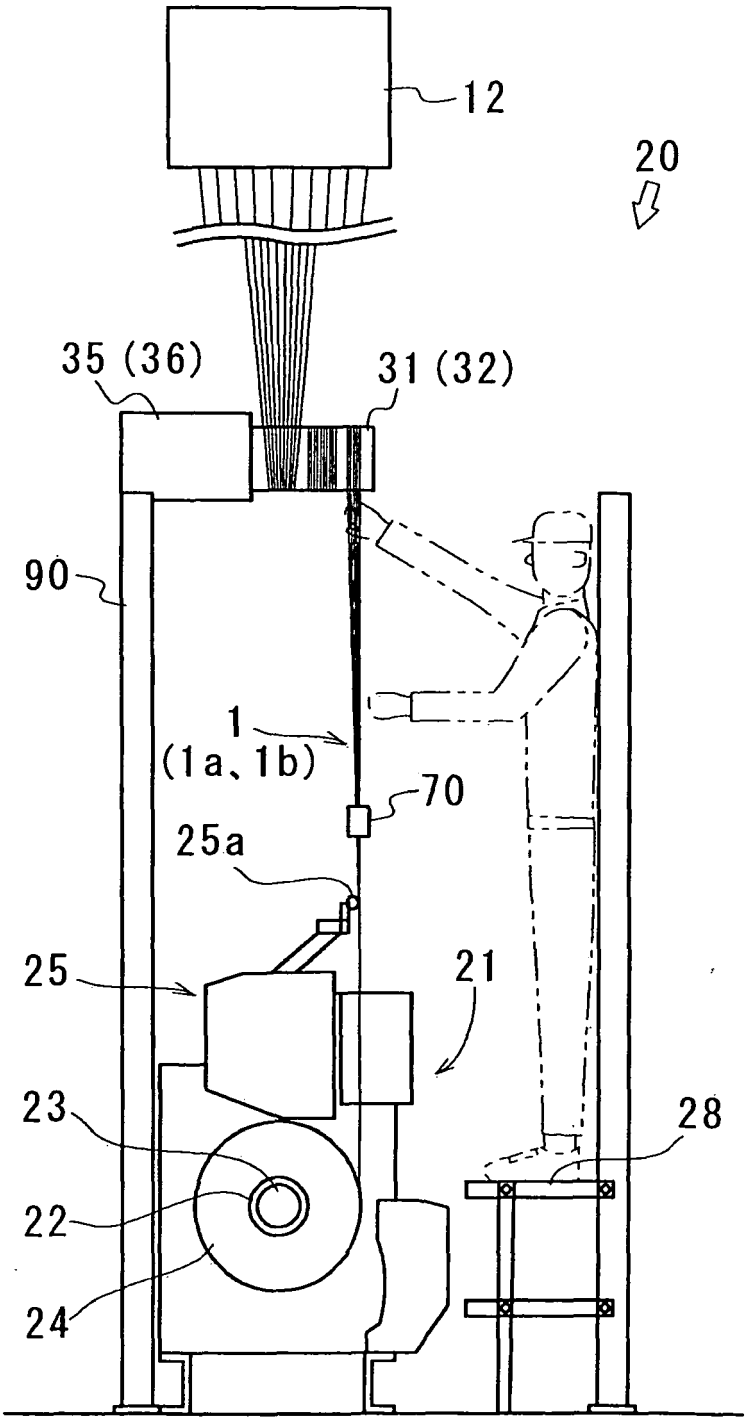


FIGURE 5

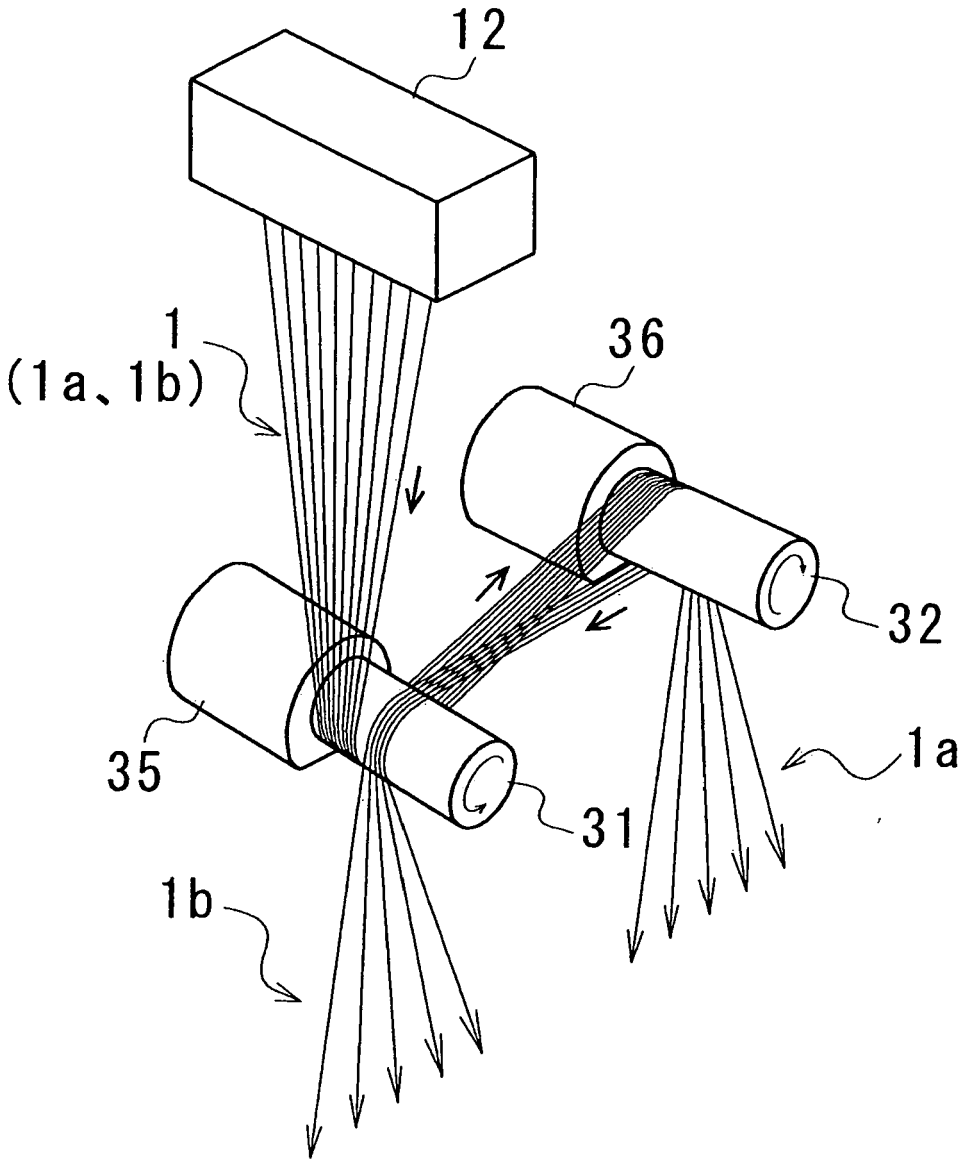


FIGURE 6

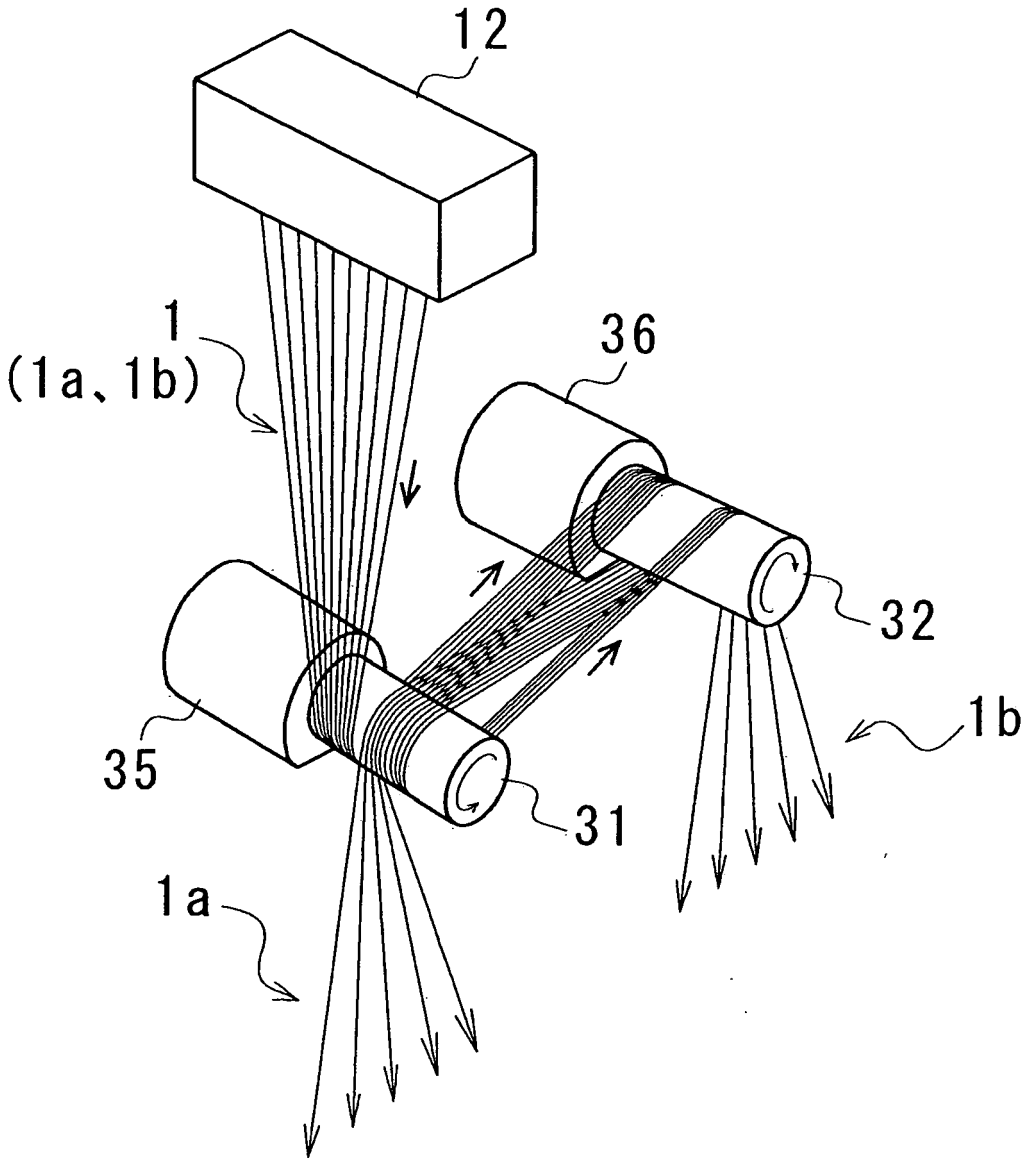


FIGURE 7

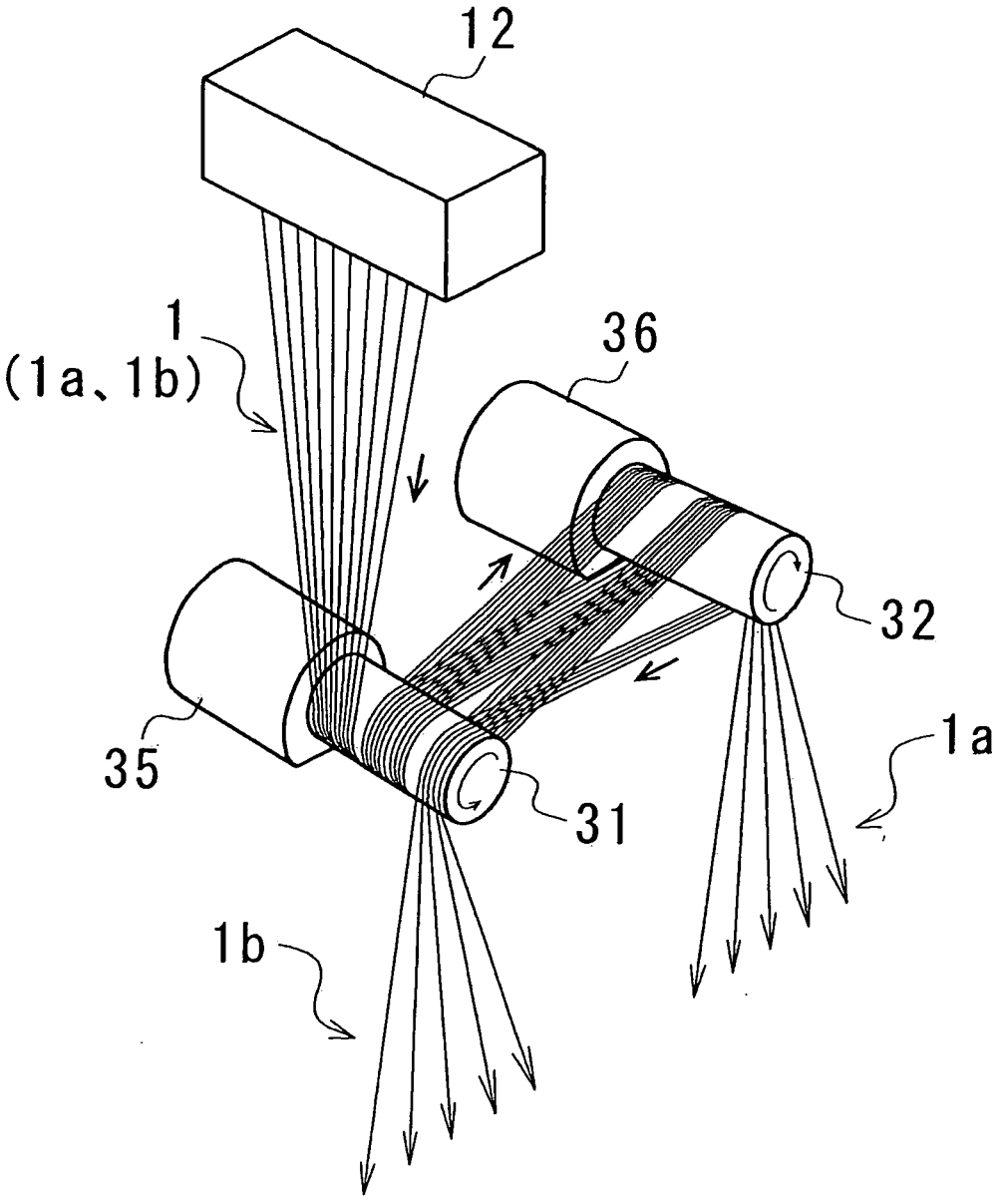


FIGURE 8

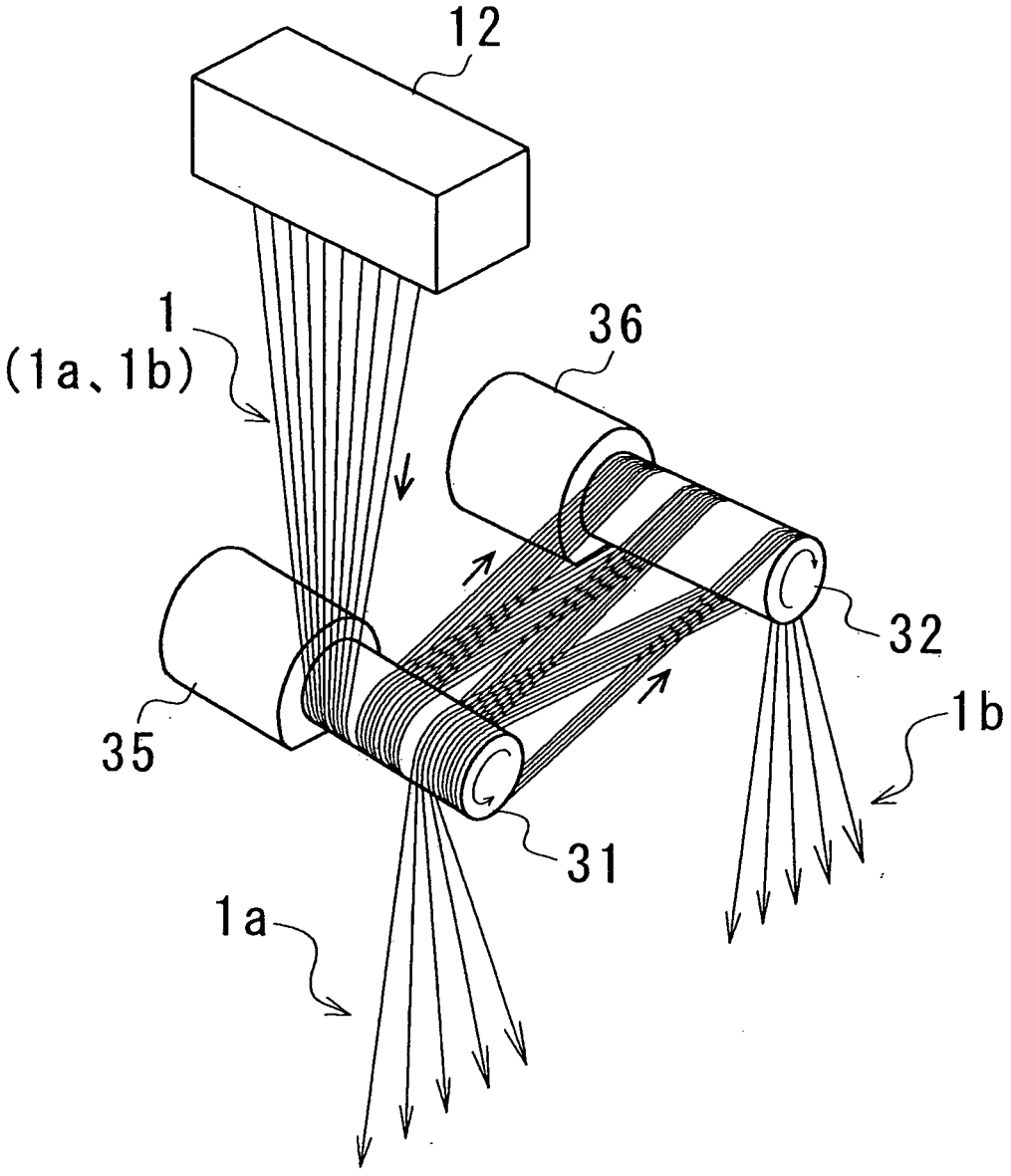


FIGURE 9A

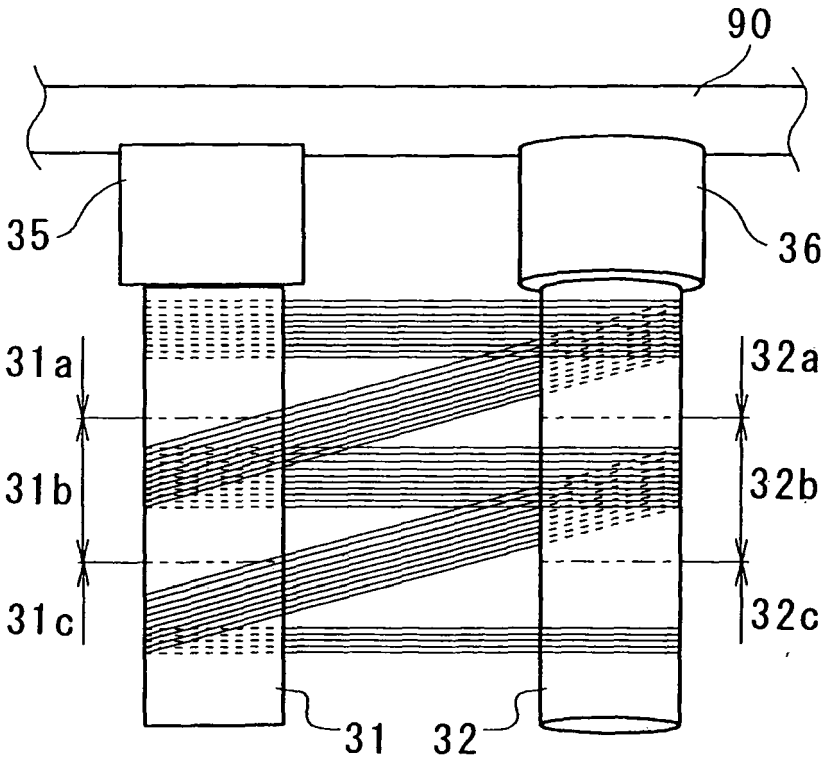


FIGURE 9B

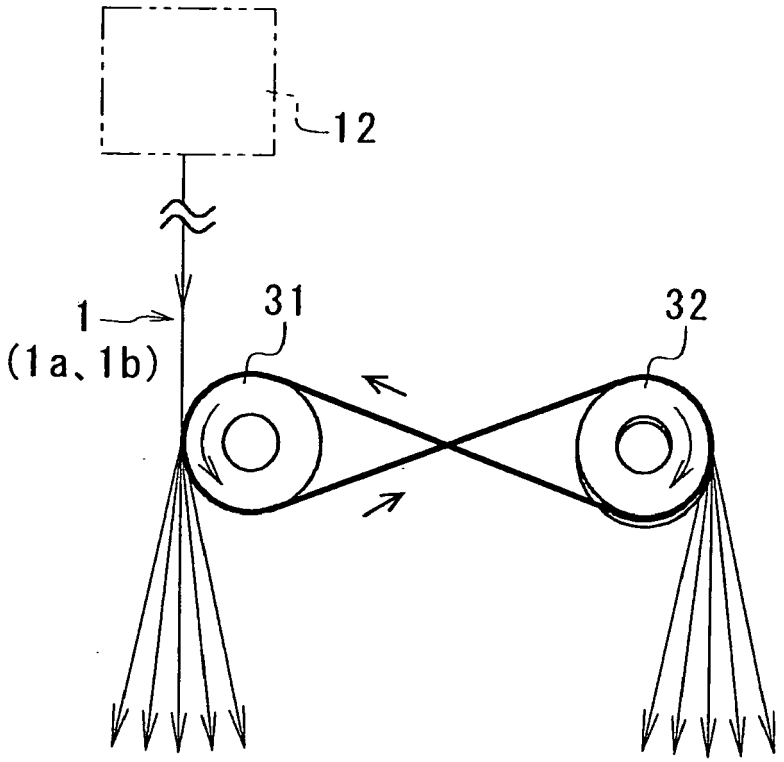


FIGURE 10A

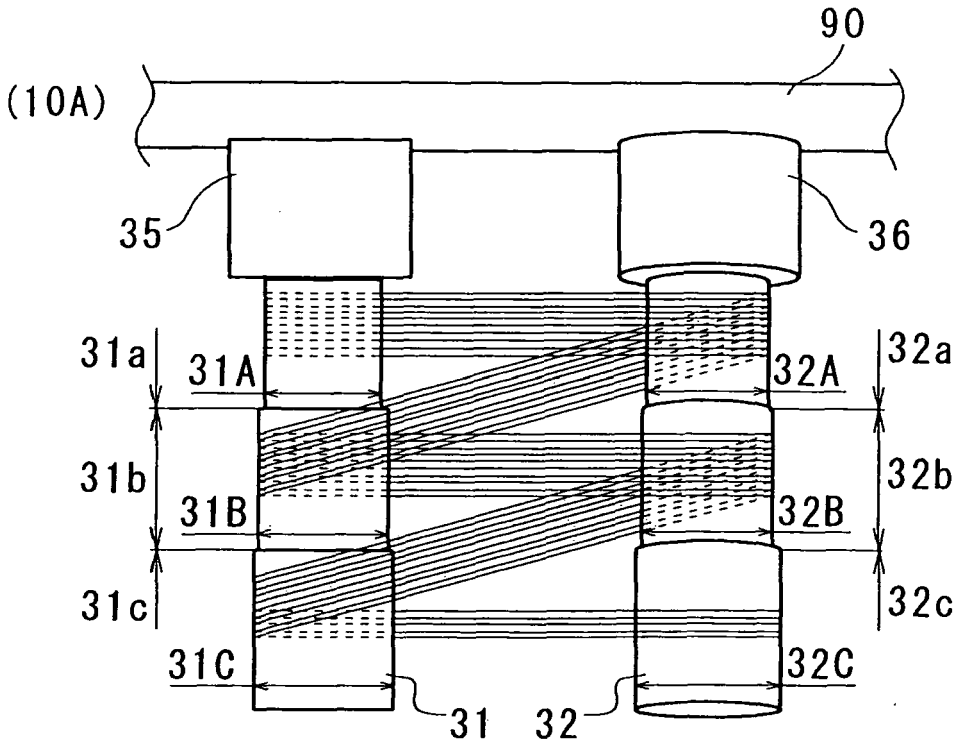
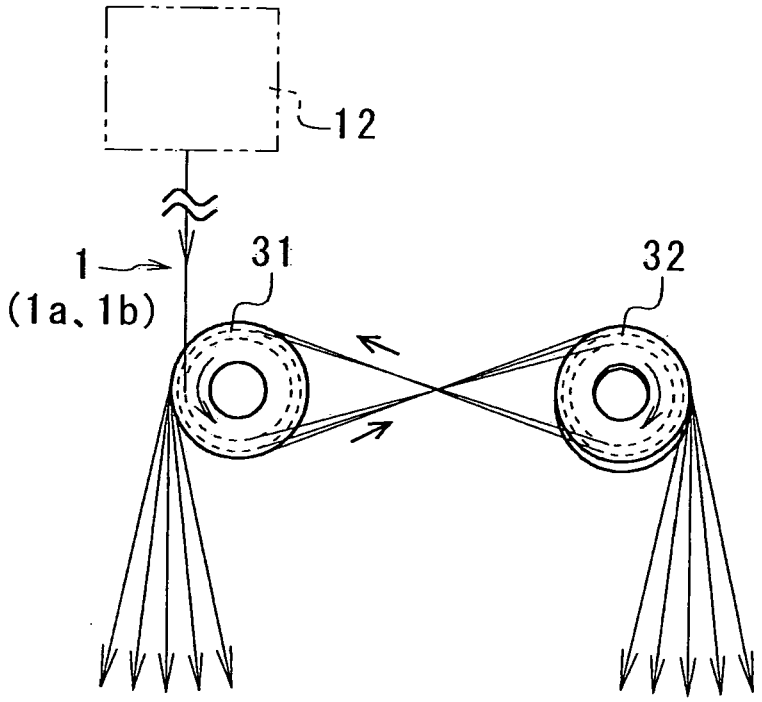


FIGURE 10B



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2003285972 A **[0002] [0004]**
- JP 2005534825 PCT **[0003] [0005]**