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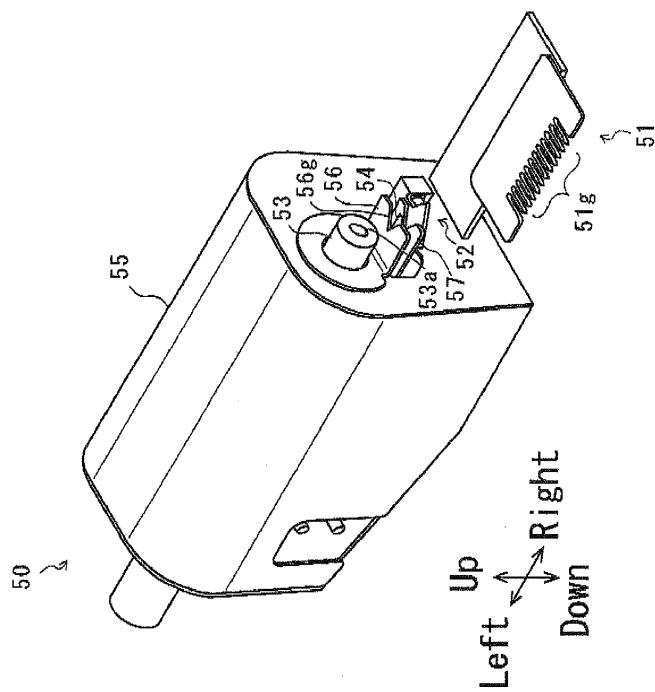
(54) Yarn cutting apparatus

(57) A yarn cutting apparatus is provided that improves the workability of the yarn threading operation while securely cutting a plurality of yarns.

A yarn cutting apparatus (50) is configured to cut a plurality of yarns Y and includes a yarn path regulating guide (51) configured to guide the plurality of yarns Y, a yarn shift guide (52) disposed further upstream than the

yarn path regulating guide (51) so as to shift the yarns Y fed onto the yarn path regulating guide (51) to one direction, an aspirator (53) disposed further upstream than the yarn shift guide (52) so as to suck the yarns Y shifted by the yarn shift guide, and a cutter (54) disposed between the yarn shift guide (52) and the aspirator (53) so as to cut the yarns Y sucked by the aspirator (53).

FIG. 3



Description**Technical Field**

[0001] The present invention relates to a technology of a yarn cutting apparatus to cut yarns. More particularly, the present invention relates to a technology of a yarn cutting apparatus to cut yarns manufactured in a take-up winding facility.

Background Art

[0002] Conventional take-up winding facilities are known to combine a plurality of filaments spun from spinning machines into a yarn, subject the yarn to drawing and other treatment, and wind up the yarn into a package.

[0003] In a take-up winding facility of this kind, at the start of yarn manufacture and yarn winding, an operator needs to carry out what is called a yarn threading operation, that is, to thread the filaments or the yarns onto corresponding rollers or guides. Additionally, at the time of malfunction such as when the manufactured yarns become entangled with the roller, a recovery measure is to cut the yarns. This necessitates an additional yarn threading operation by the operator.

[0004] Unfortunately, the yarn threading operation, which involves threading of a plurality of filaments and a plurality of yarns, is a manual operation by the operator and involves a considerable process step count. Accordingly, there has been a need for a take-up winding facility with improved workability of the yarn threading operation.

[0005] Incidentally, at the time of malfunctions such as when the manufactured yarns become entangled with the roller, the yarns are cut by a yarn cutting apparatus disposed further downstream than the spinning machine. In addition to the function to cut the yarns, the yarn cutting apparatus has a function to suck and discharge filaments continuously spun from the spinning machine. In this respect, the operator uses a suction gun with which to suck and hold the filaments having been sucked by the yarn cutting apparatus, and carries out the yarn threading operation by manipulating the suction gun holding the filaments. Thus, the yarn threading operation in particular associated with the yarn cutting apparatus requires a considerable process step count. For this reason, there has been a need for a yarn threading operation with improved workability.

[0006] Moreover, recently proposed take-up winding facilities handle increased numbers of filaments spun from the spinning machines so as to increase the number of yarns to be manufactured. In view of this, an ability to securely cut a plurality of yarns is required the yarn cutting apparatus disposed in the take-up winding facility.

[0007] In a conventionally proposed yarn cutting apparatus, a yarn shift guide (yarn pulling plate) is disposed on a side opposite an aspirator (sucking device). Here, the yarn shift guide (yarn pulling plate) serves as a hindrance to yarn threading onto a yarn path regulating

guide and the like (see, for example, Japanese Examined Patent Publication No. 1995-26247), which can make the operation difficult to carry out.

5 **SUMMARY OF THE INVENTION**

Problems to be Solved by the Invention

[0008] The present invention has been made to solve 10 the above-described problems, and it is an object of the present invention to provide a yarn cutting apparatus that improves the workability of the yarn threading operation while securely cutting a plurality of yarns. Means of Solving the Problems

[0009] Next, means of solving the problems will be described.

[0010] According to a first invention, a yarn cutting apparatus is configured to cut a plurality of yarns and includes a yarn path regulating guide, a yarn shift guide, 20 an aspirator, and a cutter. The yarn path regulating guide is configured to guide the plurality of yarns. The yarn shift guide is disposed further upstream than the yarn path regulating guide so as to shift the plurality of yarns fed on the yarn path regulating guide to one direction. The aspirator is disposed further upstream than the yarn shift guide so as to suck the plurality of yarns shifted by the 25 yarn shift guide. The cutter is disposed between the yarn shift guide and the aspirator so as to cut the plurality of yarns sucked by the aspirator.

[0011] According to a second invention, in the yarn cutting apparatus according to the first invention, the yarn path regulating guide may include a plurality of guide grooves disposed in parallel to each other in a direction in which the plurality of yarns are aligned with each other.

30 The plurality of guide grooves each may be configured to guide corresponding one of the plurality of yarns. The yarn shift guide, the aspirator, and the cutter may be disposed on one end side of the yarn path regulating guide provided with the plurality of guide grooves.

[0012] According to a third invention, in the yarn cutting apparatus according to the first or second invention, the 40 yarn shift guide may be configured to reciprocate along the direction in which the plurality of yarns are aligned with each other and in the direction in which the plurality of guide grooves are disposed, so as to shift the plurality of yarns fed on the plurality of respective guide grooves to the one end side.

[0013] According to a fourth invention, in the yarn cutting apparatus according to any one of the first to third 50 inventions, the cutter may be configured to cut the plurality of yarns sucked by the aspirator once or a plurality of times.

[0014] According to a fifth invention, in the yarn cutting apparatus according to any one of the first to fourth 55 inventions, the yarn cutting apparatus may further include a regulating guide disposed between the aspirator and the cutter. The regulating guide may include a tip end groove configured to gather all of the plurality of yarns

pulled by the yarn pulling guide.

Effects of the Invention

[0015] The embodiments of the present invention provide the following advantageous effects.

[0016] With the first invention, the aspirator holds the yarns, which eliminates loosening of the yarns at the time of cutting the yarns. This facilitates cutting of the yarns. Also, there is no need for a clamp device or other device to hold the yarns, which simplifies the yarn cutting apparatus simple in structure and ensures reductions in size and cost.

[0017] With the second invention, the yarn shift guide and other elements are collectively disposed on one end side. This ensures a large space above the yarn path regulating guide. This, as a result, improves the workability of the yarn threading operation by the operator. Also, the yarn shift guide and other elements are collectively disposed on one end side. This simplifies the yarn cutting apparatus in structure and ensures reductions in size and cost.

[0018] With the third invention, the yarn shift guide moves forward while thrusting past the yarns fed on the guide grooves, and then moves backward while hooking the yarns fed on the guide grooves. This ensures shift of all of the yarns. All that is necessary to ensure this effect is the mere mechanism in which the yarn shift guide is driven to reciprocate. This simplifies the yarn cutting apparatus in structure and ensures reductions in size and cost.

[0019] With the fourth invention, the yarns held by the aspirator are cut once or a plurality of times. This ensures cutting of all of the yarns.

[0020] With the fifth invention, all of the yarns shifted by the yarn shift guide are guided into the tip end groove. This ensures collecting of the yarns at a predetermined place. This ensures that the yarn cutting apparatus cuts all of the yarns with a few times of cutting by the cutter.

Brief Description of Drawings

[0021]

[FIG. 1] FIG. 1 is a diagram illustrating a configuration of a take-up winding facility 100.

[FIG. 2] FIG. 2 is a view of a winder 40.

[FIG. 3] FIG. 3 is a perspective view of a yarn cutting apparatus 50 illustrating its configuration.

[FIG. 4] FIG. 4 is a side view of the yarn cutting apparatus 50 illustrating its configuration.

[FIG. 5] FIG. 5 is a top view of a movable seat 57 illustrating its configuration.

[FIG. 6] FIG. 6 is a perspective view of the yarn cutting apparatus 50 illustrating its operation.

[FIG. 7] FIG. 7 is a perspective view of the yarn cutting apparatus 50 illustrating its operation.

[FIG. 8] FIG. 8 is a perspective view of the yarn cut-

ting apparatus 50 illustrating its operation.

[FIG. 9] FIG. 9 is a perspective view of the yarn cutting apparatus 50 illustrating its operation.

[FIG. 10] FIG. 10 is a perspective view of the yarn cutting apparatus 50 in another operation. Detailed Description of Presentative Embodiment

[0022] First, a take-up winding facility 100 will be described.

[0023] FIG. 1 is a diagram illustrating a configuration of the take-up winding facility 100. The vertical direction specified in the diagram represents the direction of gravity.

[0024] The take-up winding facility 100 combines a plurality of filaments F spun from a spinning machine 10 into a yarn Y, subject the yarn Y to drawing and other treatment, and wind up the yarn Y into a package P. The take-up winding facility 100 according to this embodiment mainly includes the spinning machine 10, a first godet roller pair 20, a second godet roller pair 30, and a winder 40.

[0025] The spinning machine 10 spins a plurality of filaments F. Synthetic raw materials (raw materials of the filaments) are put into the spinning machine 10, and the spinning machine 10 melts the raw materials and sends them with pressure to be spun through spinnerets disposed on a spinning head 11. The spinning machine 10 is disposed on top of the take-up winding facility 100.

[0026] The plurality of filaments F spun through the spinnerets of the spinning head 11 are combined into groups of a predetermined number of filaments F to form a plurality of yarns Y. Thus, the plurality of yarns Y thus obtained are forwarded downward and guided to the first godet roller pair 20 and the second godet roller pair 30.

[0027] The winder 40 winds the yarns Y to form packages P. As shown in FIG. 2, the winder 40 forms a plurality of packages P by winding the plurality of yarns Y, which are forwarded from the second godet roller pair 30, around corresponding bobbins 41. The winder 40 traverses the yarns Y by a traverse device 42.

[0028] Next, a yarn cutting apparatus 50 will be described.

[0029] FIGs. 3 and 4 are views of the yarn cutting apparatus 50 illustrating its configuration. The vertical direction specified in the diagram represents the direction of gravity. The lateral direction specified in the diagram represents a predetermined direction orthogonal to the vertical direction.

[0030] The yarn cutting apparatus 50 cuts the plurality of yarns Y. The yarn cutting apparatus 50 mainly includes a yarn path regulating guide 51, a yarn shift guide 52, an aspirator 53, a cutter 54, and a main body unit 55. The yarn cutting apparatus 50 is disposed between the spinning machine 10 and the first godet roller pair 20 (see FIG. 1).

[0031] The yarn path regulating guide 51 guides the plurality of yarns Y. The yarn path regulating guide 51 includes guide grooves 51g disposed in parallel to each

other in the direction in which the plurality of yarns Y are aligned with each other, so as to guide the plurality of corresponding yarns Y. The plurality of yarns Y are threaded onto the respective guide groove 51g and thereby kept under a parallel state when forwarded to the first godet roller pair 20 (see FIG. 6). The yarn path regulating guide 51 is disposed at a lowest portion of the main body unit 55 (see FIG. 4).

[0032] The yarn shift guide 52 pulls the yarns Y fed on the guide grooves 51g of the yarn path regulating guide 51. The yarn shift guide 52 includes, at a distal end portion thereof, a hook portion 52h to hook the yarns Y fed on the guide grooves 51g (see FIGs. 4 and 7). The yarn shift guide 52 reciprocates along the direction in which the guide grooves 51g are disposed (the direction in which the plurality of yarns Y are aligned with each other) so as to cause the hook portion 52h to hook the yarns Y fed on the guide grooves 51g (see FIGs. 7 and 8). Thus, the yarns Y are pulled. The yarn shift guide 52 is disposed further upstream than the yarn path regulating guide 51 (see FIG. 4).

[0033] The aspirator 53 holds the yarns Y pulled by the yarn shift guide 52. The aspirator 53 includes an air suction inlet 53a to suck the pulled yarns Y. The air suction inlet 53a sucks air in to ensure that the yarns Y pulled by the yarn shift guide 52 are sucked by and held at the air suction inlet 53a (see FIGs. 8, 9, and 10). The aspirator 53 is disposed further upstream than the yarn shift guide 52 (see FIG. 4).

[0034] The cutter 54 cuts the yarns Y held by the aspirator 53. The cutter 54 is disposed on a movable seat 57, which is driven to reciprocate along the direction in which the guide grooves 51g are disposed (the direction in which the plurality of yarns Y are aligned with each other) (see FIG. 4 and 5). The movable seat 57 reciprocates along the direction in which the guide grooves 51g are disposed (the direction in which the plurality of yarns Y are aligned with each other) to cause the cutter 54 attached on the movable seat 57 to cut the yarns Y held by the aspirator 53 (see FIGs. 9 and 10). The movable seat 57 and the cutter 54 are disposed between the yarn shift guide 52 and the aspirator 53 (see FIG. 4).

[0035] With this configuration, in the yarn cutting apparatus 50, the aspirator 53 and the yarn shift guide 52 hold the yarns Y. This eliminates loosening of the yarns Y at the time of cutting the yarns Y. This, as a result, facilitates cutting of the yarns Y.

[0036] Another feature of the yarn cutting apparatus 50 is that the yarn shift guide 52, the aspirator 53, and the cutter 54 are disposed on one end side in the direction in which the yarns Y are aligned with each other, which is the direction in which the guide grooves 51g are disposed.

[0037] With this configuration, in the yarn cutting apparatus 50, the yarn shift guide 52 and other elements are collectively disposed on one end side. This ensures a large space above the yarn path regulating guide 51. This, as a result, improves the workability of the yarn

threading operation by the operator. Collectively disposing the yarn shift guide 52 and other elements on one end side also simplifies the yarn cutting apparatus 50 in structure and ensures reductions in size and cost.

5 **[0038]** The operation of the yarn cutting apparatus 50 will be described in detail below.

[0039] FIGs. 6 to 10 are views of the yarn cutting apparatus 50 illustrating its operation. The vertical direction specified in the diagram represents the direction of gravity. The lateral direction specified in the diagram represents a predetermined direction orthogonal to the vertical direction.

[0040] As shown in FIG. 6, the plurality of yarns Y are fed onto the respective guide grooves 51g and thereby kept under a parallel state when forwarded to the first godet roller pair 20. In the meantime, the yarn shift guide 52 is in stand-by state while being accommodated in the main body unit 55. Also the aspirator 53 is stopping sucking air in.

10 **[0041]** In this respect, assume an exemplary situation in which the yarns Y become entangled with the roller and other elements, or in which some malfunction occurs to the filaments F or the yarns Y. In such situations, the yarns Y are cut in response to an instruction from the operator.

[0042] As shown in FIG. 7, in response to an instruction from the operator to cut the yarns Y, the yarn cutting apparatus 50 drives the yarn shift guide 52. Specifically, the yarn cutting apparatus 50 drives the yarn shift guide 52 away from the main body unit 55 along the direction in which the yarns Y are aligned with each other, which is the direction in which the guide grooves 51g are disposed (see arrow A in FIGs. 4 and 7). In this respect, the yarn shift guide 52 moves forward with a back portion of the hook portion 52h thrusting past the yarns Y fed on the guide grooves 51g.

15 **[0043]** The yarn cutting apparatus 50 also drives the yarn shift guide 52 when yarn-cut detection sensors 43 (see FIG. 2) sense a cutting of the yarns Y. The yarn-cut detection sensors 43 are disposed along the yarn paths of the corresponding yarns Y. The yarn shift guide 52 is driven upon sensing of cutting of at least one yarn Y. The yarn shift guide 52 is also driven when the operator presses a button 44 disposed on the winder 40.

20 **[0044]** Subsequently, as shown in FIG. 8, the yarn cutting apparatus 50 drives the yarn shift guide 52 closer to the main body unit 55 along the direction in which the yarns Y are aligned with each other, which is the direction in which the guide grooves 51g are disposed (see arrow A in FIGs. 4 and 8). In this respect, the yarn shift guide 52 moves backward with the hook portion 52h hooking the yarns Y fed on the guide grooves 51g.

[0045] With this configuration, in the yarn cutting apparatus 50, the yarn shift guide 52 moves forward while thrusting past the yarns Y fed on the guide grooves 51g and then moves backward while hooking the yarns Y fed on the guide grooves 51g. This ensures shift of all of the yarns Y. All that is necessary to ensure this effect is the

mere mechanism in which the yarn shift guide 52 is driven to reciprocate. This simplifies the yarn cutting apparatus 50 in structure and ensures reductions in size and cost. [0046] While the yarn shift guide 52 is being driven, the yarn cutting apparatus 50 starts the suction of air at the aspirator 52. This ensures that the yarns Y pulled by the yarn shift guide 52 are held and sucked by the air suction inlet 53a.

[0047] Next, the yarn cutting apparatus 50 drives the movable seat 57 to carry out cutting. Specifically, the yarn cutting apparatus 50 drives the movable seat 57 attached with the cutter 54 to reciprocate away from or closer to the main body unit 55 along the direction in which the yarns Y are aligned with each other, which is the direction in which the guide grooves 51g are disposed (see arrow B in FIGs. 4 and 5). The yarn cutting apparatus 50 is configured to carry out a plurality of times of cutting. This ensures that even when not all the yarns Y are cut at a time as shown in FIG. 9, a plurality of times of cutting cut all of the yarns Y as shown in FIG. 10.

[0048] The yarn cutting apparatus 50 drives the movable seat 57 attached with the cutter 54 to reciprocate away from or closer to the main body unit 55 along the direction in which the yarns Y are aligned with each other. Alternatively, it is possible to drive the movable seat 57 attached with the cutter 54 to reciprocate in a direction vertical to the direction in which the yarns Y are aligned with each other. It is also possible to use a pair of blades to carry out the cutting in a manner similar to a pair of scissors.

[0049] With this configuration, the yarn cutting apparatus 50 cuts the yarns Y held by the aspirator 53 once or a plurality of times. This ensures cutting of all of the yarns Y.

[0050] As shown in FIGs. 3 and 4, the yarn cutting apparatus 50 includes a regulating guide 56 disposed between the aspirator 53 and the cutter 54.

[0051] The regulating guide 56 has a tip end groove 56g tapering toward the main body unit 55 along the direction in which the yarns Y are aligned with each other, which is the direction in which the guide grooves 51g are disposed.

[0052] With this configuration, the yarn cutting apparatus 50 guides all of the yarns Y pulled by the yarn shift guide 52 into the tip end groove 56g. This ensures collecting of the yarns Y at a predetermined place. This ensures that the yarn cutting apparatus 50 cuts all of the yarns Y with a few times of cutting by the cutter 54.

Description of the Reference Numeral

[0053]

- 100 Take-up winding facility
- 10 Spinning machine
- 20 First godet roller pair

30	Second godet roller pair
40	Winder
5	50 Yarn cutting apparatus
	51 Yarn path regulating guide
10	51g Guide groove
	52 Yarn shift guide
	53 Aspirator
15	53a Air suction inlet
	54 Cutter
20	55 Main body unit
	56 Regulating guide
	57 Movable seat
25	F Filament
	P Package
30	Y Yarn

Claims

1. A yarn cutting apparatus configured to cut a plurality of yarns, the yarn cutting apparatus comprising:
 - a yarn path regulating guide configured to guide the plurality of yarns;
 - a yarn shift guide disposed further upstream than the yarn path regulating guide so as to shift the plurality of yarns fed on the yarn path regulating guide to one direction;
 - an aspirator disposed further upstream than the yarn shift guide so as to suck the plurality of yarns shifted by the yarn shift guide; and
 - a cutter disposed between the yarn shift guide and the aspirator so as to cut the plurality of yarns sucked by the aspirator.
2. The yarn cutting apparatus according to claim 1, wherein the yarn path regulating guide comprises a plurality of guide grooves disposed in parallel to each other in a direction in which the plurality of yarns are aligned with each other, the plurality of guide grooves each being configured to guide corresponding one of the plurality of yarns, and
 - wherein the yarn shift guide, the aspirator, and the cutter are disposed on one end side of the yarn path

regulating guide provided with the plurality of guide grooves.

3. The yarn cutting apparatus according to claims 1 or 2, wherein the yarn shift guide is configured to reciprocate along the direction in which the plurality of yarns are aligned with each other and in the direction in which the plurality of guide grooves are disposed, so as to shift the plurality of yarns fed on the plurality of respective guide grooves to the one end side. 10
4. The yarn cutting apparatus according to any one of claims 1 to 3, wherein the cutter is configured to cut the plurality of yarns sucked by the aspirator once or a plurality of times. 15
5. The yarn cutting apparatus according to any one of claims 1 to 4, further comprising a regulating guide disposed between the aspirator and the cutter, the regulating guide comprising a tip end groove configured to gather all of the plurality of yarns shifted by the yarn shift guide. 20

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FIG. 1

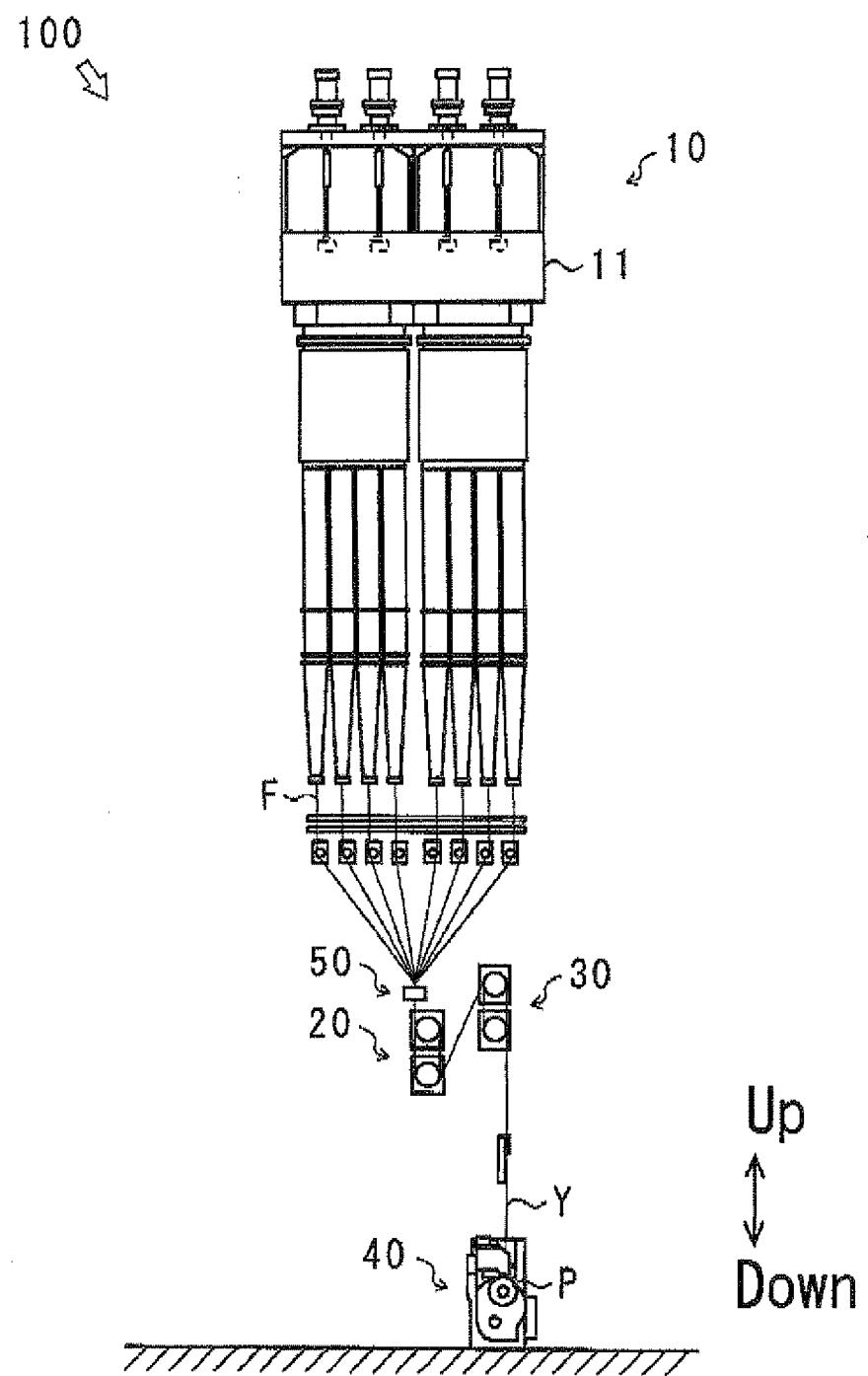


FIG. 2

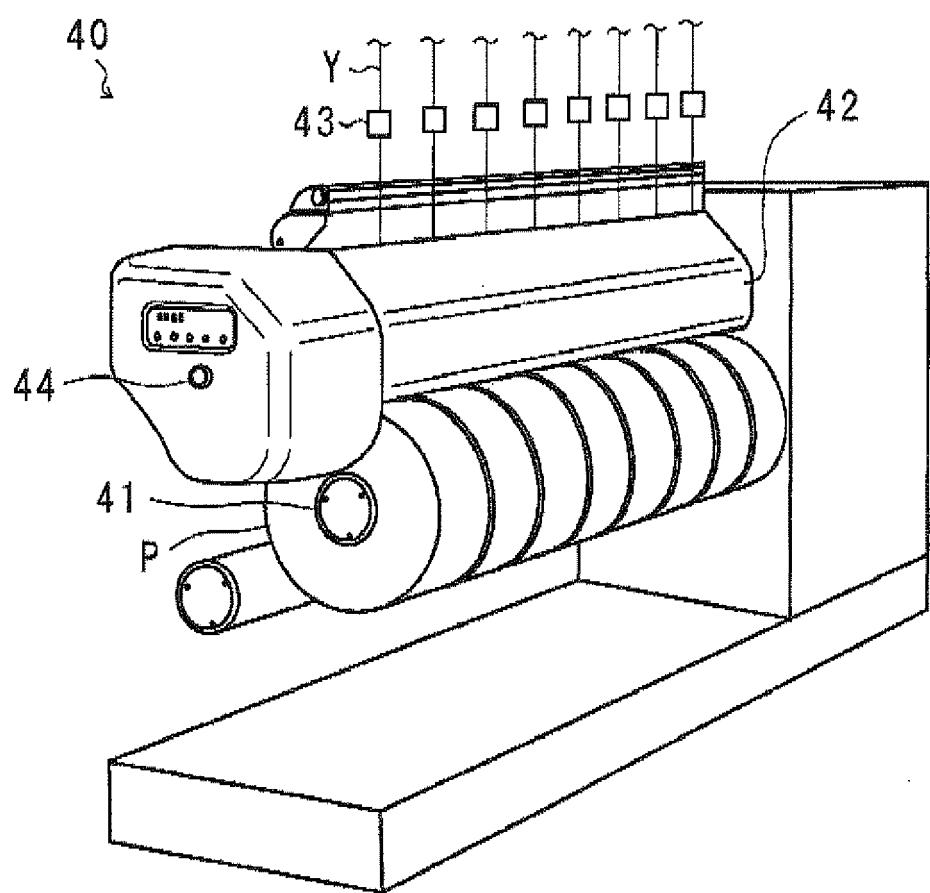


FIG. 3

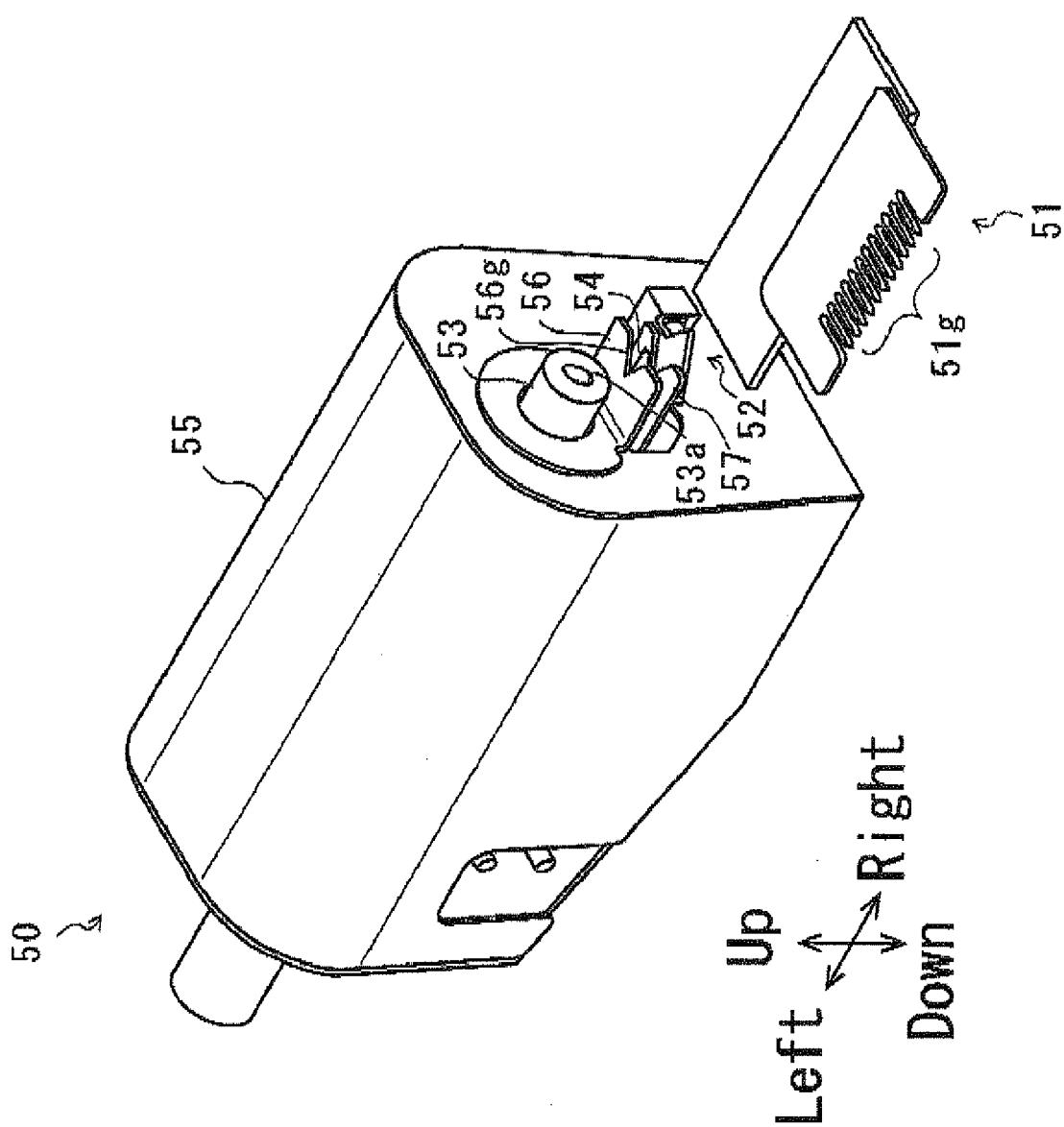


FIG. 4

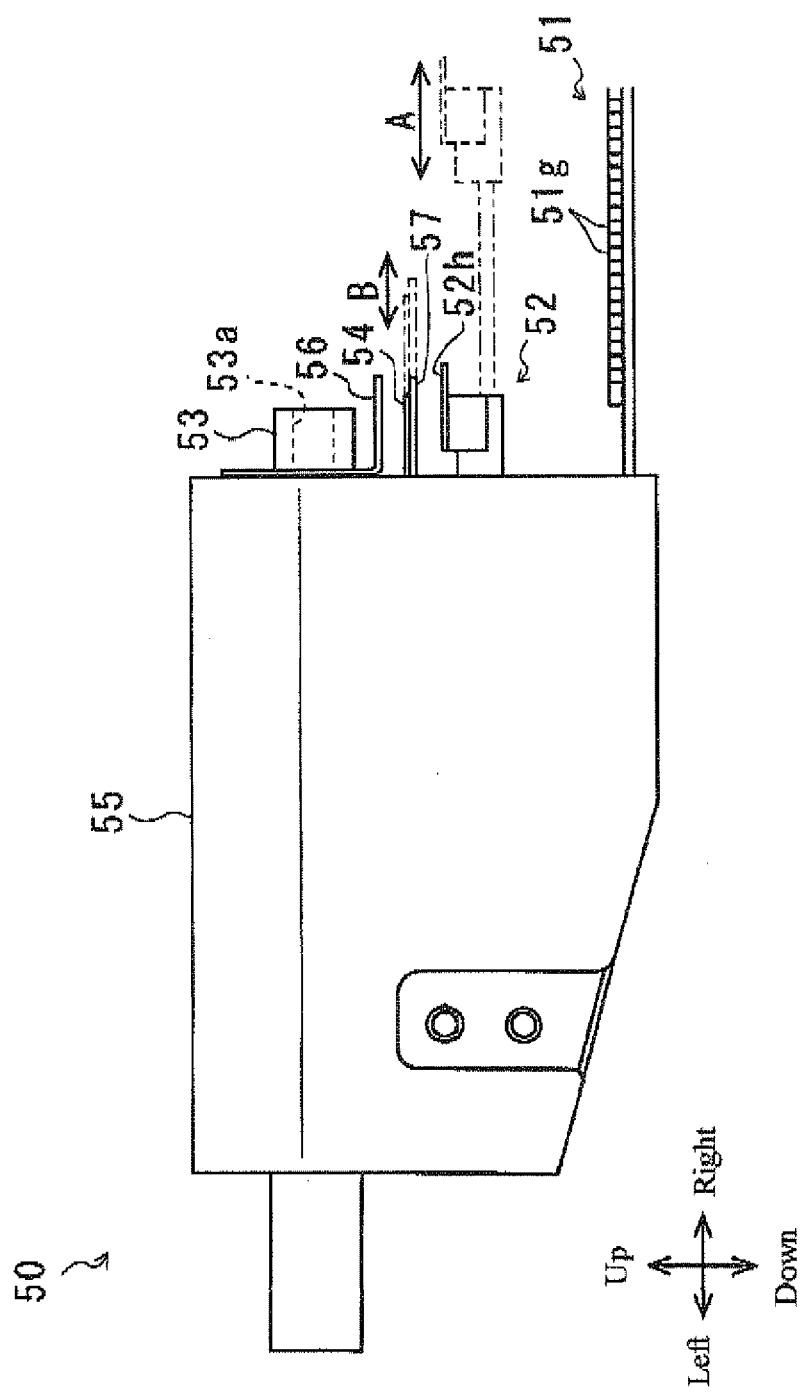


FIG. 5

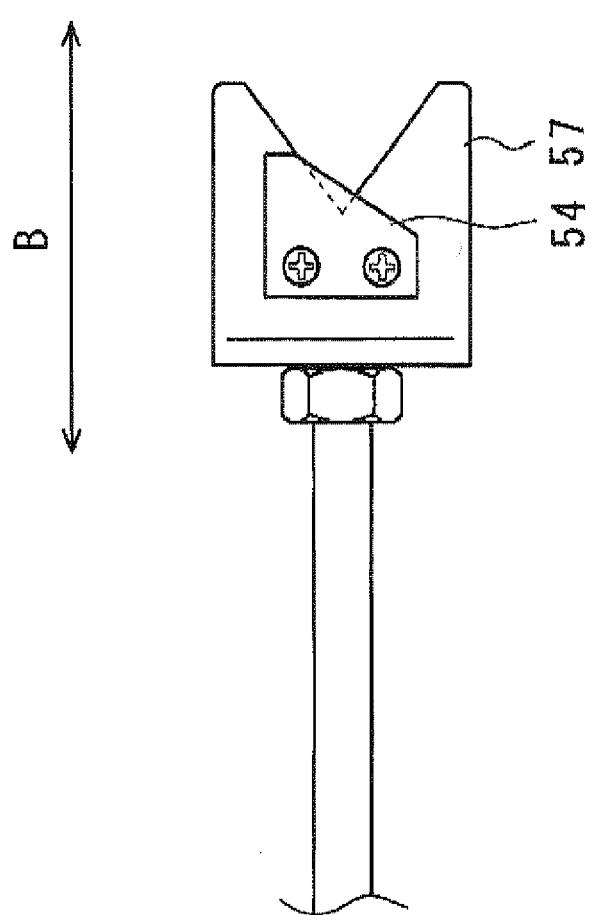


FIG. 6

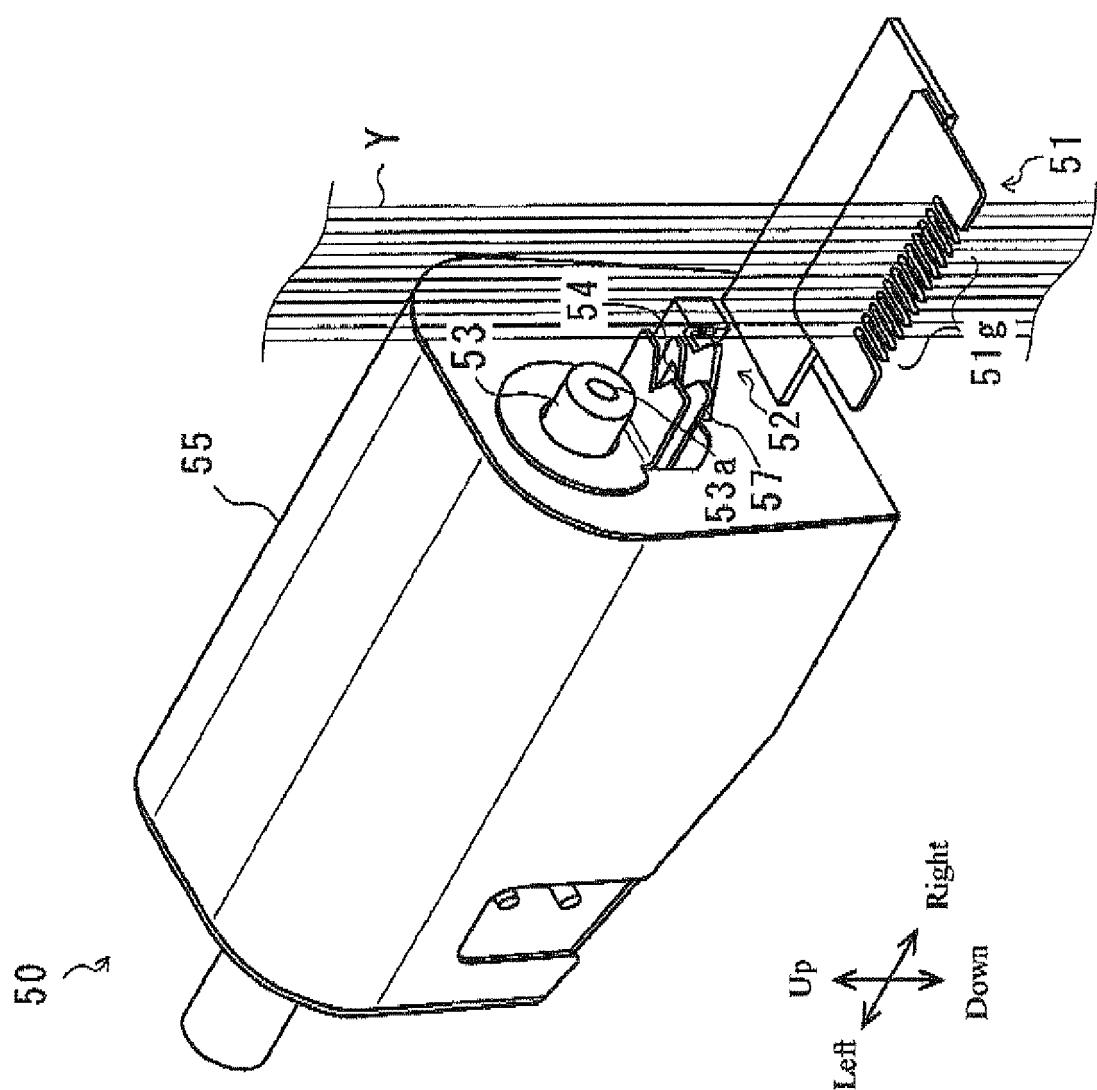


FIG. 7

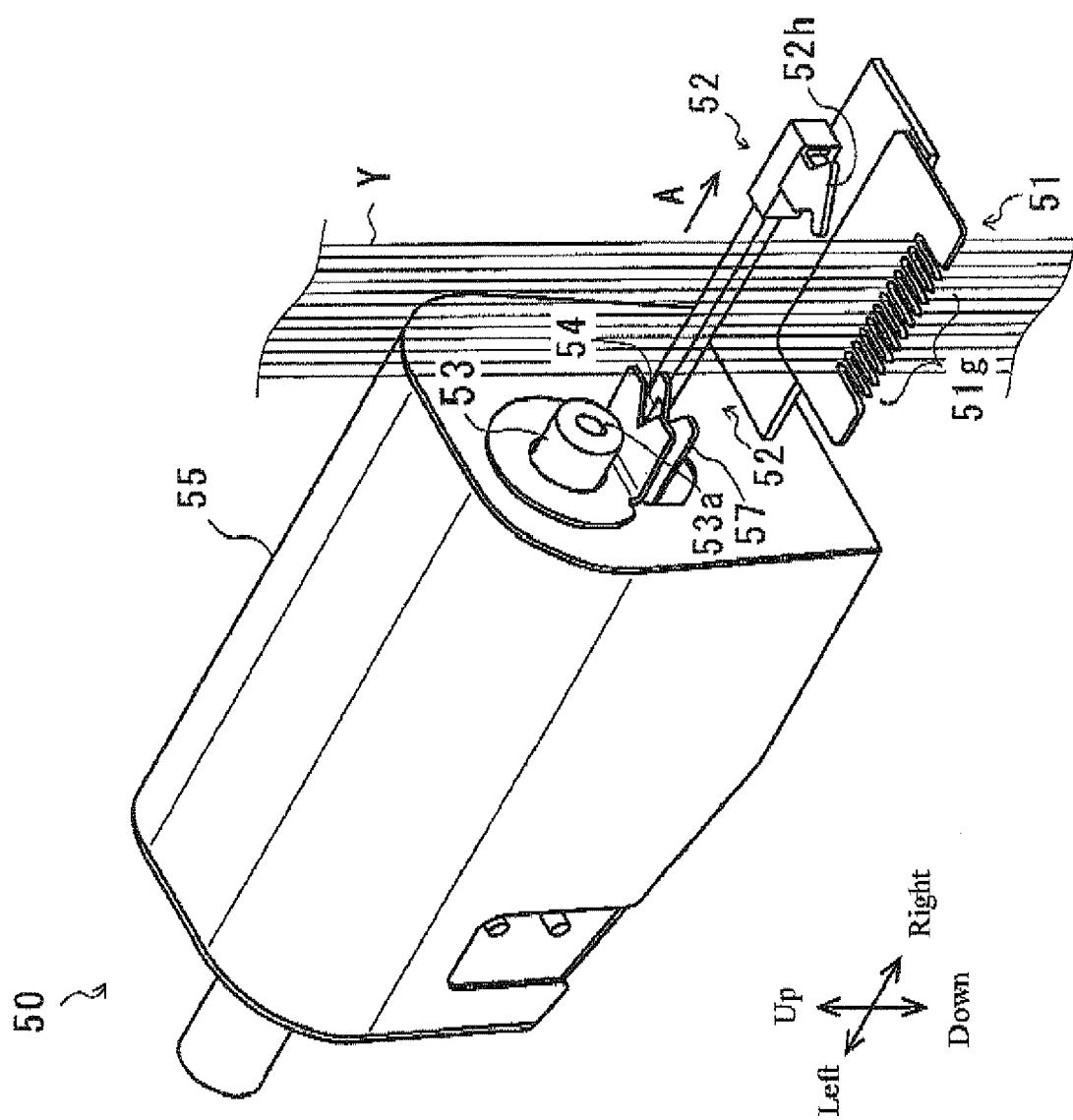


FIG. 8

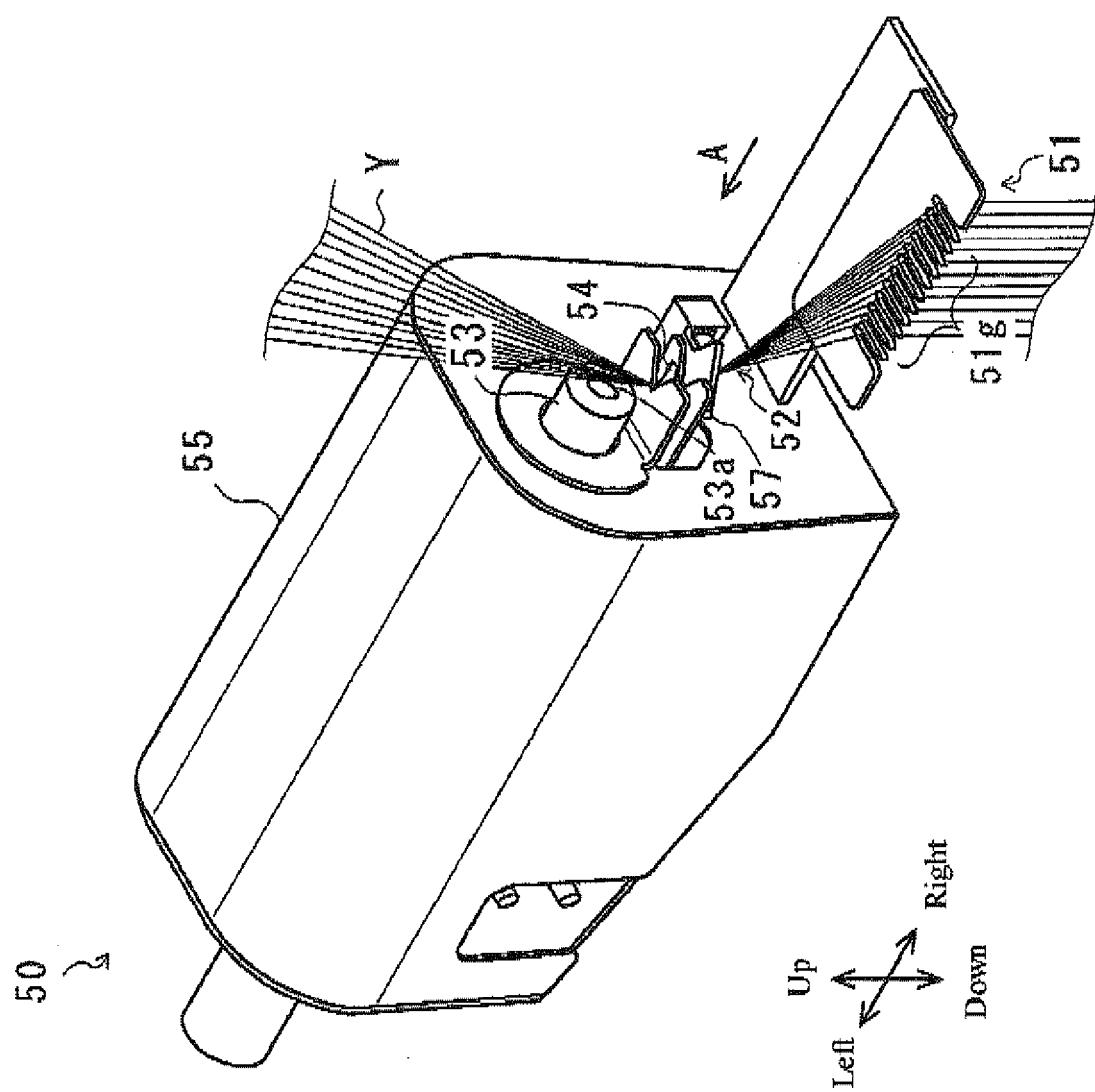


FIG. 9

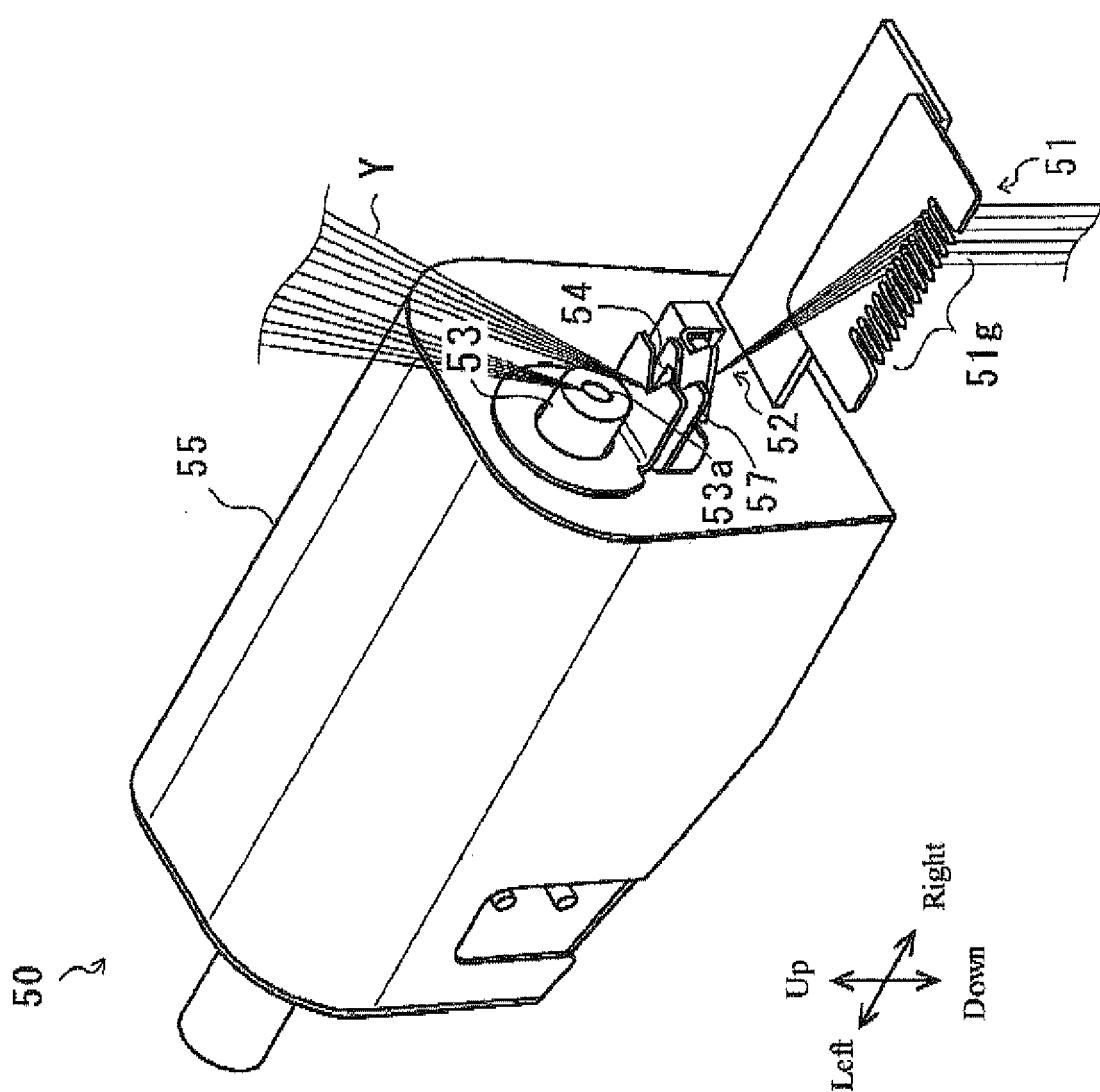
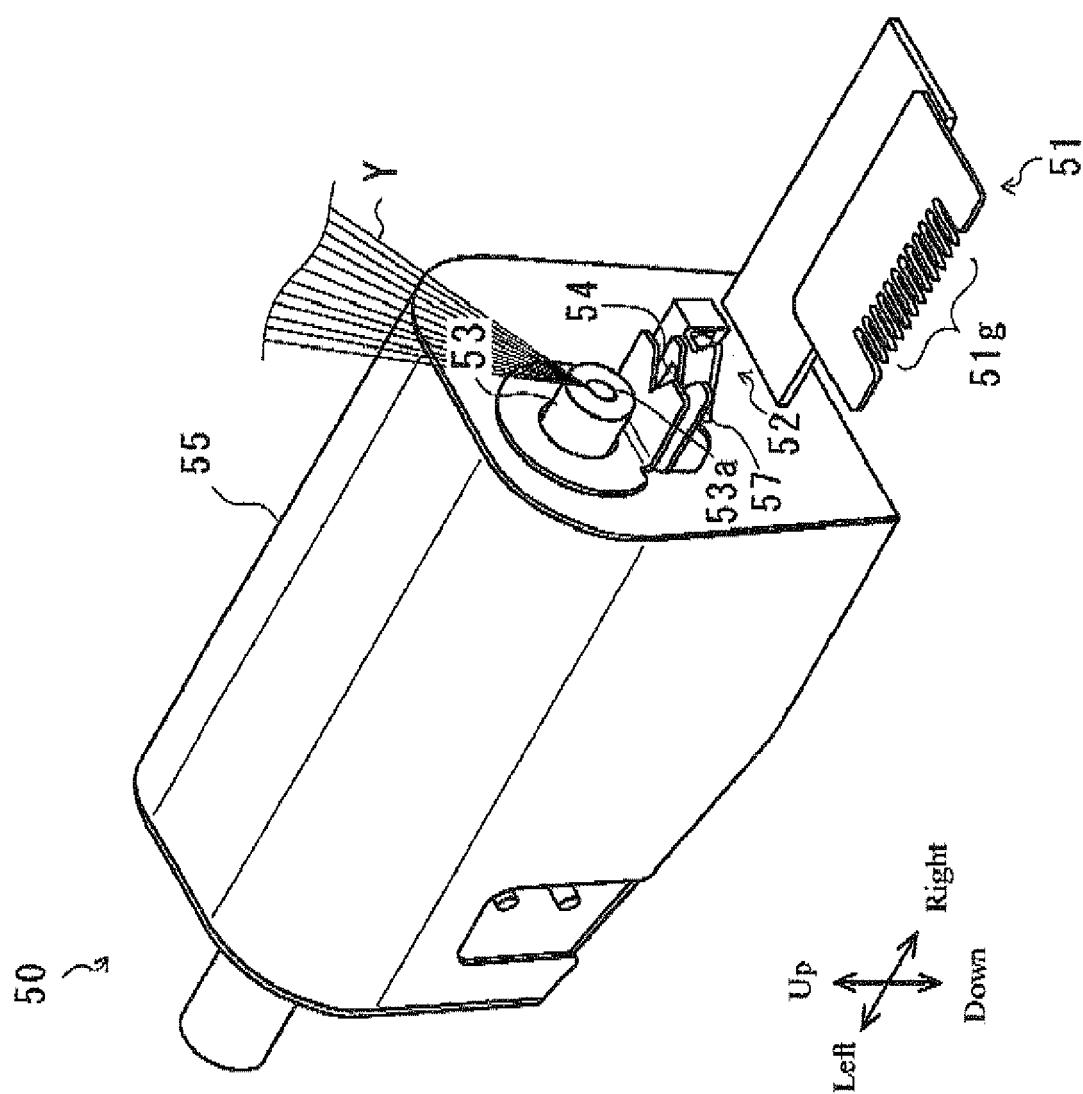


FIG. 10



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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