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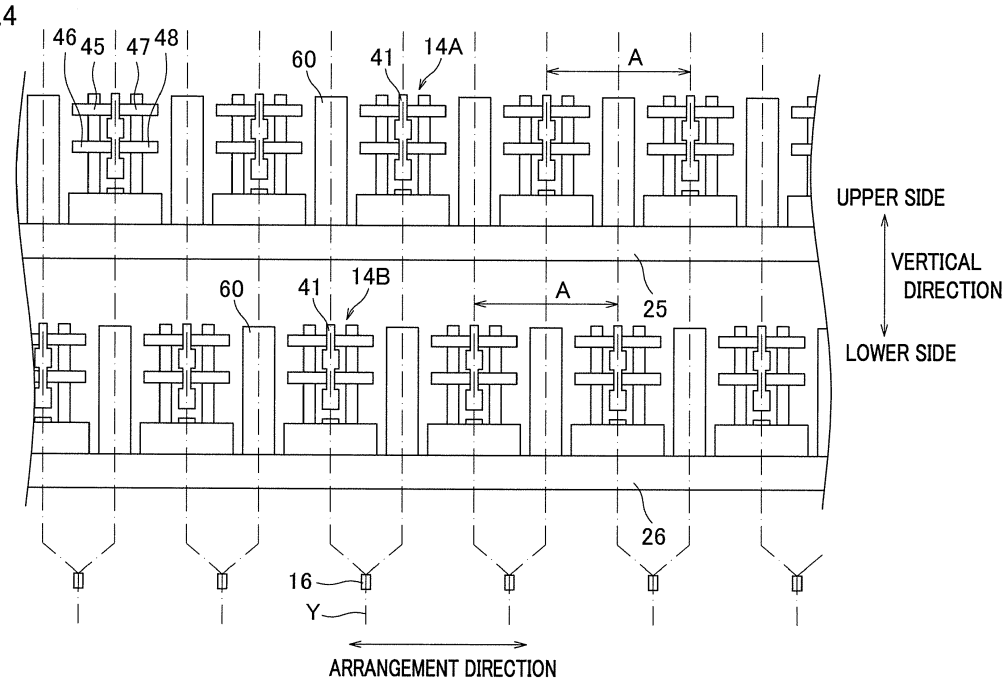
(54) DRAW TEXTURING MACHINE

(57) Objects of the present invention are, firstly, to facilitate yarn threading and, secondly, to suppress an unintentional winding of yarns around rotating members at the time of yarn breakage in a draw texturing machine in which plural twisting units are provided on plural stages. In a draw texturing machine comprising plural twisting units 14 each of which includes rotating members 45 to 48 rotated at the time of twisting a yarn Y and which are aligned in a predetermined arrangement direction and provided on plural stages, a partition 60 is provided between a yarn path of the yarn Y passing one twisting unit 14A (or 14B) on one of the plural stages and the rotating members 45 to 48 of one twisting unit 14B (or 14A) which is provided on another stage of the plural stages and which is close to the yarn path.

FIG.4



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Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a draw texturing machine in which plural twisting units configured to twist yarns are aligned in a predetermined arrangement direction and provided on plural stages.

[0002] As shown in Patent Literature 1 (Chinese Unexamined Patent Publication No. 1036668614), for example, a draw texturing machine in which plural twisting units configured to twist yarns are aligned in a predetermined arrangement direction and provided on plural stages has been known (see FIG. 3 and FIG. 4 in Patent Literature 1). Because the twisting units are provided on plural stages, a large number of the twisting units can be provided in the arrangement direction.

[0003] A pin-type twisting unit, a friction-type twisting unit, and a belt-type twisting unit have been well known as the twisting units. The pin-type twisting unit includes plural rollers and a cylindrical pin in contact with the circumferential surfaces of the rollers. The rollers are rotated to rotate the pin, with the result that a yarn running inside the pin is twisted. In regard to the friction-type twisting unit, a yarn runs while making contact with the circumferential surfaces of plural discs which are spirally arranged. The discs are rotated so that the yarn is twisted. In regard to the belt-type twisting unit, two endless belts are provided to sandwich a yarn. Each endless belt is rotated so that the yarn is twisted. In all types of the twisting units, rotating members such as a roller, a disc, and an endless belt are rotated so that yarns are twisted.

SUMMARY OF THE INVENTION

[0004] In the above-described draw texturing machine in which the twisting units are provided on plural stages, for example, the yarns may pass close to the twisting units on the upper stage when yarns are threaded to the twisting units on the lower stage. When the rotation of rotating members (such as roller, disc, and endless belt) of the twisting units on the upper stage has already been started at this time, the yarns may be disadvantageously swung because of an influence of the wind, generated by the rotating members, so that the yarn threading becomes difficult or the yarn threading fails. In addition to that, when yarn breakage occurs while the draw texturing machine is in operation, the broken yarns may be unintentionally wound around the rotating members.

[0005] The present invention has been done to solve the problem above, and objects of the present invention are, firstly, to facilitate yarn threading and, secondly, to suppress an unintentional winding of yarns around rotating members at the time of yarn breakage in a draw texturing machine in which plural twisting units are provided on plural stages.

[0006] A draw texturing machine of the present invention is a draw texturing machine comprising plural twisting units each of which includes a rotating member rotated at the time of twisting a yarn and which are aligned in a predetermined arrangement direction and provided on plural stages, and a partition is provided between a yarn path of the yarn passing one of the plural twisting units on one of the plural stages and the rotating member of another one of the plural twisting units on another stage of the plural stages, and the another one of the plural twisting units is close to the yarn path.

[0007] According to the present invention, because the partition is provided between the yarn path and the rotating member of one twisting unit, it is possible to suppress the influence of the wind, generated by the rotation of the rotating member, on the yarn. The yarn swing is therefore suppressed, and hence the yarn threading is easily performed. In addition to that, the presence of the partition suppresses the unintentional winding of the yarn around the rotating member in the yarn breakage.

[0008] In the present invention, preferably, the plural twisting units are provided to form two stages which are an upper stage and a lower stage.

[0009] Because the twisting units are provided on two stages, a space required for providing the twisting units is reduced in the vertical direction.

[0010] In the present invention, preferably, twisting units on the upper stage and other twisting units on the lower stage are alternately arranged in the arrangement direction, the yarn twisted by each of the twisting units on the upper stage passes between two adjacent ones of the other twisting units on the lower stage, the yarn twisted by each of the other twisting units on the lower stage passes between two adjacent ones of the twisting units on the upper stage, and the partition is provided between two adjacent ones of the plural twisting units on each of the upper stage and the lower stage.

[0011] When the draw texturing machine is structured so that the yarn passes between two twisting units, a distance between the yarn and each of the two twisting units is decreased, with the result that the yarn swing due to the wind from the rotating member and the unintentional winding of the yarn around the rotating member easily occur. The effect of providing the partition is therefore conspicuous in such a case.

[0012] In the present invention, preferably, the partition includes a wall portion surrounding at least a part of the periphery of the yarn.

[0013] Because the wall portion surrounds at least a part of the periphery of the yarn as described above, it is possible to further effectively suppress the yarn swing due to the wind from the rotating member and the unintentional winding of the yarn around the rotating member.

[0014] In the present invention, preferably, the wall portion is shaped to surround only a part of the periphery of the yarn.

[0015] When the wall portion is formed as a cylindrical member surrounding the entire periphery of the yarn, it becomes difficult to thread the yarn to the inside of the cylindrical wall portion, even though it is possible to in-

crease the effect of suppressing the yarn swing due to the wind from the rotating member and the unintentional winding of the yarn around the rotating member. Meanwhile, when the wall portion is shaped to surround only a part of the periphery of the yarn, the yarn is easily threaded to the inner side of the wall portion via the opening provided in a place where the wall portion is not provided in the partition.

[0016] In the present invention, preferably, the wall portion extends over a range in which the rotating member is provided in a yarn running direction.

[0017] Because the partition is arranged as described above, it is possible to further effectively suppress the yarn swing due to the wind from the rotating member and the unintentional winding of the yarn around the rotating member.

[0018] In the present invention, preferably, the partition and a yarn guide are integrally formed.

[0019] In order to define the yarn path, the yarn guide may be provided in the vicinity of each twisting unit. Meanwhile, when the yarn guide and the partition are integrally formed, a step of providing the yarn guide is unnecessary.

[0020] In the present invention, preferably, the yarn guide is embedded in the partition by insert molding.

[0021] Because the yarn guide is embedded in the partition by the insert molding, the partition and the yarn guide are easily and certainly integrated even when the partition and the yarn guide are made of different materials.

[0022] In the present invention, preferably, the partition includes an engaging portion which is flexible and engageable with an attached portion to which the partition is attached, and the engaging portion is deformable between an engagement state in which the engaging portion and the attached portion are engaged with each other and a cancellation state in which the engagement between the engaging portion and the attached portion is cancelled.

[0023] With this arrangement, the partition is easily attached to and detached from the attached portion only in such a way that the operator causes the engaging portion to be deformed.

[0024] In the present invention, preferably, each of the plural twisting units includes plural rollers each of which is the rotating member and a cylindrical pin in contact with the circumferential surfaces of the rollers, and each of the plural twisting units is a pin-type twisting unit configured to twist the yarn running inside the pin in such a way that the rollers are rotated so that to rotate the pin is rotated.

[0025] As described later, when each twisting unit is a pin-type twisting unit, the tension of the yarn is almost zero in the yarn threading so that the yarn swing easily occurs. Therefore, providing the partition is especially effective.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026]

FIG. 1 shows the overall structure of a draw texturing machine related to an embodiment.
FIG. 2 is a front view of one of twisting units.
FIG. 3 shows the one of the twisting units from above.
FIG. 4 shows the twisting units on an upper stage and the twisting units on a lower stage from a working space.
FIG. 5(a) shows the twisting units on the upper stage from above, and FIG. 5(b) shows the twisting units on the lower stage from above.
FIG. 6 is a perspective view of a partition.
FIG. 7 is a cross section of the partition taken along a horizontal plane.
FIG. 8 is a cross section of the partition taken along a vertical plane.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0027] The following will describe an embodiment of the present invention with reference to figures.

(Overall Structure of Draw Texturing Machine)

[0028] FIG. 1 shows the overall structure of a draw texturing machine 1 related to the present embodiment. As shown in FIG. 1, the draw texturing machine 1 includes a yarn supplying unit 2 configured to supply yarns Y, a processing part 3 configured to false-twist the yarns Y supplied from the yarn supplying unit 2, and a winding unit 4 configured to wind the yarns Y false-twisted by the processing part 3 so as to form packages P.

[0029] The yarn supplying unit 2 includes a creel stand 10 retaining yarn supply packages Q, and supplies the yarns Y to the processing part 3. In the processing part 3, the following members are provided in this order from the upstream in the yarn running direction along a yarn path: first feed rollers 11; a twist-stopping guide 12; a first heater 13; at least one twisting unit 14 (14A and 14B) ; second feed rollers 15; a combining unit 16; third feed rollers 17; a second heater 18; and fourth feed rollers 19. In the winding unit 4, the yarns Y false-twisted by the processing part 3 are wound by winding devices 20 so as to form packages P.

[0030] In the draw texturing machine 1, the yarns Y run while being aligned in a direction vertical to the sheet of FIG. 1 (hereinafter, it is referred to as an arrangement direction). Plural sets of the above-described members 11 to 19 are aligned in the arrangement direction to correspond to the yarns Y. With this arrangement, the yarns Y can be simultaneously false-twisted in the draw texturing machine 1.

[0031] The draw texturing machine 1 includes a main base 5 and a winding base 6 which oppose each other and are spaced apart from each other in the left-right

direction of FIG. 1. The main base 5 and the winding base 6 are provided to extend in the arrangement direction. A supporting frame 7 is provided between the upper portion of the main base 5 and the upper portion of the winding base 6. The plural sets of the above-described members 11 to 19 constituting the processing part 3 are mainly attached to the main base 5 and the supporting frame 7. The yarns Y run mainly around the working space 8 surrounded by the main base 5, the winding base 6, and the supporting frame 7. An operator performs operations such as yarn threading in the working space 8.

(Structure of Processing Part)

[0032] The following will describe the structure of the yarn processing part 3. The first feed rollers 11 send a yarn Y supplied from the yarn supplying unit 2 to the first heater 13. The first feed rollers 11 are provided below the supporting frame 7. The first feed rollers 11 include a drive roller and a driven roller, and the yarn Y is sent while being sandwiched by the drive roller and the driven roller. The second feed rollers 15, the third feed rollers 17, and the fourth feed rollers 19 are similarly arranged.

[0033] The twist-stopping guide 12 prevents twist of the yarn Y formed by each twisting unit 14 from being propagated to the upstream in the yarn running direction of the twist-stopping guide 12. The twist-stopping guide 12 is provided between the first feed rollers 11 and the first heater 13 in the yarn running direction. The twist-stopping guide 12 is attached to a shifter 22 which is movable along a guide rail 21 extending roughly in the vertical direction. The shifter 22 is movable between a yarn threading position (indicated by dashed lines in FIG. 1) in the vicinity of the first feed rollers 11 and an operation position (indicated by full lines in FIG. 1) immediately above the first heater 13. The operator performs the yarn threading to the twist-stopping guide 12 while the shifter 22 is at the yarn threading position, and the shifter 22 is moved to the operation position after the yarn threading. Therefore, when the draw texturing machine 1 is in operation, the twist-stopping guide 12 is immediately above the first heater 13.

[0034] The first heater 13 heats the yarn Y twisted by each twisting unit 14. The first heater 13 is provided at an upper end portion of the main base 5, and extends in the vertical direction.

[0035] Each twisting unit 14 twists the yarn Y. Each twisting unit 14 is provided immediately below the first heater 13 in the main base 5. Therefore, a yarn path from the twist-stopping guide 12 to each twisting unit 14 via the first heater 13 is along the vertical direction. The twisting units 14 include the twisting units 14 on an upper stage and the twisting units 14 on a lower stage. Hereinafter, the twisting units 14 on the upper stage are referred to as twisting units 14A, and the twisting units 14 on the lower stage are referred to as twisting units 14B. The details of the twisting units 14 will be given later.

[0036] The second feed rollers 15 send the yarn Y twisted by each twisting unit 14 toward the combining unit 16. The second feed rollers 15 are provided below the twisting unit 14 in the main base 5. The conveyance speed of conveying the yarn Y by the second feed rollers 15 is higher than the conveyance speed of conveying the yarn Y by the first feed rollers 11. The yarn Y is therefore drawn between the first feed rollers 11 and the second feed rollers 15.

[0037] The combining unit 16 is an interlacing unit (interlacing device) configured to combine two yarns Y with each other by injecting air thereto. As detailed later, a yarn Y twisted by one twisting unit 14A on the upper stage and a yarn Y twisted by one twisting unit 14B on the lower stage are combined with each other by the combining unit 16 into a single yarn Y. The combining unit 16 is provided below the second feed rollers 15 in the main base 5.

[0038] The third feed rollers 17 send the combined yarn Y processed by the combining unit 16 toward the second heater 18. The third feed rollers 17 are provided below the combining unit 16 in the main base 5. The conveyance speed of conveying the yarn Y by the third feed rollers 17 is lower than the conveyance speed of conveying the yarn Y by the second feed rollers 15. The yarn Y is therefore relaxed between the second feed rollers 15 and the third feed rollers 17.

[0039] The second heater 18 heats the yarn Y sent from the third feed rollers 17. The second heater 18 is provided below the third feed rollers 17 in the main base 5, and extends in the vertical direction.

[0040] The fourth feed rollers 19 send the yarn Y thermally treated by the second heater 18 to each winding device 20. The fourth feed rollers 19 are provided in the vicinity of the lower portion of the winding base 6. The conveyance speed of conveying the yarn Y by the fourth feed rollers 19 is lower than the conveyance speed of conveying the yarn Y by the third feed rollers 17. The yarn Y is therefore relaxed between the third feed rollers 17 and the fourth feed rollers 19.

[0041] In the processing part 3 arranged as described above, the yarn Y drawn between the first feed rollers 11 and the second feed rollers 15 is twisted by each twisting unit 14. The twist-stopping guide 12 prevents the twist of the yarn Y formed by the twisting unit 14 from being propagated to the upstream in the yarn running direction, and then the first heater 13 thermally sets the twist of the yarn Y. Each of the combining unit 16 and the second heater 18 processes the relaxed yarn Y.

[0042] A suction 23 is provided below the third feed rollers 17 in the main base 5 so as to face the working space 8. The suction 23 is used to temporarily retain the yarn Y in the yarn threading.

(Structure of Twisting Unit)

[0043] The following will describe the structure of each twisting unit 14. As described above, the twisting units 14 include the twisting units 14A on the upper stage and

the twisting units 14B on the lower stage. These units are structurally identical with each other. FIG. 2 is a front view of one twisting unit 14, i.e., shows the twisting unit 14 from the working space 8. FIG. 3 shows the twisting unit 14 from above. The twisting unit 14 is a pin-type twisting unit configured to twist the yarn Y running inside the cylindrical pin 41 by axially rotating the pin 41.

[0044] The twisting unit 14 includes two rotational shafts 43 and 44 each of which extends in the vertical direction and which are aligned in the arrangement direction. The rotational shafts 43 and 44 are rotatably supported by the base 42 via unillustrated bearings. To the rotational shaft 43, upper and lower rollers 45 and 46 are fixed. To the rotational shaft 44, upper and lower rollers 47 and 48 are fixed. Both of the rollers 45 and 47 are provided at the same position in the vertical direction, and are slightly spaced apart from each other not to make contact with each other. Both of the rollers 46 and 48 are provided at the same position in the vertical direction, and are slightly spaced apart from each other not to make contact with each other. The rotational shaft 43 is rotationally and axially driven by the motor 54.

[0045] The pin 41 is a cylindrical member extending in the vertical direction. The yarn Y runs in the pin 41. At an intermediate portion of the pin 41, a large-diameter magnetic portion 41a is formed to oppose later-described magnets 49 and 50. At a lower end portion (downstream end portion in the yarn running direction) of the pin 41, a wound portion 41b is internally fixed to extend in a direction orthogonal to the axial direction of the pin 41. The yarn Y is wound once around the wound portion 41b. As the pin 41 is rotationally and axially driven, the yarn Y is twisted.

[0046] The magnets 49 and 50 are fixed to the base 42 via a bracket 51. The magnet 49 is provided between the roller 45 and the roller 46. The magnet 50 is provided between the roller 47 and the roller 48. As the pin 41 is inserted between the roller 45 and the roller 47 (between the roller 46 and the roller 48), the magnetic portion 41a of the pin 41 opposes the magnets 49 and 50. Because of this, the pin 41 is retained by the magnets 49 and 50 while making contact with the circumferential surfaces of the rollers 45 to 48. The pin 41 is not fixed to another member, and is retained only by the magnetic forces of the magnets 49 and 50.

[0047] A ring-shaped guide member 52 is provided immediately above the pin 41. The guide member 52 is fixed to the base 42 via an unillustrated bracket. A pipe-shaped guide member 53 is provided immediately below the pin 41 to extend in the vertical direction. The guide member 53 is fixed to the base 42.

[0048] As the rotational shaft 43 is rotated in the direction indicated by an arrow in FIG. 3 by the motor 54, the rollers 45 and 46 fixed to the rotational shaft 43 are rotated in the same direction with each other. Because of this, the pin 41 in contact with the circumferential surfaces of the rollers 45 and 46 is rotationally driven in the direction opposite to the rotation of the rollers 45 and 46 by the friction force. In addition to that, the rollers 47 and 48 in contact with the circumferential surface of the pin 41 are rotationally driven in the direction opposite to the rotation of the pin 41 by the friction force. The pin 41 is rotated while being sandwiched by the rollers 45 and 46 and the rollers 47 and 48, so as to twist the yarn Y running inside the pin 41.

(Arrangement of Twisting Units)

[0049] The following will describe the arrangement of the twisting units 14. FIG. 4 shows the twisting units 14A on the upper stage and the twisting units 14B on the lower stage from the working space 8. FIG. 5(a) shows the twisting units 14A on the upper stage from above, and FIG. 5(b) shows the twisting units 14B on the lower stage from above. FIGs. 5(a) and 5(b) are identical with each other in coordinates, except the vertical direction. A direction orthogonal to both the vertical direction and the arrangement direction is defined as a depth direction. The working space 8 side in the depth direction is defined as the near side, and the side opposite to the near side is defined as the far side.

[0050] In the draw texturing machine 1 of the present embodiment, for example, yarns Y are combined with each other by the combining unit 16 into one yarn Y. These yarns Y to be combined are: a yarn Y to which an S-twist is added by one twisting unit 14A on the upper stage; and a yarn Y to which a Z-twist is added by one twisting unit 14B on the lower stage which is provided below and to the left of the one twisting unit 14A. Because of this, the total number of the twisting units 14 is twice as many as the number of the winding devices 20. If the twisting units 14 are provided to form a single line in the arrangement direction, the size of the draw texturing machine 1 in the arrangement direction is disadvantageously increased. Because the twisting units 14 are provided on the upper stage and the lower stage and each twisting unit 14A on the upper stage is arranged to partially overlap each twisting unit 14B on the lower stage in the arrangement direction, the twisting units 14 are densely disposed in the arrangement direction. Because of this, the increase in the size of the draw texturing machine 1 in the arrangement direction is suppressed.

[0051] The twisting units 14A on the upper stage are fixed to a supporting member 25 while being aligned at regular intervals (pitches A) in the arrangement direction. Similarly, the twisting units 14B on the lower stage are fixed to a supporting member 26 while being aligned at regular intervals (pitches A) in the arrangement direction. The position of each twisting unit 14A on the upper stage is deviated from the position of each twisting unit 14B on the lower stage by a half of one interval (i.e., A/2), and the twisting units 14A on the upper stage and the twisting units 14B on the lower stage are alternately arranged in the arrangement direction. The twisting units 14A on the upper stage and the twisting units 14B on the lower stage are provided at the same position in the depth direction.

[0052] Each twisting unit 14A on the upper stage is provided at the middle between each two adjacent twisting units 14B on the lower stage in the arrangement direction. Each twisting unit 14B on the lower stage is provided at the middle between each two adjacent twisting units 14A on the upper stage in the arrangement direction. Therefore, each yarn Y twisted by each twisting unit 14A on the upper stage passes between each two adjacent twisting units 14B on the lower stage. In addition to that, each yarn Y twisted by each twisting unit 14B on the lower stage passes between each two adjacent twisting units 14A on the upper stage. In other words, each yarn Y passes through a narrow gap (e.g., space the width of which is 50 mm or less) between each two adjacent twisting units 14 in the arrangement direction.

(Yarn Swing in Yarn Threading to Twisting Units)

[0053] The yarn threading is simultaneously performed to two twisting units 14 configured to twist two yarns Y which are to be combined with each other by the combining unit 16. As shown in FIG. 4, the yarn threading is simultaneously performed to one twisting unit 14A on the upper stage and to one twisting unit 14B on the lower stage, which is provided below and to the left of the one twisting unit 14A. In this regard, A yarn Y twisted by one twisting unit 14A on the upper stage may be combined with a yarn Y twisted by one twisting unit 14B on the lower stage which is provided below and to the right of the one twisting unit 14A. In this case, the yarn threading is simultaneously performed to the one twisting unit 14A on the upper stage and to the one twisting unit 14B on the lower stage, which is provided below and to the right of the one twisting unit 14A as described above. When the yarn threading to one pair of one twisting unit 14A and one twisting unit 14B is completed, the one twisting unit 14A and the one twisting unit 14B are activated after the yarns Y are sucked and retained by the suction 23. Subsequently, the yarn threading is performed to another pair of another twisting unit 14A and another twisting unit 14B which are provided to the right of the one pair of the one twisting unit 14A and the one twisting unit 14B. Conversely, the yarn threading may be performed in order from the rightmost pair of the twisting units 14A and 14B.

[0054] Assume that the yarn threading is performed as described above. In this case, when the yarn threading to one pair of one twisting unit 14A and one twisting unit 14B is performed, another pair of another twisting unit 14A and another twisting unit 14B which are provided, as shown in FIG. 4, to the left of the one pair of the one twisting unit 14A and the one twisting unit 14B is already in operation. Therefore, the yarn Y which is being threaded to the one twisting unit 14A on the upper stage (or the one twisting unit 14B on the lower stage) may be disadvantageously swung because of the wind generated by the rotation of the rollers 45 to 48 of the another twisting unit 14B on the lower stage (or the another twisting unit 14A on the upper stage) which is provided to the left of the one twisting unit 14A (or the one twisting unit 14B) as described above.

[0055] Especially, the yarn swing tends to be significant in the pin-type twisting units 14 for the reasons as follows. Before the yarn threading to one twisting unit 14 is completed and the one twisting unit 14 is activated, the sucking force of the suction 23 scarcely influences on the upstream of the wound portion 41b of the pin 41 in the yarn running direction. For this reason, the tension of the upstream part of the yarn Y is almost zero in the yarn threading, with the result that the yarn Y is easily swung by the influence of the wind. In this regard, the upstream part of the yarn Y is provided upstream of the one twisting unit 14 in the yarn running direction. When the yarn threading is performed to one twisting unit 14B on the lower stage, the upstream part of the yarn Y which is provided upstream of the one twisting unit 14B on the lower stage in the yarn running direction passes between two adjacent twisting units 14A on the upper stage. Therefore, the yarn swing is particularly conspicuous in such a case.

[0056] The occurrence of the yarn swing may bring about the problem such as the difficulty in the yarn threading, the failure in the yarn threading, and the unintentional winding of the yarn Y around the rotating rollers 45 to 48 while the yarn Y is being threaded. These problems may occur not only when the yarn threading is performed for the first time in order to prepare the activation the draw texturing machine 1 but also when the yarn threading is performed because the yarn Y is broken while the draw texturing machine 1 is in operation. In addition to that, when the yarn breakage occurs while the draw texturing machine 1 is in operation, the broken yarn Y may be unintentionally wound around the rotating rollers 45 to 48.

(Partition)

[0057] In the present embodiment, a partition 60 is provided to solve the problems described above. As shown in FIG. 4 and FIG. 5, each partition 60 is provided at the middle between two adjacent twisting units 14 in the arrangement direction on each of the upper stage and the lower stage.

[0058] FIG. 6 is a perspective view of the partition 60. FIG. 7 is a cross section of the partition 60 taken along the horizontal plane, i.e., a cross section of a later-described yarn guide 62 taken along the horizontal plane. FIG. 8 is a cross section of the partition 60 taken along the vertical plane, i.e., a cross section of the partition 60 taken along the VIII-VIII line in FIG. 7. FIG. 8 shows the partition 60 attached to the supporting member 25 on the upper stage. The structure of the partition 60 shown in FIG. 8 is identical with that of each partition 60 attached to the supporting member 26 on the lower stage.

[0059] As shown in FIG. 6, each partition 60 includes a main body 61 made of resin and the yarn guide 62 which is made of ceramic and which is embedded in the main body 61 by insert molding. The main body 61 is

arranged so that a wall portion 63, a guide supporting portion 64, an engaging portion 65, and press portions 66 are integrally formed by resin molding.

[0060] The wall portion 63 extends along the yarn running direction (direction substantially corresponds to the vertical direction in the present embodiment). In the yarn running direction, the wall portion 63 extends at least over the range in which the rollers 45 to 48 of each twisting unit 14 are provided, i.e., the range from the upper end of the roller 45 (47) to the lower end of the roller 46 (48). The wall portion 63 has a U-shaped cross section orthogonal to the yarn running direction. The partition 60 is provided so that a part of the periphery of the yarn Y is surrounded by the wall portion 63. In other words, the wall portion 63 of the partition 60 is provided between a yarn path of the yarn Y passing one twisting unit 14A on the upper stage (or twisting unit 14B on the lower stage) and the rollers 45 to 48 of one twisting unit 14B on the lower stage (or twisting unit 14A on the upper stage), which is closest to the yarn path.

[0061] An opening 67 is provided in a place where the wall portion 63 is not formed in the partition 60. The opening 67 faces the working space 8, and enables the operator to easily perform the yarn threading to the yarn guide 62 via the opening 67 from the working space 8.

[0062] The guide supporting portion 64 is a member which is formed at a lower end portion of the wall portion 63 and formed on the inner side of the wall portion 63, and into which the yarn guide 62 is inserted. The guide supporting portion 64 is, when viewed from above, a C-shaped member in which an inlet 64a is formed as shown in FIG. 7. The inlet 64a functions as a passage for introducing the yarn Y, which is inserted from the opening 67, to the yarn guide 62.

[0063] As shown in FIG. 8, the engaging portion 65 protrudes downward from the lower end of the wall portion 63 so as to be engageable with an attachment hole 25a formed in the supporting member 25. The engaging portion 65 has flexibility and a U-shaped cross section orthogonal to the vertical direction. On the outer circumferential surface of the engaging portion 65, two hook portions 65a are formed to oppose each other in the arrangement direction. When power is not applied to each hook portion 65a, the hook portion 65a protrudes outward from the peripheral edge of the attachment hole 25a. As a result, the engaging portion 65 and the attachment hole 25a are in an engagement state, i.e., are engaged with each other. Meanwhile, when the hook portion 65a is pressed inward, the engaging portion 65 is deformed so as to be in a cancellation state in which the engagement between the engaging portion 65 and the attachment hole 25a is cancelled.

[0064] In order to attach the partition 60 to the attachment hole 25a, the operator presses down the engaging portion 65 to the attachment hole 25a. Because of this, an inclined portion 65b of the hook portion 65a is pressed by the peripheral edge of the attachment hole 25a so that the engaging portion 65 is deformed and inserted into the attachment hole 25a. As the original shape of the engaging portion 65 is recovered, the hook potion 65a protrudes outward from the peripheral edge of the attachment hole 25a so that the engaging portion 65 is in the engagement state. In order to remove the partition 60 from the attachment hole 25a, the operator presses two hook portions 65a inward. Because of this, the engaging portion 65 is in the cancellation state so that the partition 60 can be pulled upward from the attachment hole 25a. In this regard, the attachment hole 25a is connected to a cutout portion 25b (see FIG. 5) which is formed to extend from the near side of the supporting member 25 toward the attachment hole 25a along the depth direction. When the yarn threading is performed to the partition 60, the yarn Y is inserted from the cutout portion 25b by the operator in the working space 8.

[0065] As shown in FIG. 8, the press portions 66 are formed as two members which are provided to oppose each other in the arrangement direction and each of which protrudes outward from the outer circumferential surface of the lower end portion of the wall portion 63. Each press portion 66 is shaped to be bent downward. Because of this, when the partition 60 is attached to the attachment hole 25a, the partition 60 is biased upward by the press portions 66. As a result, each hook portion 65a is pressed onto the lower surface of the supporting member 25 so as to reduce the rattle of the partition 60.

[0066] The yarn guide 62 is, when viewed from above, a C-shaped member in which an inlet 62a is formed as shown in FIG. 7. The inlet 62a of the yarn guide 62 communicates with the inlet 64a of the guide supporting portion 64. The yarn Y is threaded to the yarn guide 62 via the inlets 64a and 62a. The yarn guide 62 is provided on the inner side of the wall portion 63, i.e., on the far side as compared to the near-side ends of the wall portion 63 in the depth direction. Because of this, the yarn Y is certainly provided inside the wall portion 63 by being threaded to the yarn guide 62.

[0067] For example, when the yarn threading is performed to one twisting unit 14B, the yarn threading is performed after the yarn Y is threaded to the yarn guide 62 of the partition 60 provided immediately above the one twisting unit 14B. Because of this, even when the wind is generated by the rotation of the rollers 45 to 48 of one twisting unit 14A adjacent to a yarn path of the yarn Y, the wall portion 63 of the partition 60 suppresses the influence of the wind on the yarn Y. Even if the wind enters the inner side of the wall portion 63 from the opening 67, the occurrence of the yarn swing causing an adverse effect on the yarn threading is avoided because the yarn Y is threaded to the yarn guide 62. In addition to that, the presence of the wall portion 63 suppresses the unintentional winding of the yarn Y around the rollers 45 to 48 at the time of the yarn breakage.

(Effects)

[0068] In the draw texturing machine 1 of the present

embodiment, plural twisting units 14 each of which includes the rollers 45 to 48 (corresponding to rotating members of the present invention) rotated at the time of twisting the yarn Y are aligned in a predetermined arrangement direction and provided on plural stages. In addition to that, the partition 60 is provided between a yarn path of the yarn Y passing one twisting unit 14 on one of the plural stages and the rollers 45 and 48 of another twisting unit 14 on another of the plural stages, which is close to the yarn path. This suppresses the influence of the wind, generated by the rotation of the rollers 45 to 48, on the yarn Y. The yarn swing is therefore suppressed, and hence the yarn threading is easily performed. In addition to that, the presence of the partition 60 suppresses the unintentional winding of the yarn Y around the rollers 45 to 48 in the yarn breakage.

[0069] In the present embodiment, the twisting units 14 include the twisting units 14 on the upper stage and the twisting units 14 on the lower stage. Because the twisting units 14 are provided on two stages, a space required for providing the twisting units 14 is reduced in the vertical direction.

[0070] In the present embodiment, the twisting units 14A on the upper stage and the twisting units 14B on the lower stage are alternately arranged in the arrangement direction, and each yarn Y twisted by each twisting unit 14A on the upper stage passes between two adjacent twisting units 14B on the lower stage while each yarn Y twisted by each twisting unit 14B on the lower stage passes between two adjacent twisting units 14A on the upper stage. The partition 60 is provided between each two adjacent twisting units 14 on each of the upper stage and the lower stage. When the draw texturing machine 1 is structured so that each yarn Y passes between two twisting units 14, a distance between the yarn Y and each of the two twisting units 14 is decreased, with the result that the yarn swing due to the wind from the rollers 45 to 48 and the unintentional winding of the yarn Y around the rollers 45 to 48 easily occur. The effect of providing the partition 60 is therefore conspicuous in such a case.

[0071] In the present embodiment, the partition 60 includes the wall portion 63 surrounding at least a part of the periphery of the yarn Y. Because the wall portion 63 surrounds at least a part of the periphery of the yarn Y as described above, it is possible to further effectively suppress the yarn swing due to the wind from the rollers 45 to 48 and the unintentional winding of the yarn Y around the rollers 45 to 48.

[0072] In the present embodiment, the wall portion 63 is shaped to surround only a part of the periphery of the yarn Y. When the wall portion 63 is formed as a cylindrical member surrounding the entire periphery of the yarn Y, it becomes difficult to thread the yarn Y to the inside of the cylindrical wall portion 63, even though it is possible to improve the effect of suppressing the yarn swing due to the wind from the rollers 45 to 48 and the unintentional winding of the yarn Y around the rollers 45 to 48. Meanwhile, when the wall portion 63 is shaped to surround only a part of the periphery of the yarn Y, the yarn Y is easily threaded to the inner side of the wall portion 63 via the opening 67 provided in a place where the wall portion 63 is not provided in the partition 60.

[0073] In the present embodiment, the wall portion 63 extends over the range in which the rollers 45 to 48 are provided in the yarn running direction. Because the partition 60 is arranged as described above, it is possible to further effectively suppress the yarn swing due to the wind from the rollers 45 to 48 and the unintentional winding of the yarn Y around the rollers 45 to 48.

[0074] In the present embodiment, the partition 60 and the yarn guide 62 are integrally formed. In order to define the yarn path, the yarn guide 62 may be provided in the vicinity of each twisting unit 14. Meanwhile, when the yarn guide 62 and the partition 60 are integrally formed, a step of providing the yarn guide 62 is unnecessary.

[0075] In the present embodiment, the yarn guide 62 is embedded in the partition 60 by insert molding. Because the yarn guide 62 is embedded in the partition 60 by the insert molding, the partition 60 and the yarn guide 62 are easily and certainly integrated even when the partition 60 and the yarn guide 62 are made of different materials.

[0076] In the present embodiment, the partition 60 includes the engaging portion 65 which is flexible and engageable with the attachment hole 25a (corresponding to an attached portion of the present invention) to which the partition member is attached, and the engaging portion 65 can be deformed to be switchable between the engagement state in which the engaging portion 65 and the attachment hole 25a are engageable with each other and the cancellation state in which the engagement between the engaging portion 65 and the attachment hole 25a is cancelled. With this arrangement, the partition 60 is easily attached to and detached from the attachment hole 25a only in such a way that the operator causes the engaging portion 65 to be deformed.

[0077] In the present embodiment, each twisting unit 14 includes the rollers 45 to 48 and the cylindrical pin 41 in contact with the circumferential surfaces of the rollers 45 to 48, and is a pin-type twisting unit configured to twist each yarn Y running inside the pin 41 in such a way that the rollers 45 to 48 are rotated to rotate the pin 41. As described above, when the twisting unit 14 is a pin-type twisting unit, the tension of the yarn Y is almost zero in the yarn threading so that the yarn swing easily occurs. Therefore, providing the partition 60 is especially effective.

(Other Embodiments)

[0078] The following will describe modifications of the above-described embodiment.

[0079] The embodiment above has described a case where the present invention is applied to the draw texturing machine 1 including the pin-type twisting unit 14. Alternatively, the present invention may be applied to a

draw texturing machine including a friction-type twisting unit or a belt-type twisting unit. In regard to the friction-type twisting unit, a yarn runs while making contact with the circumferential surfaces of plural discs which are spirally arranged. The discs are rotated so that the yarn is twisted. In this case, the discs correspond to rotating members of the present invention. In regard to the belt-type twisting unit, two endless belts are provided to sandwich a yarn. Each endless belt is rotated so that the yarn is twisted. In this case, the two endless belts correspond to rotating members of the present invention.

[0080] In the embodiment above, the plural twisting units 14 include the twisting units 14 on the upper stage and the twisting units 14 on the lower stage. Alternatively, the plural twisting units 14 may be provided on three or more stages.

[0081] In the embodiment above, the twisting units 14A on the upper stage and the twisting units 14B on the lower stage are provided at the same position in the depth direction, and are alternately arranged in the arrangement direction. Alternatively, the twisting units 14A on the upper stage and the twisting units 14B on the lower stage may be provided at different positions from each other in the depth direction. In this case, when a yarn path passing each twisting unit 14A on the upper stage and a yarn path passing each twisting unit 14B on the lower stage are deviated from each other in the depth direction so as to avoid interference between the yarns Y, the twisting units 14A on the upper stage and the twisting units 14B on the lower stage may be provided at the same positions as each other in the arrangement direction.

[0082] The specific arrangement of the partition 60 may be different from that in the embodiment above. For example, a partition may be a plate member which is substantially vertical to the horizontal plane and which is provided between a yarn Y and one twisting unit 14 closest to the yarn Y. Alternatively, the wall portion 63 of the partition 60 may be cylindrical in shape. Alternatively, each partition 60 may be fixed to each of the supporting members 25 and 26 by a bolt, etc.

[0083] In the embodiment above, the partition 60 and the yarn guide 62 are integrally formed by the insert molding. Alternatively, the partition 60 and the yarn guide 62 may be integrally provided by a method which is not the insert molding. Alternatively, the yarn guide may be provided to be independent from the partition.

[0084] The specific arrangement of the yarn guide 62 may be different from that in the embodiment above. In other words, the yarn guide 62 may not be a C-shaped member and may be a pipe-shaped member, a snail guide, a dog-tail guide, or a hook guide, etc. The shape of the guide supporting portion 64 may also be suitably changeable in accordance with the specific shape of the yarn guide 62.

[0085] While in the embodiment above two yarns Y are combined into one yarn Y in the draw texturing machine 1, it is not prerequisite to combine yarns Y.

Claims

1. A draw texturing machine (1) comprising plural twisting units (14) each of which includes a rotating member (45 to 48) rotated at the time of twisting a yarn (Y) and which are aligned in a predetermined arrangement direction and provided on plural stages, wherein,
a partition (60) is provided between a yarn path of the yarn (Y) passing one of the plural twisting units (14) on one of the plural stages and the rotating member (45 to 48) of another one of the plural twisting units (14) on another stage of the plural stages, the another one of the plural twisting units (14) being close to the yarn path.

2. The draw texturing machine (1) according to claim 1, wherein, the plural twisting units (14) are provided to form two stages which are an upper stage and a lower stage.

3. The draw texturing machine (1) according to claim 2, wherein, twisting units (14A) on the upper stage and other twisting units (14B) on the lower stage are alternately arranged in the arrangement direction,
the yarn (Y) twisted by each of the twisting units (14A) on the upper stage passes between two adjacent ones of the other twisting units (14B) on the lower stage,
the yarn (Y) twisted by each of the other twisting units (14B) on the lower stage passes between two adjacent ones of the twisting units (14A) on the upper stage, and
the partition (60) is provided between two adjacent ones of the plural twisting units (14) on each of the upper stage and the lower stage.

4. The draw texturing machine (1) according to any one of claims 1 to 3, wherein, the partition (60) includes a wall portion (63) surrounding at least a part of the periphery of the yarn (Y).

5. The draw texturing machine (1) according to claim 4, wherein, the wall portion (63) is shaped to surround only a part of the periphery of the yarn (Y).

6. The draw texturing machine (1) according to claim 4 or 5, wherein, the wall portion (63) extends over a range in which the rotating member (45 to 48) is provided in a yarn running direction.

7. The draw texturing machine (1) according to any one of claims 1 to 6, wherein, the partition (60) and a yarn guide (62) are integrally formed.

8. The draw texturing machine (1) according to claim 7, wherein, the yarn guide (62) is embedded in the partition (60) by insert molding.

9. The draw texturing machine (1) according to any one of claims 1 to 8, wherein, the partition (60) includes an engaging portion (65) which is flexible and engageable with an attached portion (25a) to which the partition (60) is attached, and
the engaging portion (65) is deformable between an engagement state in which the engaging portion (65) and the attached portion (25a) are engaged with each other and a cancellation state in which the engagement between the engaging portion (65) and the attached portion (25a) is cancelled.

10. The draw texturing machine (1) according to any one of claims 1 to 9, wherein, each of the plural twisting units (14) includes plural rollers (45 to 48) each of which is the rotating member and a cylindrical pin (41) in contact with the circumferential surfaces of the rollers (45 to 48), and
each of the plural twisting units (14) is a pin-type twisting unit configured to twist the yarn (Y) running inside the pin (41) in such a way that the rollers (45 to 48) are rotated to rotate the pin (41).

FIG.1

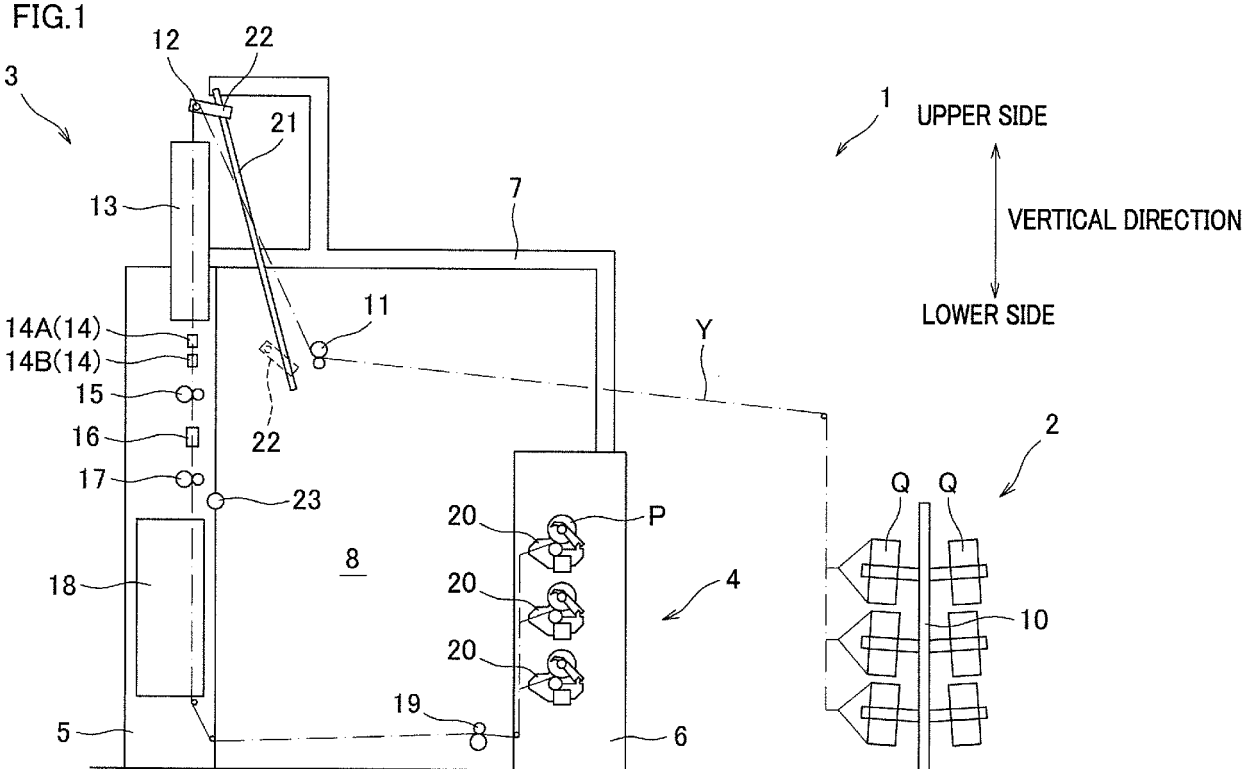

3
12
22
21
13
7
1
UPPER SIDE
VERTICAL DIRECTION
LOWER SIDE
14A(14)
14B(14)
15
16
17
11
Y
22
23
2
Q
Q
20
P
8
4
18
20
10
20
19
5
6

FIG.2

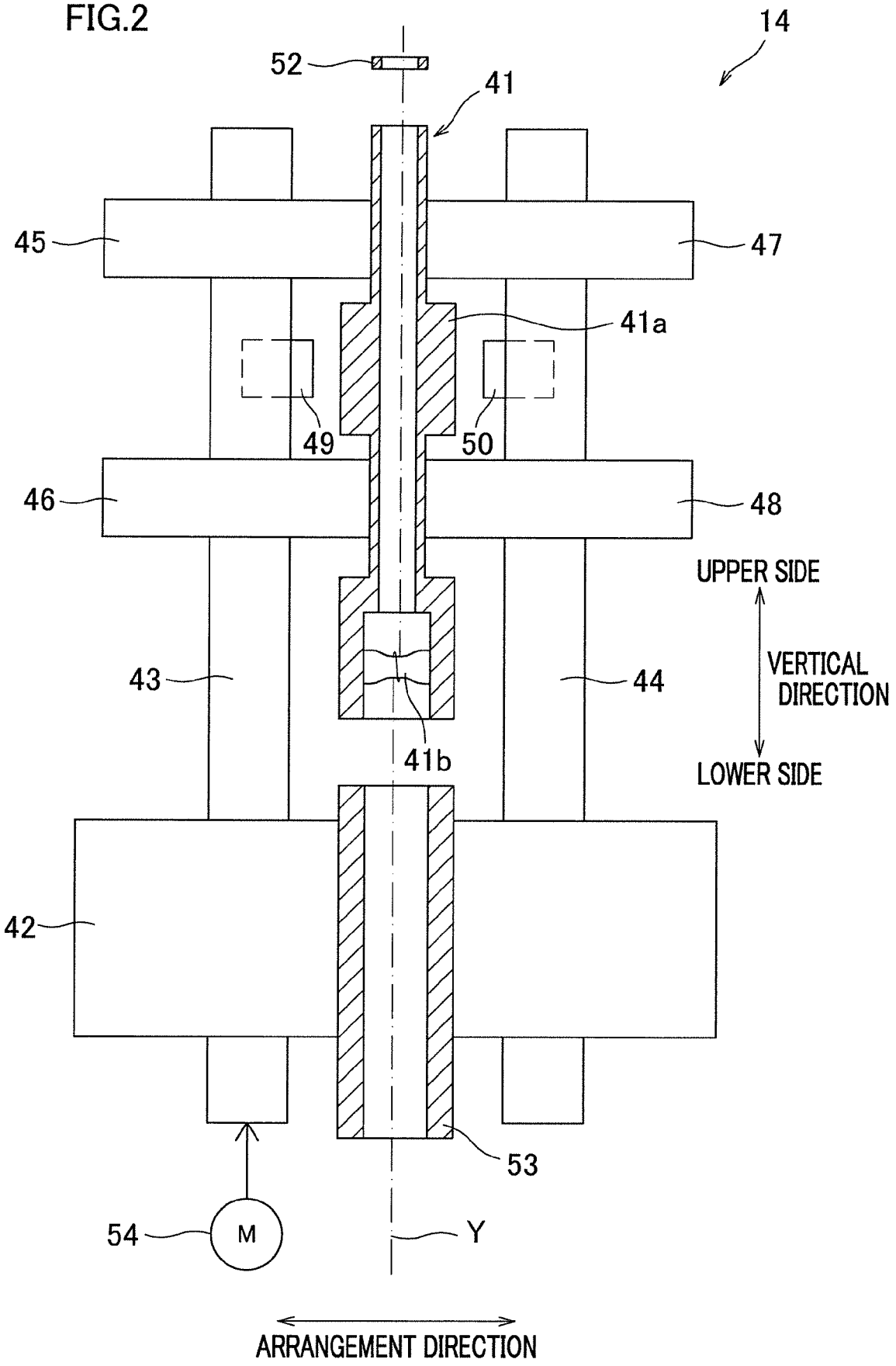

14
52
41
45
47
41a
49
50
46
48
UPPER SIDE
VERTICAL DIRECTION
LOWER SIDE
43
44
41b
42
53
54
M
Y
ARRANGEMENT DIRECTION

FIG.3

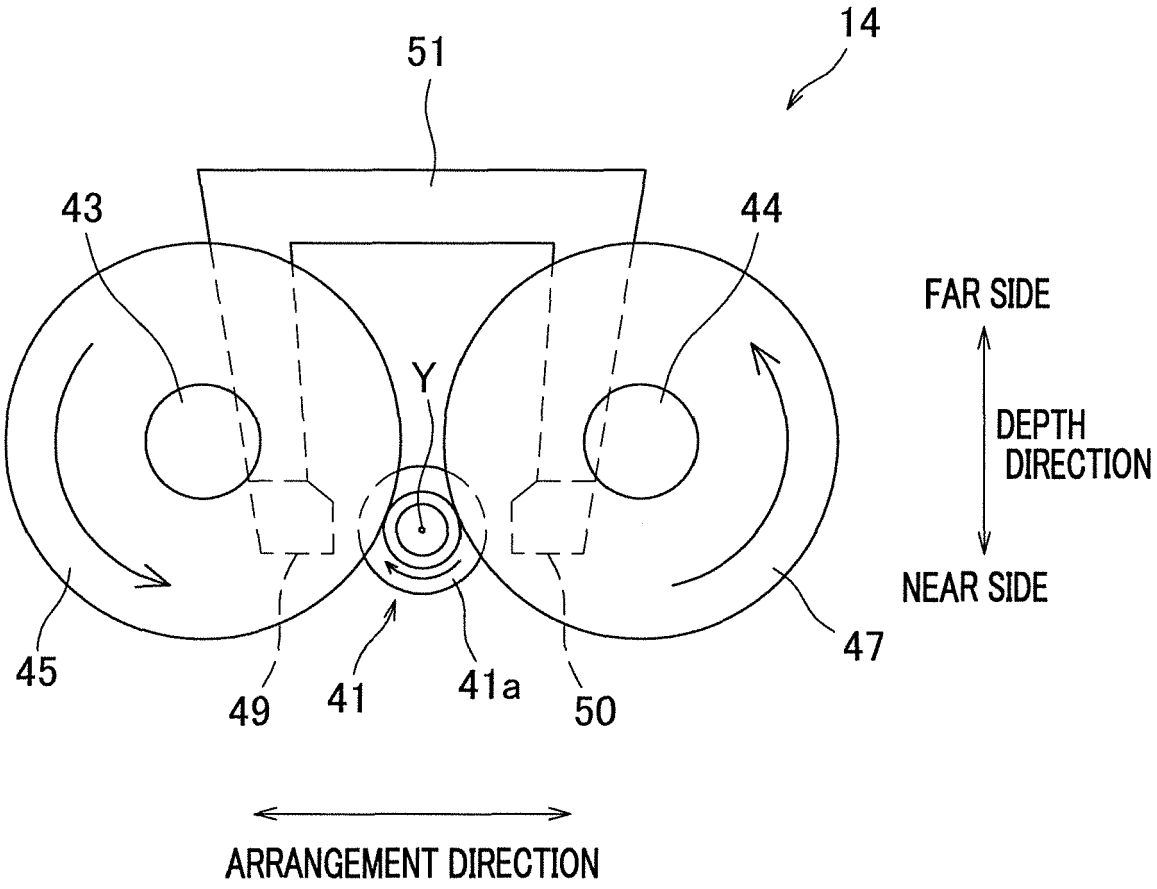

14
51
43
44
Y
FAR SIDE
DEPTH DIRECTION
NEAR SIDE
45
49
41
41a
50
47
ARRANGEMENT DIRECTION

FIG.4

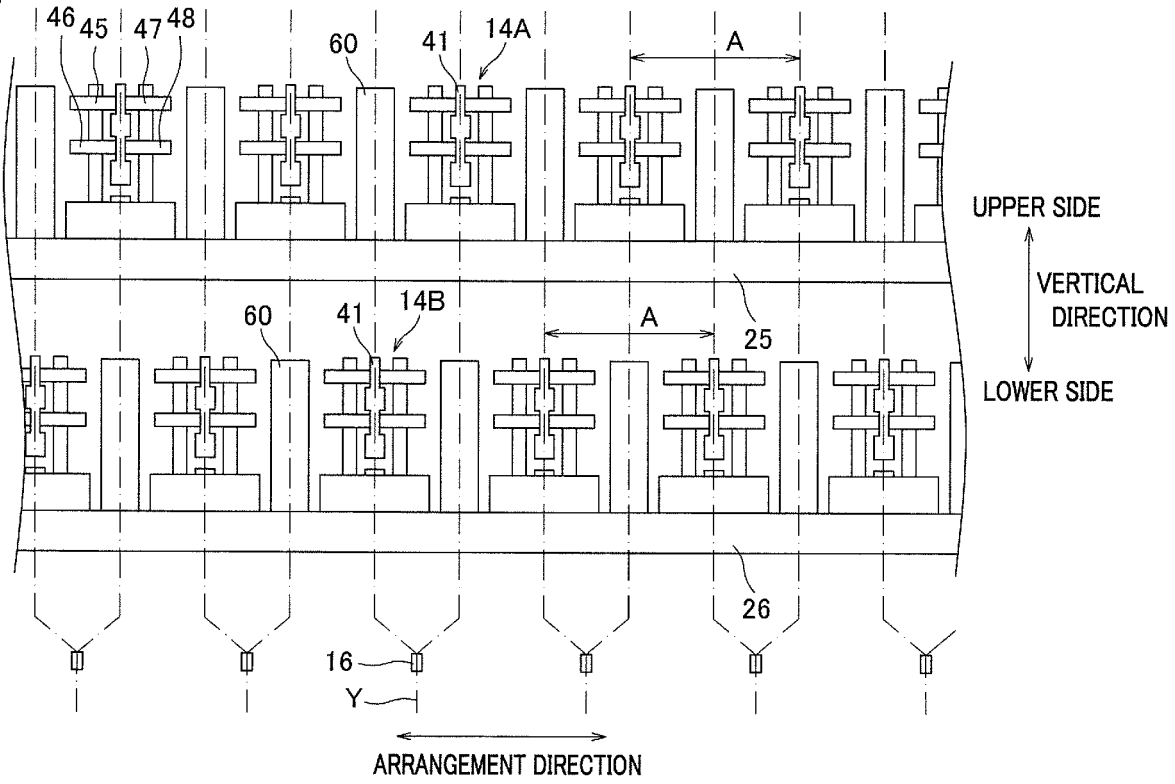

46
45
47
48
60
41
14A
A
UPPER SIDE
VERTICAL DIRECTION
LOWER SIDE
60
41
14B
A
25
26
16
Y
ARRANGEMENT DIRECTION

FIG.5

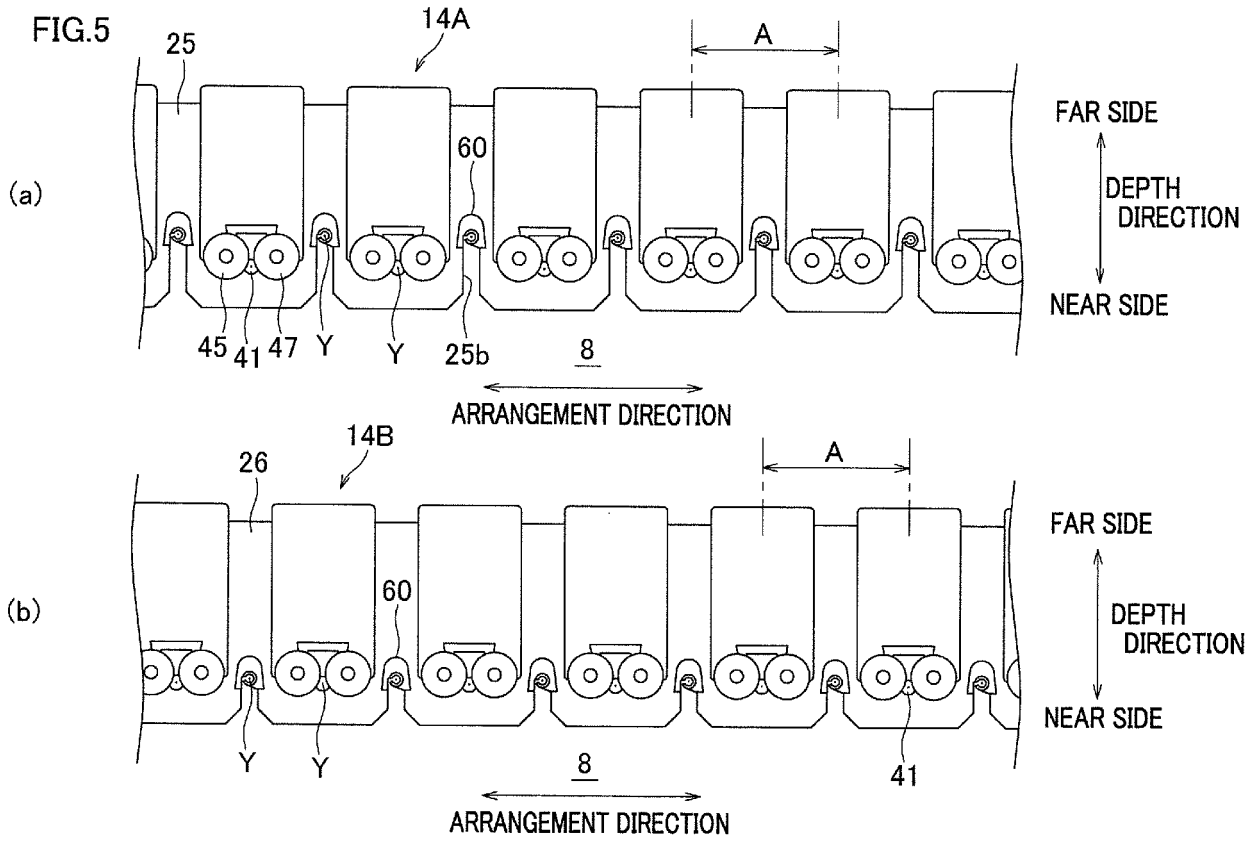

(a)
14A
25
A
60
FAR SIDE
DEPTH DIRECTION
NEAR SIDE
45
41
47
Y
Y
25b
8
ARRANGEMENT DIRECTION
(b)
14B
26
A
60
FAR SIDE
DEPTH DIRECTION
NEAR SIDE
Y
Y
8
41
ARRANGEMENT DIRECTION

FIG.6

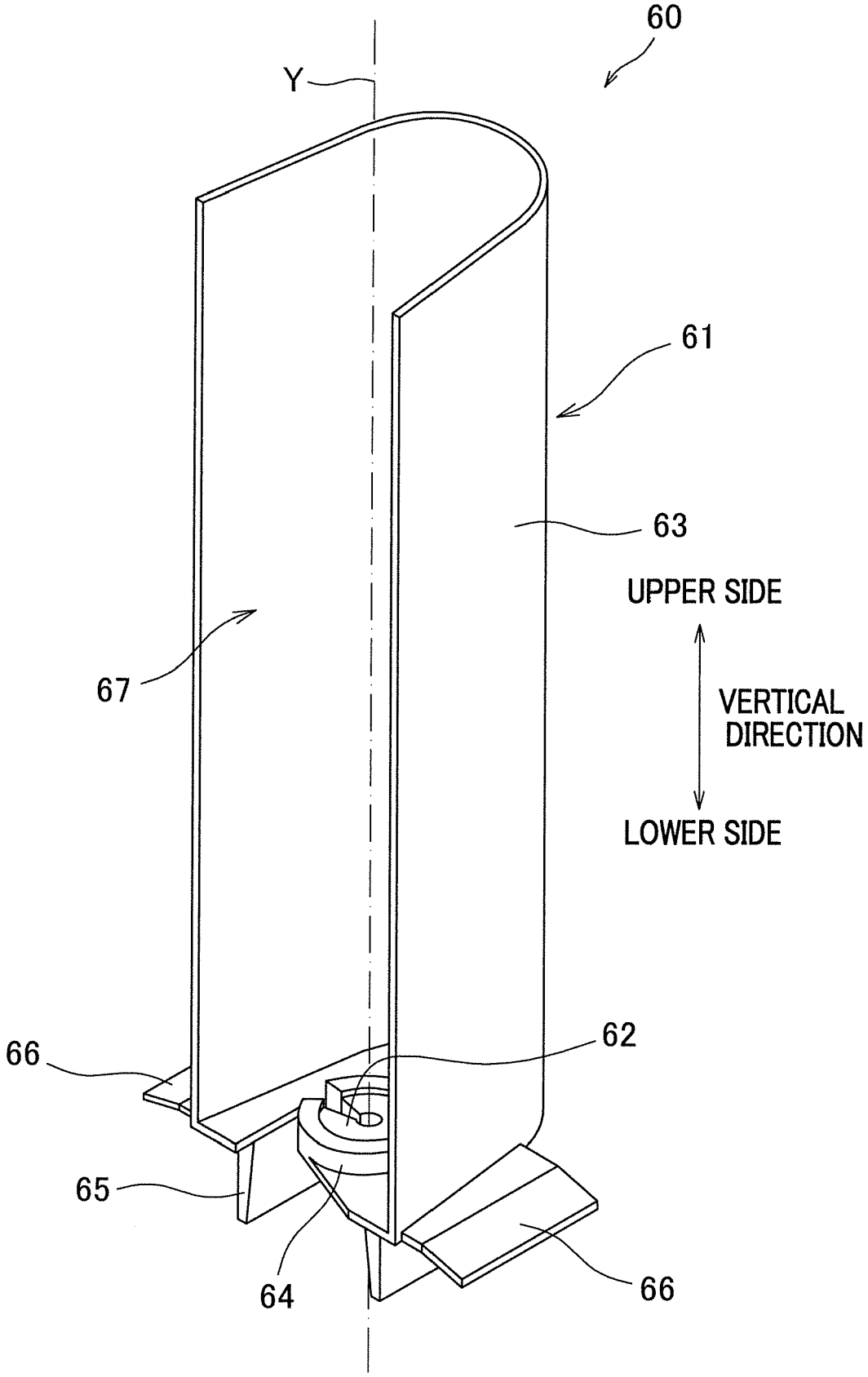

60
Y
61
63
UPPER SIDE
VERTICAL DIRECTION
LOWER SIDE
67
66
62
65
64
66

FIG.7

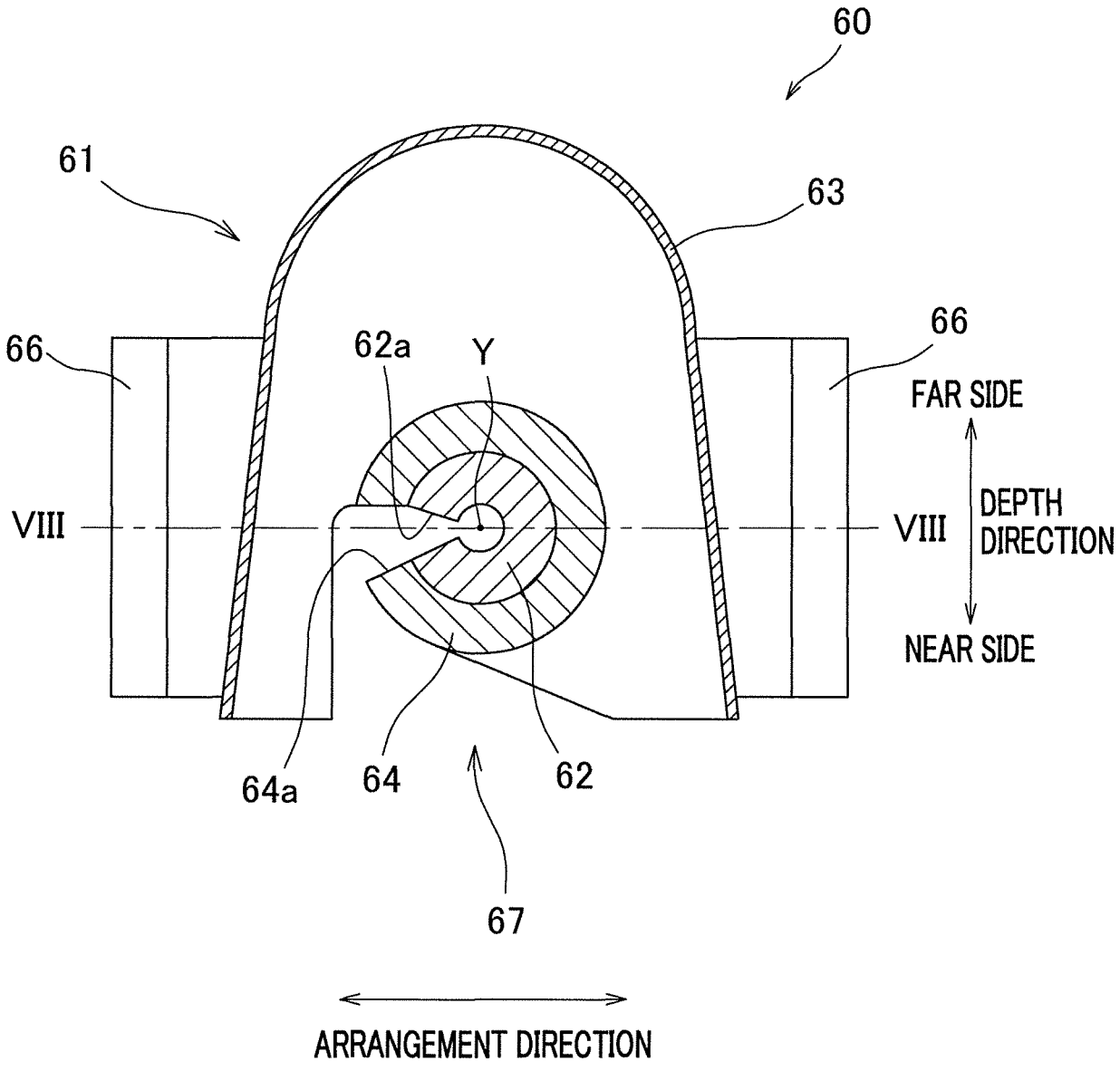
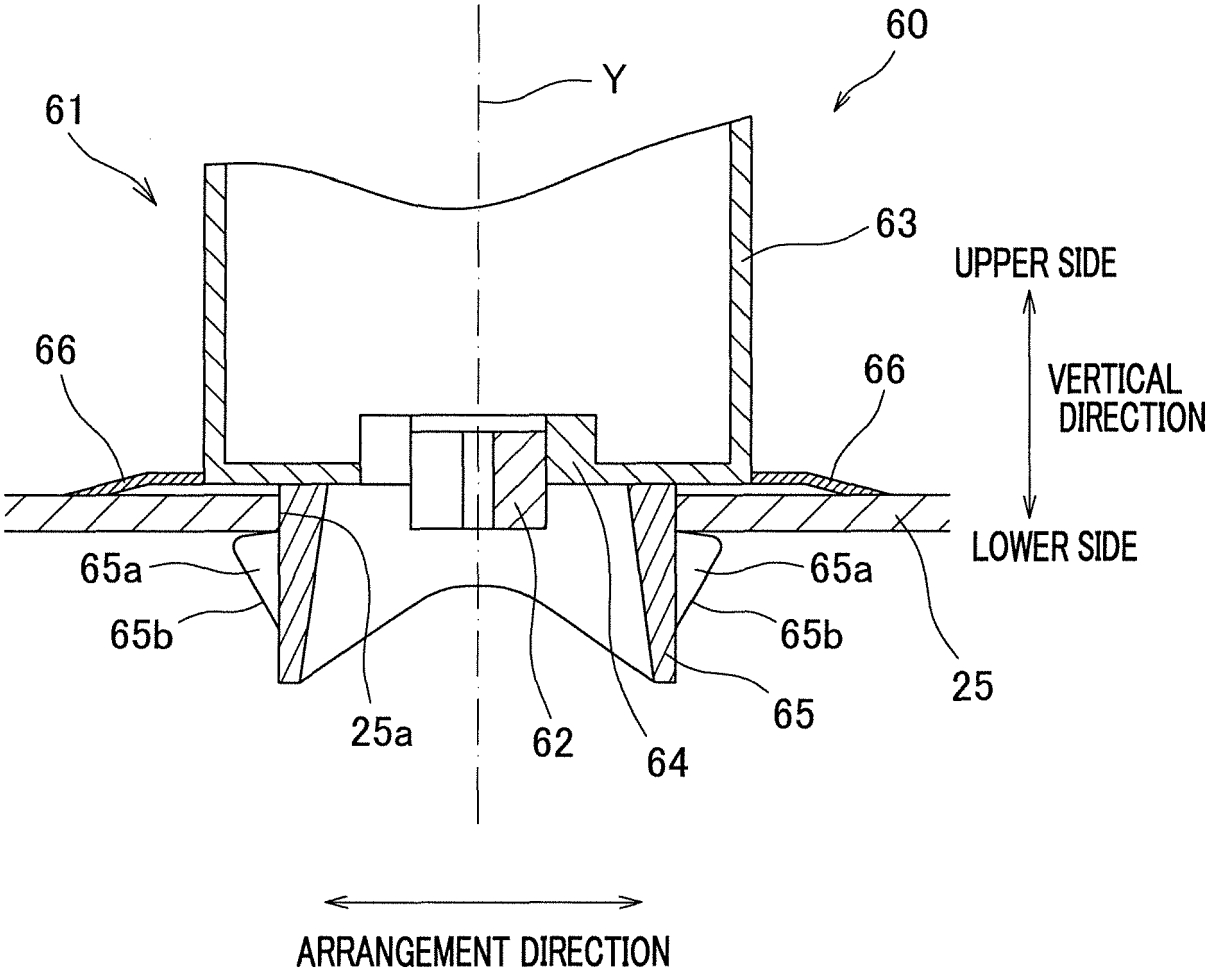

60
61
63
66
66
62a
Y
FAR SIDE
VIII
VIII
DEPTH DIRECTION
NEAR SIDE
64a
64
62
67
ARRANGEMENT DIRECTION

FIG.8


60
Y
61
63
UPPER SIDE
VERTICAL DIRECTION
LOWER SIDE
66
66
65a
65a
65b
65b
25
65
25a
62
64
ARRANGEMENT DIRECTION

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EUROPEAN SEARCH REPORT

Application Number
EP 21 16 1767

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Y	EP 1 136 601 A1 (TEIJIN SEIKI CO LTD [JP]) 26 September 2001 (2001-09-26) * paragraphs [0012], [0035], [0038], [0039], [0041], [0055], [0059]; figures 3,4c,8 *	1-10	D02G1/04 D02G1/06
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D02G
D01H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	3 August 2021	Van Beurden-Hopkins

CATEGORY OF CITED DOCUMENTS

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03-08-2021

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

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