

(19)



(11)

EP 2 551 226 A2

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

30.01.2013 Bulletin 2013/05

(51) Int Cl.:

B65H 54/20 (2006.01)**B65H 65/00** (2006.01)**D02G 1/02** (2006.01)(21) Application number: **12177601.7**(22) Date of filing: **24.07.2012**

(84) Designated Contracting States:

AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

Designated Extension States:

BA ME

(72) Inventors:

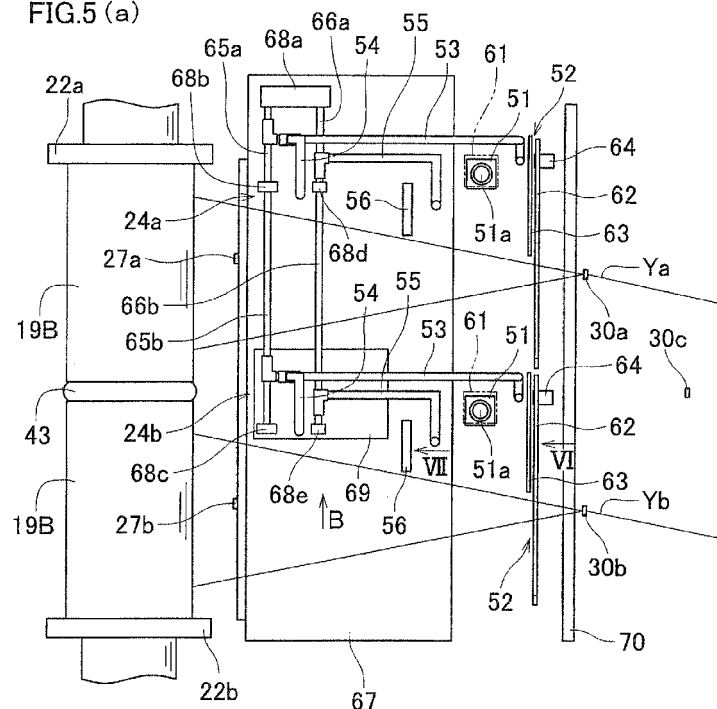
- **Yamamoto, Masato**
Kyoto, 612-8686 (JP)
- **Yamato, Manabu**
Kyoto, 612-8686 (JP)

(74) Representative: **HOFFMANN EITLE****Patent- und Rechtsanwälte****Arabellastrasse 4****81925 München (DE)**(30) Priority: **26.07.2011 JP 2011163356**(71) Applicant: **TMT Machinery, Inc.****Osaka-shi, Osaka 541-0041 (JP)**(54) **Yarn winder**

(57) A winding device capable of forming two packages P by winding yarns Ya and Yb onto respective two take up tubes 19B supported by a single cradle 20 is provided with two automatic yarn threading devices 24a and 24b. Each of the automatic yarn threading devices 24a and 24b has components such as a suction mouth 51, a yarn moving mechanism 52, a yarn providing arm 53, a yarn supporting arm 54, and a yarn pressing arm 55. The yarn providing arm 53 is swung about a shaft 65

which is in parallel to the axis of the take up tube 19B so as to cause the yarn Ya (Yb) to oppose the take up tube 19B. The yarn pressing arm 55 is swung about a shaft 66 which is in parallel to the shaft 65 so as to cause the yarn Ya (Yb) positioned by the yarn providing arm 53 to closely contact the outer circumference of the take up tube 19B. The yarn supporting arm 54 supports the yarn Ya (Yb) by sandwiching the yarn with the yarn pressing arm 55.

FIG.5 (a)



Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a yarn winder that winds a yarn onto a take up tube.

[0002] A yarn winder recited in Patent Literature 1 (Japanese Unexamined Patent Publication No. 2009-74219) is arranged so that a single take up tube is rotatably supported by a cradle and is switchable between (i) the formation of a single package by doubling supplied two yarns and winding the doubled yarns onto the take up tube and (ii) the formation of two packages by winding supplied two yarns onto different parts of the take up tube, respectively.

[0003] In the yarn winder of Patent Literature 1, both in the formation of a single package and the formation of two packages, when an empty take up tube on which a yarn is to be wound next is supplied after the formation of the package(s) is completed, an operator carries out yarn threading onto the take up tube.

[0004] When two packages are formed by the yarn winder of Patent Literature 1, the formed two packages are significantly different in the amount of wound yarn when the timing to start the yarn winding onto the take up tube is significantly different between the two. To wind the same amounts of yarns on the two packages, it is preferable to start the yarn winding onto the take up tubes at the same timing. To achieve this, it is necessary to thread two yarns onto the respective take up tubes at the same timing.

[0005] In this regard, when an operator threads two yarns onto the take up tubes as described in Patent Literature 1, one yarn is threaded on the take up tube and then the other yarn is threaded on the take up tube. Therefore a timing difference in the threading between two yarns is unavoidable.

[0006] In this regard, the two yarns are threaded at the same timing if, for example, at the same timing as an operator threads one yarn onto the take up tube, another operator threads the other yarn onto the take up tube. This arrangement, however, requires two operators, with the result that the yarn threading operation becomes complicated.

SUMMARY OF THE INVENTION

[0007] An object of the present invention is to provide a yarn winder which is capable of threading a plurality of yarns at the same timing without requiring any complicated operations.

[0008] According to the first aspect of the invention, a includes: a cradle rotatably supporting a take up tube, a plurality of supplied yarns being wound onto the take up tube so that a plurality of packages are formed, and the yarn winder further comprising an automatic yarn threading device which is provided for at least one of the packages to automatically perform yarn threading onto the

take up tube.

[0009] According to the present invention, because at least one of the supplied yarns is threaded onto the take up tube by the automatic yarn threading device, it is possible to thread a plurality of yarns at the same timing without any complications.

[0010] According to the second aspect of the invention, the yarn winder of the first aspect further includes a doubling device for doubling the supplied yarns, the yarn winder being switchable between (i) the formation of a plurality of packages by winding the supplied yarns onto the take up tube, and (ii) the formation of a single package by doubling the supplied yarns in the doubling device and winding a yarn formed by the doubling onto the take up tube.

[0011] According to the present invention, when a plurality of packages are formed by the yarn winder which is switchable between the formation of a plurality of packages and the formation of a single package, at least one of the supplied yarns is threaded onto the take up tube by the automatic yarn threading device. It is possible to thread a plurality of yarns at the same timing without any complications.

[0012] According to the third aspect of the invention, the yarn winder of the second aspect is arranged so that automatic yarn threading devices are provided for two or more of the packages, respectively, one of the automatic yarn threading devices corresponding to one of the two or more of the packages is used for both the formation of the single package and the formation of the plurality of packages, and a part of each of the remaining automatic yarn threading devices is arranged to be detachable.

[0013] According to the present invention, it is possible to use one of the automatic yarn threading devices for both the formation of a single package and the formation of a plurality of packages. Furthermore, because at least a part of each of the automatic yarn threading devices other than the shared automatic yarn threading device above is removable, it is possible to prevent a yarn from interfering a part of the automatic yarn threading device by removing that part at the time of the formation of a plurality of packages.

[0014] According to the fourth aspect of the invention, the yarn winder of any one of the first to third aspects is arranged so that the automatic yarn threading devices are provided for all of the packages.

[0015] According to the present invention, it is possible to automatically thread all yarns onto the take up tube at the same timing.

[0016] According to the fifth aspect of the invention, the yarn winder according to any one of the first to fourth aspects is arranged so that, the automatic yarn threading device includes: a yarn holding member for supporting a middle part of a yarn sent toward the take up tube; a cutter provided between the take up tube and the yarn holding member to cut the yarn supported by the yarn holding member; a yarn providing arm for positioning the

yarn to oppose the take up tube in such a way that the yarn providing arm is swung about an axis in parallel to the axis of the take up tube so as to move a part of the yarn cut by the cutter, which part is upstream of the yarn holding member, to the winding section side; and a yarn pressing arm which is provided on the opposite side to the take up tube over the yarn positioned to oppose the take up tube by the yarn providing arm, the yarn pressing arm being swung about an axis in parallel to the axis of the take up tube so as to cause the yarn to closely contact the take up tube.

[0017] Because the intervals between the take up tubes are not long, a plurality of automatic yarn threading devices must be provided at short intervals in the axial directions of the take up tube. In this regard, according to the present invention, the yarn providing arm and the yarn pressing arm are arranged to be swingable about the axes in parallel to the axis of the take up tube, and they do not really move along the axis of the take up tube. For this reason, it is possible to provide the automatic yarn threading devices at short intervals in the axial directions of the take up tube.

[0018] According to the sixth aspect of the invention, the yarn winder of the fifth aspect further includes a yarn supporting arm for supporting the yarn closely contacting the outer circumference of the take up tube on account of the yarn pressing arm, by sandwiching the yarn with the pressing arm.

[0019] According to the present invention, the yarn closely contacting the outer circumference of the take up tube is supported by being sandwiched between the yarn pressing arm and the yarn supporting arm. Therefore, after the completion of the yarn threading, the supporting of the yarn by the arms is canceled by swinging the yarn pressing arm away from the yarn supporting arm or swinging the yarn supporting arm away from the yarn pressing arm, and it is possible to immediately start the winding of the yarn.

[0020] According to the seventh aspect of the invention, the yarn winder of the fifth or sixth aspect further includes a yarn guide unit for guiding the yarn, which has been wound onto the take up tube, to the yarn holding member.

[0021] According to the present invention, because the yarn is guided to the yarn holding member by the yarn guide unit, it is possible to provide the yarn holding member at a position remote from the yarn being wound, with the result that the degree of freedom in the arrangement of the yarn holding member is increased.

[0022] According to the eighth aspect of the invention, the yarn winder of the seventh aspect further includes a traverse guide for traversing the yarn to be wound onto the take up tube, in axial directions of the take up tube, a traversal range of the yarn traversed by the traverse guide extending over a guidable area in which the yarn guide unit is able to guide the yarn to the yarn holding member and a non-guidable area in which the yarn guide unit is unable to guide the yarn to the yarn holding mem-

ber, the traverse guide temporarily stopping the traversal of the yarn when the yarn is in the guidable area during the yarn threading by the automatic yarn threading device, and the yarn guide unit guiding the yarn to the yarn holding member while the traversal of the yarn is temporarily stopped by the traverse guide.

[0023] According to the present invention, it is possible to certainly guide the yarn to the yarn holding member by the yarn guide unit, even if the traversal range of the yarn traversed by the traverse guide extends across the guidable area and the non-guidable area.

[0024] According to the present invention, because at least one of the supplied yarns is threaded onto the take up tube by the automatic yarn threading device, it is possible to thread a plurality of yarns at the same timing without any complications.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025]

FIG. 1 is a schematic diagram of a doubling draw texturing machine according to an embodiment of the present invention.

FIG. 2 is a schematic view in which components of the doubling draw texturing machine are exploded along the path of the yarn.

FIG. 3 is a schematic diagram of the winding section. FIG. 4 shows a winding body supported by the cradle of FIG. 3.

FIG. 5(a) is a plan view of the winding device including an automatic yarn threading device, whereas FIG. 5(b) shows the winding device of FIG. 5(a) in the direction of the arrow B.

FIG. 6(a) shows the yarn moving mechanism when viewed in the direction of the arrow VI in FIG. 5(a), whereas FIG. 6(b) shows that the yarn moving lever is swung from the state shown in FIG. 6(a).

FIG. 7(a) shows a cutter when viewed in the direction of the arrow VII in FIG. 5(a), whereas FIG. 7(b) shows the movement of the yarn around the cutter when yarn threading is carried out.

FIG. 8 shows the state when the yarn threading is in process. FIG. 8(a) corresponds to FIG. 5(a) whereas FIG. 8(b) corresponds to FIG. 5(b).

FIG. 9 shows the state when the yarn threading is in process and after the state shown in FIG. 8. FIG. 9(a) corresponds to FIG. 5(a) whereas FIG. 9(b) corresponds to FIG. 5(b).

FIG. 10 shows the state when the yarn threading is in process and after the state shown in FIG. 9. FIG. 10(a) corresponds to FIG. 5(a) whereas FIG. 10(b) corresponds to FIG. 5(b).

FIG. 11 shows the case where a single package is formed. FIG. 11(a) corresponds to FIG. 5(a) whereas FIG. 11(b) corresponds to FIG. 5(b).

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0026] The following will describe a preferred embodiment of the present invention.

[0027] A doubling draw texturing machine 1000 of the present embodiment includes false-twisting units 100 aligned in the crosswise directions of FIG. 2. FIG. 2 shows two units among the false-twisting units 100.

[0028] As shown in FIG. 1 and FIG. 2, each false-twisting unit 100 includes a yarn supplying portion 1, a false twisting section 2, a doubling section 3, a post processing section 4, and a winding section 5. The yarn supplying portion 1 is a part which is upstream of later-described first feed rollers 6a and 6b, whereas the false twisting section 2 is a part between the first feed rollers 6a and 6b and later-described upstream-side second feed rollers 7a and 7b. Similarly, the doubling section 3 indicates a part between the upstream-side second feed rollers 7a and 7b and a later-described downstream-side second feed rollers 8a and 8b, whereas the post processing section 4 indicates a part between the downstream-side second feed rollers 8a and 8b and a layer-described third feed rollers 9a and 9b. The winding section 5 indicates a part on the downstream of the third feed rollers 9a and 9b.

[0029] The yarn supplying portion 1 includes two yarn supply packages 11a and 11b that are supported by a creel stand 10 and send out two yarns Ya and Yb. The yarns Ya and Yb sent out from the yarn supply packages 11a and 11b are supplied to the false twisting section 2 via pipes 12a and 12b and the first feed rollers 6a and 6b.

[0030] The false twisting section 2 false-twists a pair of yarns Ya and Yb sent out from the yarn supplying portion 1. The false twisting section 2 includes, from the upstream to the downstream in the running direction of the yarns Ya and Yb, a primary heater 13 for heating the yarns Ya and Yb, coolers 14a and 14b for cooling the yarns Ya and Yb, and false twisting devices 15a and 15b for false-twisting the yarns Ya and Yb.

[0031] The doubling section 3 forms interlaced portions in the yarns false-twisted by the false twisting section 2 and includes interlace nozzles 16a and 16b. As the two yarns Ya and Yb pass together through an interlace nozzle 16b (or through the interlace nozzle 16a; the same hereinafter) among the interlace nozzles 16a and 16b, the interlace nozzle 16b forms interlaced portions in the yarns Ya and Yb, and hence the yarns Ya and Yb are doubled. On the other hand, when the yarns Ya and Yb pass through the respective interlace nozzles 16a and 16b, the interlace nozzle 16a forms interlaced portions in the yarn Ya whereas the interlace nozzle 16b forms interlaced portions in the yarn Yb.

[0032] The post processing section 4 subjects the yarns Ya and Yb to thermal treatment and includes secondary heaters 17a and 17b. The secondary heaters 17a and 17b may not be provided in some cases.

[0033] The winding section 5 is provided for winding the two yarns Ya and Yb false-twisted by the false twisting

section 2 onto a take up tube, and includes a winding device 18 (yarn winder). The winding device 18 includes a cradle 20, a traverse unit 21, a winding drum 23, and two automatic yarn threading devices 24a and 24b. In consideration of the size of the doubling draw texturing machine 1000, the winding devices 18 of the respective units 100 are arranged to substantially vertically overlap one another.

[0034] The cradle 20 includes a pair of opposing bobbin holders 22a and 22b, and rotatably supports a single substantially-cylindrical take up tube 19A via the bobbin holders 22a and 22b, as shown in FIG. 3(a). Alternatively, as shown in FIG. 3(b), the cradle 20 rotatably supports a winding body 40 having two take up tubes 19B.

[0035] The winding body 40 includes, as shown in FIG. 4, two take up tubes 19B and a connection member 41 which detachably connects the two take up tubes 19B with each other. Each take up tube 19B is about half as long as the take up tube 19A in the axial directions.

[0036] The connection member 41 is made of an elastic material such as synthetic resins, is substantially cylindrical, and has the outer diameter substantially identical with the inner diameter of the take up tube 19B. The axial end portions of the connection member 41 sandwiching its central part are insertion portions 42. As these two insertion portions 42 are inserted into the take up tubes from the leading end sides, the take up tubes 19B are attached to the connection member 41 and hence the two take up tubes 19B are connected with each other.

[0037] On the axially substantially central part of the connection member 41 between the two insertion portions 42 is mounted an O-ring 43 made of an elastic material such as rubber. When the take up tubes 19B are attached to the insertion portions 42, the edges of the take up tubes 19B closely contact the O-ring 43.

[0038] The traverse unit 21 includes a belt component 26 that is reciprocally moved by an unillustrated motor and two traverse guides 27a and 27b that are attached to the belt component 26 to guide the yarns Ya and Yb. The belt component 26 is, for example, a toothed belt having many teeth on the inner circumference, and is mounted on a driving pulley 28 rotated forward or backward by an unillustrated drive motor and a pair of driven pulleys 29. The running path of the belt component 26 between the pair of driven pulleys 29 is substantially in parallel to the axis of the take up tube 19B. Between the driven pulleys 29, the above-described traverse guides 27a and 27b are provided on the belt component 26 with a predetermined distance therebetween. This predetermined distance is more or less the same as the distance between the centers of the respective take up tubes 19B in the axial directions. The two traverse guides 27a and 27b are detachable to the belt component 26.

[0039] In addition to the above, on the upstream of the traverse unit 21 are provided yarn guides 30a to 30c. The yarn guide 30a is provided for changing the yarn path of the yarn Ya sent out from the third feed roller 9a to the front of the traversal center of the traverse guide 27a.

The yarn guide 30b is provided for changing the yarn path of the yarn Yb sent out from the third feed roller 9b to the front of the traversal center of the traverse guide 27b. The yarn guide 30c is provided upstream and below the yarn guides 30a and 30b, and are between the yarn guides 30a and 30b in the axial directions of the take up tube 19B. The yarn guide 30c is provided for changing the yarn path of a yarn Yg formed by doubling the yarn Ya and the yarn Yb to the front of the traversal center of the traverse guide 27b (or 27a). In the actual configuration, the position of the yarn guide 30c is lower than the position shown in FIG. 5(b), more specifically, the position is as high as the yarn guides 30a and 30b of the winding device 18, which are provided below the winding device 18 shown in FIG. 5(b). However, in FIG. 5(b), the yarn guide 30c is positioned high as compared to the actual configuration, because of spatial restriction.

[0040] The yarn guides 30a to 30c may be arranged to be detachable and positionally changeable according to the usage. Furthermore, as shown in FIG. 5, at a part immediately downstream of the yarn guides 30a and 30b, a substantially cylindrical guide bar 70 is provided to extend in the axial directions of the take up tube 19B.

[0041] The winding drum 23 is provided to closely contact the outer circumferences of the take up tubes 19A and 19B supported by the cradle 20. This winding drum 23 is rotated by an unillustrated motor. As the winding drum 23 rotates, the take up tubes 19A and 19B closely contacting the winding drum 23 are rotated.

[0042] Each of the automatic yarn threading devices 24a and 24b includes components such as a suction mouth 51, a yarn moving mechanism 52, a yarn providing arm 53, a yarn supporting arm 54, a yarn pressing arm 55, and a cutter 56.

[0043] The suction mouth 51 (yarn holding member) is provided in the vicinity of the yarn guide 30a (30b) and between the yarn guide 30a (30b) and the traverse guide 27a (27b) to be deviated from the yarn Ya (Yb) traversed by the traverse guide 27a (27b) in the axial direction of the take up tube 19B (i.e., upper part of FIG. 5(a)), and is attached to an unillustrated frame of the false-twisting unit 100. The suction mouth 51 of the automatic yarn threading device 24b is arranged to be detachable from the frame.

[0044] The suction mouth 51 is provided with a suction port 51a at its upper end and connected to an unillustrated negative pressure source at its lower end. Furthermore, the suction port 51a is arranged to be closable by a lid 61. After the lid 61 is moved by an unillustrated driving mechanism and the suction port 51a is opened, as discussed later, it becomes possible to suck the yarns Ya (Yb) through the suction port 51a (and retain the same).

[0045] The yarn moving mechanism 52 (yarn guide unit) is provided between the yarn guides 30a (30b) and the suction mouth 51 and includes a yarn moving lever 62 and a yarn guide plate 63. The yarn moving lever 62 is a thin plate that extends in the axial directions of the

take up tube 19B to pass below the yarn Ya (Yb) traversed by the traverse guide 27a (27b). The yarn moving lever 62 opposes the yarn Ya (Yb) no matter where in the traversal range the yarn Ya (Yb) locates. The yarn moving lever 62 is, at its one end portion (right end portion in FIG. 6(a)), swingably supported by a shaft 64 extending in directions orthogonal to the axial directions of the take up tube 19B in plan view (i.e., in the crosswise directions in FIG. 5(a)). The yarn moving lever 62 is swung about the shaft 64 by an unillustrated motor or the like.

[0046] The yarn guide plate 63 is a plate extending in the axial directions of the take up tube 19B. In the axial directions of the take up tube 19B, the yarn guide plate 63 is arranged so that a portion of the upper surface between an edge on the leading end side of the yarn moving lever 62 to a middle part is increased in height toward the shaft 64, whereas a portion of the upper surface between the middle part and an edge on the shaft 64 side is constant in height. The yarn guide plate 63 is deviated from the yarn Ya (Yb) traversed by the traverse guide 27a (27b), in the axial direction of the take up tube 19B (i.e., provided in an upper part in FIG. 5(a)).

[0047] In addition to the above, the yarn moving lever 62 and the yarn guide plate 63 of the automatic yarn threading device 24b are arranged to be detachable from the frame of the false-twisting unit 100.

[0048] The yarn providing arm 53 is attached to the shaft 65 which is between the suction mouth 51 and the traverse guide 27a (27b) and extends in the axial directions of the take up tube 19B, and is swung about the shaft 65 as the shaft 65 is rotated by, for example, an unillustrated motor. The yarn providing arm 53 is deviated from the yarns Ya and Yb traversed by the traverse guides 27a and 27b in the axial direction of the take up tube 19B (i.e., provided in an upper part of FIG. 5(a)).

[0049] As discussed later, the yarn providing arm 53 extends from the junction with the shaft 65 in the direction away from the take up tube 19B (i.e., rightward in FIG. 5) when the yarn is being wound onto the take up tube 19B (i.e., in the state shown in FIG. 5), and the leading end of the yarn providing arm 53 locates between the suction mouth 51 and the yarn guide plate 63. In the state described above, from the shaft 65 side, the yarn providing arm 53 is bended downward, in the axial direction of the take up tube 19B (downward in FIG. 5(a)), and then upward. Among these bended parts, the part bended in the axial direction of the take up tube 19B and the part bended upward are below the suction port 51a of the suction mouth 51 and the highest part (i.e., the part having constant height) of the upper end of the yarn guide plate 63.

[0050] The yarn supporting arm 54 is attached to the vicinity of the shaft 65 of the yarn providing arm 53, and is swung about the shaft 65 together with the yarn providing arm 53. In FIG. 5(b), the yarn supporting arm 54 extends upward and rightward with respect to the yarn providing arm 53 from the junction with the yarn providing arm 53, and is bended in the middle in the axial direction

of the take up tube 19B (i.e., downward in FIG. 5(a)).

[0051] The yarn pressing arm 55 is attached to the shaft 66 which is provided between the suction mouth 51 and the shaft 65 and extends in the axial directions of the take up tube 19B. As the shaft 66 is rotated by, for example, an unillustrated motor, the yarn pressing arm 55 is swung about the shaft 66. Furthermore, the yarn pressing arm 55 is deviated from the yarn Ya (Yb) traversed by the traverse guide 27a (27b) in the axial direction of the take up tube 19B (i.e., provided in an upper part of FIG. 5(a)).

[0052] As discussed later, the yarn pressing arm 55 extends from the junction with the shaft 66 in the direction away from the take up tube 19B (i.e., rightward in FIG. 5) when the yarn is being wound onto the take up tube 19B (i.e., in the state shown in FIG. 5), and the leading end of the yarn pressing arm 55 locates between the suction mouth 51 and the shaft 66. In the state described above, the yarn pressing arm 55 is bended, from the shaft 66 side, in the axial direction of the take up tube 19B (downward in FIG. 5(a)) and then upward. The leading end of the yarn supporting arm 54 overlaps a part of the leading end of the yarn pressing arm 55 which part extends in the axial direction of the take up tube 19B, when viewed in the crosswise direction in FIG. 5(a).

[0053] The shaft 65 is divided into a part 65a to which the yarn providing arm 53 of the automatic yarn threading device 24a is attached and a part 65b to which the yarn providing arm 53 of the automatic yarn threading device 24b is attached. The part 65a is, at the both end portions, rotatably supported by supporting portions 68a and 68b that are fixed to a plate 67 fixed to the unillustrated frame of the false-twisting unit 100. The part 65b is, at the end portions, rotatably supported by the above-described supporting portion 68b and a supporting portion 68c of a mounting plate 69 attached to the plate 67. The part 65a and the part 65b are connected with each other in the supporting portion 68b and rotate together.

[0054] The shaft 66 is divided into a part 66a to which the yarn pressing arm 55 of the automatic yarn threading device 24a is attached and a part 66b to which the yarn pressing arm 55 of the automatic yarn threading device 24b is attached. The part 66a is, at the end portions, rotatably supported by the above-described supporting portion 68a and a supporting portion 68d of the plate 67. The part 66b is, at the end portions, rotatably supported by the above-described supporting portion 68d and a supporting portion 68e of the mounting plate 69. The part 66a and the part 66b are connected with each other in the supporting portion 68d and rotate together.

[0055] The mounting plate 69 having the supporting portions 68c and 68e is arranged to be detachable from the plate 67, and the part 65b of the shaft 65 and the part 66b of the shaft 66 can be pulled out from the supporting portions 68b and 68d, respectively. As the plate 67 is detached from the mounting plate 69 and the parts 65b and 66b are pulled out from the supporting portions 68b and 68d, the yarn providing arm 53, the yarn supporting

arm 54, and the yarn pressing arm 55 of the automatic yarn threading device 24b are detached from the false-twisting unit 100.

[0056] The cutter 56 is, as described later, provided for cutting a yarn at the time of yarn threading. This cutter 56 is provided between the leading end of the yarn pressing arm 55 of the plate 67 and the shaft 66 (at least between the suction mouth 51 and the traverse guide 27a (27b)) and extends in the axial directions of the take up tube 19B. At the right end of the cutter 56 in FIG. 7, a slit 56a is formed, and a blade 56b is provided at a wall part of the slit 56. The cutter 56 is arranged to be detachable from the plate 67.

[0057] Now, a process of forming a package P in the false-twisting unit 100 will be described. The false-twisting unit 100 is switchable between the formation of two packages P by winding two yarns Ya and Yb onto two take up tubes 19B and the formation of a single package P by doubling two yarns Ya and Yb and winding a yarn Yg formed by the doubling onto a single take up tube 19A.

[0058] First, the operation to form two packages P will be described. In such a case, two yarns Ya and Yb sent out from the yarn supply packages 11a and 11b are supplied to the winding device 18 via the pipes 12a and 12b, the first feed rollers 6a and 6b, the primary heater 13, the coolers 14a and 14b, the false twisting devices 15a and 15b, the upstream-side second feed rollers 7a and 7b, the interlace nozzles 16a and 16b, the downstream-side second feed rollers 8a and 8b, the secondary heaters 17a and 17b, and the third feed rollers 9a and 9b, respectively.

[0059] More specifically, the yarn supplying rate of the upstream-side second feed rollers 7a and 7b is arranged to be higher than the yarn supplying rate of the first feed rollers 6a and 6b. With this, the yarns Ya and Yb are drawn between the first feed rollers 6a and 6b and the upstream-side second feed rollers 7a and 7b, and the drawn yarns are twisted in the intervals between the first feed rollers 6a and 6b and the upstream-side second feed rollers 7a and 7b, by the false twisting devices 15a and 15b. The yarns Ya and Yb having been drawn and twisted are subjected to thermal treatment by the primary heater 13, and then cooled by the coolers 14a and 14b. The yarns Ya and Yb having been twisted, heated, and cooled pass through the false twisting devices 15a and 15b, and are then untwisted before reaching the upstream-side second feed rollers 7a and 7b.

[0060] After passing through the upstream-side second feed rollers 7a and 7b, the yarn Ya (Yb) is led to the interlace nozzle 16a (16b). Interlaced portions are formed by the interlace nozzles 16a and 16b, and then the yarn Ya is supplied to the downstream-side second feed rollers 8a and 8b.

[0061] The yarn supplying rate of the downstream-side second feed rollers 8a and 8b is arranged to be different from the yarn supplying rate of the third feed rollers 9a and 9b. With this, the yarns Ya and Yb are slacken in the intervals between the downstream-side second feed roll-

ers 8a and 8b and the third feed rollers 9a and 9b. The loosened yarns Ya and Yb are subjected to slacken thermal treatment by the secondary heaters 17a and 17b, and are then supplied to the third feed rollers 9a and 9b. The ratio between the yarn supplying rate of the downstream-side second feed rollers 8a and 8b and the yarn supplying rate of the third feed rollers 9a and 9b is determined in accordance with the state of the yarns Ya and Yb.

[0062] The two yarns Ya and Yb sent out from the third feed rollers 9a and 9b pass through the yarn guides 30a and 30b, respectively, and are wound onto the two take up tubes 19B contacting and rotated by the rotating winding drum 23 while being traversed by the traverse guides 27a and 27b that are reciprocally moved in directions in parallel to the axes of the two take up tubes 19B by the reciprocal movement of the belt component 26. As a result, two packages P are formed.

[0063] After the formation of the two packages P is completed, while the traversal of the yarns Ya and Yb by the traverse guides 27a and 27b is continued, as shown in FIG. 8, the suction ports 51a of the suction mouths 51 are opened to be able to suck the yarns Ya and Yb. Thereafter, as shown in FIG. 6(b), the yarn moving levers 62 are rotated about 90 degrees clockwise. As a result, as shown in FIG. 6(b), the parts of the yarns Ya and Yb in the vicinity of the yarn moving levers 62 are pushed by the yarn moving levers 62 and moved along the upper ends of the yarn guide plates 63 as indicated by the arrow R in FIG. 6(b), and each yarn reaches the opposite side over the suction mouth 51 in the axial direction of the take up tube 19B (i.e., the yarns are guided to the suction mouths 51).

[0064] In this connection, the yarn Ya (Yb) is, as indicated by the arrow S in FIG. 7(b), moved along the upper end of the cutter 56 to the open end of the slit 56a of the cutter 56 (i.e., right side in FIG. 7(b)). In FIG. 8, the positions of the yarns Ya and Yb at this stage by dashed lines. Furthermore, as the yarns Ya and Yb arranged as above are traversed by the traverse guides 27a and 27b, the yarn Ya (Yb) is moved downward in FIG. 8(a) and introduced in the slit 56a as indicated by the arrow T in FIG. 7(b), and then the yarn is cut by the blade 56b. At this stage, a part of the yarn Ya (Yb) on the upstream of the cutter 56 is immediately above the suction port 51a of the suction mouth 51. After the yarn Ya (Yb) is cut, the yarn end of a part of the yarn upstream of the cutter 56 (indicated by the full line in FIG. 8) is sucked by the suction mouth 51 and the part is retained, whereas a part of the yarn downstream of the yarn end cutter 56 (indicated by the two-dot chain line in FIG. 8(a)) is wound onto the take up tube 19B.

[0065] Thereafter, an unillustrated doffing mechanism rotates the cradle 20 and the package P is removed from the winding drum 23 and doffed. As the winding body 40 having two empty take up tubes 19B is supplied to the cradle 20 and retained by the bobbin holders 22a and 22b, the cradle 20 is rotated to cause the two take up

tubes 19B to contact the winding drum 23. In response to this, the two take up tubes 19B contacting the winding drum 23 start to rotate.

[0066] Subsequently, as shown in FIG. 9, by swinging the yarn providing arm 53 counterclockwise in FIG. 9(b), the leading end of the yarn providing arm 53 is moved to be above the take up tube 19B. On this account, a part of the yarn Ya (Yb) upstream of the suction mouth 51 is caught by the leading end of the yarn providing arm 53, and the part of the yarn Ya (Yb), which is caught by the yarn providing arm 53, is moved to the take up tube 19B side together with the leading end of the yarn providing arm 53, with the result that the yarn Ya (Yb) is disposed to oppose the take up tube 19B. In this connection, because the leading end of the yarn providing arm 53 is bended as described above, the yarn Ya (Yb) caught by the yarn providing arm 53 does not drop off from the yarn providing arm 53.

[0067] Thereafter, the yarn moving lever 62 is swung to the original position (shown in FIG. 6(a)). As a result, in plan view, the yarn Ya is disposed to cross the border between the corresponding take up tube 19B and the bobbin holder 22a, whereas the yarn Yb is disposed to cross the border between the corresponding take up tube 19B and the O-ring 43.

[0068] At this stage, the yarn supporting arm 54 which is swung together with the yarn providing arm 53 is moved to the vicinity of the take up tube 19B. At this position the yarn supporting arm 54 is below the yarn Ya (Yb) and opposes the yarn Ya (Yb).

[0069] Thereafter, as shown in FIG. 10, the yarn pressing arm 55 is swung counterclockwise in FIG. 10(b). As a result, a part of the yarn Ya (Yb) between the yarn providing arm 53 and the yarn guide 30a (30b) is pushed down by the yarn pressing arm 55 and closely contacts the outer circumference of the take up tube 19B. At this stage, because the leading end of the yarn pressing arm 55 is bended as described above, the yarn Ya (Yb) does not drop off from the yarn pressing arm 55 when the yarn pressing arm 55 pushes the yarn Ya (Yb). Furthermore, the yarn Ya (Yb) closely contacting the outer circumference of the take up tube 19B is retained by being sandwiched between the yarn pressing arm 55 and the yarn supporting arm 54.

[0070] As the yarn Ya (Yb) is retained while closely contacting the outer circumference of the take up tube 19B, the part of the yarn Ya (Yb) closely contacting the outer circumference of the take up tube 19B is captured by being sandwiched between the corresponding take up tube 19B and the bobbin holder 22a (by being sandwiched between the corresponding take up tube 19B and the O-ring 43). At this stage, as described above, because the yarns Ya and Yb are disposed to cross the border between the corresponding take up tube 19B and the bobbin holder 22a and to cross the border between the corresponding take up tube 19B and the O-ring 43, respectively. On this account, even if the axial lengths of the take up tubes 19B are not uniform, the parts of the

yarns Ya and Yb closely contacting the outer circumferences of the take up tubes 19B are certainly sandwiched between the corresponding take up tube 19B and the bobbin holder 22a and between the corresponding take up tube 19B and the O-ring 43, respectively. As the take up tube 19B in this state is rotated, a bunch winding B is formed at one end portion (upper end portion in FIG. 10 (a)) of the take up tube 19B in the axial directions, and the yarn threading is completed.

[0071] Thereafter, as the yarn pressing arm 55 is swung to the original position (shown in FIG. 5), the movement of the yarns Ya and Yb in the axial directions of the take up tubes 19B, i.e., the traversal by the traverse guides 27a and 27b becomes possible, and the winding of the yarns Ya and Yb onto the take up tubes 19B is resumed. In this regard, because the yarn pressing arm 55 does not retain the yarn Ya (Yb) at the time of returning the yarn pressing arm 55 to the original position, the traversal is resumed immediately after the completion of the yarn threading, as discussed above. For this reason, successive winding of the yarn Ya (Yb) onto the same part of the take up tube 19B (so-called straight winding) does not occur before the traversal is resumed by the traverse guide 27a (27b), and therefore the yarns Ya and Yb wound onto the take up tubes 19B are unlikely to be slacken. After the winding of the yarns Ya and Yb onto the take up tubes 19B is resumed and the yarns Ya and Yb are moved to positions not opposing the yarn supporting arms 54, the yarn providing arms 53 (yarn supporting arms 54) are swung to the original positions (shown in FIG. 5).

[0072] Now, an operation to form a single package P will be described. In so doing, to prevent the contact with the yarn Yg, the mounting plate 69 is removed from the plate 67 in advance, the yarn providing arm 53, the yarn supporting arm 54, and the yarn pressing arm 55 of the automatic yarn threading device 24b are detached in advance by pulling out the parts 65b and 66b from the respective supporting portions 68b and 68d, and the suction mouth 51, the yarn moving lever 62, the yarn guide plate 63, and the cutter 56 are removed from the automatic yarn threading device 24b in advance.

[0073] In this case, in the same manner as above, two yarns Ya and Yb drawn and twisted between the first feed rollers 6a and 6b and the upstream-side second feed rollers 7a and 7b pass through the false twisting devices 15a and 15b and are then introduced into a single interlace nozzle 16b, and after being doubled in the interlace nozzle 16b, the yarns Ya and Yb are conveyed to the downstream-side second feed roller 8b.

[0074] The yarn Yg formed by the doubling is, as shown in FIG. 3(a), slacken in the part between the downstream-side second feed roller 8b and the third feed roller 9b, and the yarn Yg in this state is subjected to slacken thermal treatment by the secondary heater 17b and then conveyed to the third feed roller 9b.

[0075] The yarn Yg sent out from the third feed roller 9b passes through the yarn guide 30c and is wound onto

a single take up tube 19A contacting and rotated by the rotating winding drum 23, while being traversed by the traverse guide 27a which is reciprocally moved in directions in parallel to the axis of the take up tube 19A by the reciprocal movement of the belt component 26, with the result that a single package P is formed.

[0076] In this connection, the moving distance of the traverse guide 27b when the yarn Yg is wound onto a single take up tube 19A is longer than the moving distance of each of the traverse guides 27a and 27b when the yarns Ya and Yb are wound onto two take up tube 19B, respectively. However, as shown in FIG. 11, because the yarn Yg is traversed on the yarn guide 30c which is further from the traverse guide 27a than the yarn guides 30a and 30b, the bending angle of the yarn Yg at the yarn guide 30c is of the same degree as the bending angles of the yarns Ya and Yb at the yarn guides 30a and 30b in the case of the formation of two packages.

[0077] Because the yarn guide 30c is provided below the yarn guides 30a and 30b, a part of the yarn Yg between the yarn guide 30c and the traverse guide 27a is threaded on a substantially cylindrical guide bar 70, and is smoothly bended. The part of the yarn Yg threaded on the guide bar 70 moves on the smooth outer circumference of the guide bar 70 in the axial direction of the guide bar 70, when traversed by the traverse guide 27a. This prevents the yarn Yg bended at the guide bar 70 from being seriously damaged.

[0078] In the case of the formation of a single package P, in the same manner as the formation of two packages P, the doffing of the package P and the yarn threading onto an empty take up tube 19A are carried out when the package P is fully formed. In this case, the yarn threading onto the take up tube 19A is carried out by the automatic yarn threading device 24a. That is to say, in the present embodiment, the automatic yarn threading device 24a is used for performing yarn threading of the yarn Ya onto the take up tube 19B to form two packages P and for performing yarn threading of the yarn Yg onto the take up tube 19A to form a single package P.

[0079] In the case above, as shown in FIG. 11(a), the yarn Yg traversed by the traverse guide 27a may not oppose yarn moving lever 62 depending on the position of the yarn Yg. For this reason, when the yarn moving lever 62 is swung while the yarn Yg does not oppose the yarn moving lever 62 as in the same manner as in FIG. 8, the yarn Yg is not moved toward the suction mouth 51.

[0080] Therefore, to perform the yarn threading onto the take up tube 19A, the traverse guide 27a is temporarily stopped when the yarn Yg is positioned to oppose the yarn moving lever 62, and the yarn moving lever 62 is swung in this state. Thereafter, the yarn Yg is sucked into the suction mouth 51 and then the operation of the traverse guide 27a is resumed. This makes it possible to certainly move the yarn Yg toward the suction mouth 51 when the yarn moving lever 62 is swung. According to the present embodiment, in the traversal range of the yarn Yg traversed by the traverse guide 27a, a range

opposing the yarn moving lever 62 is equivalent to the guidable area of the present invention, whereas a range not opposing the yarn moving lever 62 is equivalent to the non-guidable area of the present invention.

[0081] According to the present embodiment described above, a winding device 18, which is switchable between the formation of two packages P by winding supplied two yarns Ya and Yb onto respective take up tubes 19B and the formation of a single package P by winding a yarn Yg in which yarns Ya and Yb are doubled onto a take up tube 19A, includes two automatic yarn threading devices 24a and 24b. It is therefore possible to perform yarn threading onto two take up tubes 19B at the same timing, when two packages P are formed. With this, the winding of the yarns Ya and Yb onto respective two take up tubes 19B start at the same timing. This does not complicate the operation of the operator.

[0082] In addition to the above, because the winding device 18 of the present embodiment winds the yarns Ya and Yb onto two take up tubes 19B provided at a relatively short interval, it is impossible to widen the gap between the automatic yarn threading devices 24a and 24b in the axial directions of the take up tube 19B. However, in the present embodiment the yarn providing arm 53, the yarn supporting arm 54, and the yarn pressing arm 55 of each of the automatic yarn threading devices 24a and 24b are swung about the shaft 65 or 66 extending along the axial directions of the take up tube 19B, and hence the components above do not really move along the axial directions of the take up tube 19B. It is therefore possible to provide the automatic yarn threading devices 24a and 24b at a short interval with respect to the axial directions of the take up tube 19B.

[0083] In addition to the above, the present embodiment is arranged so that the yarn supporting arm 54 extends, at its leading end, to be parallel to the axial directions of the take up tube 19B, and the yarn pressing arm 55 and the yarn supporting arm 54 sandwich the yarn Ya (Yb) to cause the yarn Ya (Yb) to closely contact the outer circumference of the take up tube 19B. For this reason, as the yarn pressing arm 55 is detached from the yarn supporting arm 54 and moved to the original position after the formation of the bunch winding B, the traversal of the yarn Ya (Yb) by the traverse guide 27a (27b) becomes possible and the winding of the yarn Ya (Yb) onto the take up tube 19B can be immediately resumed. This makes it possible to prevent the yarns Ya and Yb to be straight-wound onto the take up tubes 19B.

[0084] In addition to the above, because in the present embodiment each of the automatic yarn threading devices 24a and 24b has a yarn moving mechanism 52, it is possible to provide the suction mouth 51 to be remote from the yarn Ya (Yb) being wound. As such, the degree of freedom in the arrangement of the suction mouth 51 is increased.

[0085] Now, various modifications of the present embodiment will now be described. It is noted that the description of the same arrangements as in the embodiment

will be omitted.

[0086] While in the embodiment above the yarn moving lever 62 opposes the yarn Ya (Yb) wherever the yarn Ya (Yb) locates in the traversal range of the traverse guide 27a (27b), the present invention is not limited to this arrangement. The yarn moving lever may be shorter than the yarn moving lever 62 of the embodiment above and oppose the yarn Ya (Yb) only when the yarn Ya (Yb) is in a part (guidable area) of the traversal range of the traverse guide 27a (27b), and not oppose the yarn Ya (Yb) when the yarn Ya (Yb) is in other parts (non-guidable area). In the yarn threading in this case, in the same manner as the yarn threading onto a single take up tube 19A, the yarn moving lever 62 is swung after the traversal of the traverse guide 27a (27b) is temporarily stopped when the yarn Ya (Yb) is moved to the position of opposing the yarn moving lever, with the result that the yarn Ya (Yb) is guided to the suction mouth 51.

[0087] In addition to the above, the yarn moving mechanism 52 may not include the yarn moving lever 62 and the yarn guide plate 63. The yarn moving mechanism 52 may be another mechanism which is able to guide the yarn Ya, Yb, or Yg to the suction mouth 51.

[0088] In addition to the above, in the embodiment above the suction mouth 51 is deviated from the yarn Ya (Yb) traversed by the traverse guide 27a (27b), in the axial directions of the take up tube 19B, and at the time of the yarn threading the yarn Ya (Yb) is guided by the yarn moving mechanism 52 to a position where the suction mouth 51 is able to suck the yarn. The present invention, however, is not limited to this arrangement. The yarn moving mechanism 52 may not be provided, and the suction mouth 51 may be positioned so that simply opening the suction port 51a causes the yarn Ya (Yb) traversed by the traverse guide 27a (27b) to be sucked. In this case, however, the suction mouth 51 must be positioned to be able to suck the traversed yarn Ya (Yb) but not to interfere the yarn Ya (Yb) when the yarn is wound.

[0089] In addition to the above, the embodiment above is arranged so that the yarns Ya and Yb are positioned by the yarn providing arms 53 to cross the border between the corresponding take up tube 19B and the bobbin holder 22a and to cross the border between the corresponding take up tube 19B and the O-ring 43, respectively. The present invention, however, is not limited to this arrangement. For example, the yarns Ya and Yb may be positioned by the yarn providing arms 53 to be in parallel to the respective borders.

[0090] In this case, for example, a mechanism for sliding the yarns Ya and Yb positioned by the yarn providing arms 53 toward the borders in the axial direction of the take up tubes 19B may be provided. With this, the parts of the yarns Ya and Yb closely contacting the outer circumferences of the take up tubes 19B are certainly captured by being sandwiched between the corresponding take up tube 19B and the bobbin holder 22a and between the corresponding take up tube 19B and the O-ring 43.

[0091] Even if such a mechanism for sliding the yarns

Ya and Yb is not provided, the parts of the yarns Ya and Yb closely contacting the outer circumferences of the take up tubes 19B are captured by being sandwiched between the corresponding take up tube 19B and the bobbin holder 22a, and between the corresponding take up tube 19B and the O-ring 43, when the yarns Ya and Yb are precisely positioned to oppose the borders.

[0092] In addition to the above, the embodiment above is arranged so that the yarn Ya is captured by being sandwiched between the corresponding take up tube 19B and the bobbin holder 22a whereas the yarn Yb is captured by being sandwiched between the corresponding take up tube 19B and the O-ring 43. This arrangement, however, is not essential. The yarn Ya may be captured by being sandwiched between the corresponding take up tube 19B and the bobbin holder 22a and the yarn Yb may be captured by being sandwiched between the take up tube 19B and the bobbin holder 22b. Alternatively, both of the yarns Ya and Yb may be captured by being sandwiched between the corresponding take up tubes 19B and the O-rings 43, respectively. In this regard, because in these cases the bunch windings B are formed at the opposite end portions of the two take up tubes 19B, the direction of winding of the yarn Ya (Yb) is opposite between the two take up tubes 19B.

[0093] In addition to the above, the present invention is not limited to the arrangement in which the yarns Ya and Yb are captured by being sandwiched between the corresponding take up tubes 19B and the bobbin holders 22a and 22b or the O-ring 43. For example, the yarns Ya and Yb may be captured by grooves formed along the circumferential directions at an axial end portion of the take up tube 19B.

[0094] In addition to the above, in the embodiment above, after the yarn threading is completed (i.e., the bunch winding B is formed), the yarn pressing arm 55 is swung whereas the yarn supporting arm 54 is not swung, with the result that the yarns Ya and Yb are movable in the axial direction of the take up tube 19B (i.e., traversed by the traverse guides 27a and 27b). This arrangement, however, is not essential. The yarn supporting arm 54 may be swung in a direction away from the yarn pressing arm 55 without swinging the yarn pressing arm 55. Alternatively, the yarn pressing arm 55 and the yarn supporting arm 54 may be swung in directions away from each other.

[0095] In addition to the above, while in the embodiment above the yarn Ya (Yb) closely contacting the outer circumference of the take up tube 19B on account of the yarn pressing arm 55 is supported by being sandwiched between the yarn pressing arm 55 and the yarn supporting arm 54, the yarn Ya (Yb) may be supported by a mechanism different from the two arms 54 and 55.

[0096] In addition to the above, the embodiment above is arranged so that, in order to switch the formation of two packages P by winding yarns Ya and Yb onto two take up tubes 19B and the formation of a single package P by winding a yarn Yg onto a single take up tube 19A,

the components of the automatic yarn threading device 24b, such as the suction mouth 51, the yarn moving lever 62, the yarn guide plate 63, the yarn providing arm 53, the yarn supporting arm 54, and the yarn pressing arm 55 are arranged to be removable. This arrangement, however, is not essential.

[0097] For example, only some of these components are removable, and the other components are positioned not to interfere the yarn Yg at the time of the winding onto the take up tube 19A. Alternatively, the components above may be arranged to be movable to positions not interfering the yarn Yg at the time of the formation of a single package P. Furthermore, all components of the automatic yarn threading device 24b may not be removable when all components of the automatic yarn threading device 24b are positioned not to interfere the yarn Yg at the time of the winding onto the take up tube 19A or when the winding device 18 performs only the formation of two packages P by winding yarns Ya and Yb onto two take up tubes 19B.

[0098] In addition to the above, the embodiment above is arranged so that the yarn Ya (Yb) supported by the suction mouth 51 is moved to oppose the take up tube 19B by the yarn providing arm 53 that swings about the shaft 65 which is in parallel to the axial directions of the take up tube 19B, and the yarn is brought into close-contact with the outer circumference of the take up tube 19B by the yarn pressing arm 55 that swings about the shaft 66 which is in parallel to the axial directions of the take up tube 19B. This arrangement, however, is not essential.

[0099] For example, the yarn Ya (Yb) may be moved to oppose the take up tube 19B by an arrangement different from the yarn providing arm 53, and the yarn Ya (Yb) may be brought into close-contact with the outer circumference of the take up tube 19B by an arrangement different from the yarn pressing arm 55. Moreover, the automatic yarn threading device may perform the yarn threading into the take up tube 19B by an operation different from the operation of moving the yarn Ya (Yb) to oppose the take up tube 19B and bringing the moved yarn to closely contact the outer circumference of the take up tube 19A.

[0100] In addition to the above, while in the embodiment above two automatic yarn threading devices 24a and 24b are provided for winding yarns Ya and Yb onto two take up tubes 19B, a different arrangement may be used. For example, only one automatic yarn threading device 24a is provided. In such a case, the yarn Ya is threaded by the automatic yarn threading device 24a whereas the yarn Yb is manually threaded by an operator. Also in this case, two yarns Ya and Yb are threaded onto the take up tubes 19B at the same timing, if the operator threads the yarn Yb at the same time as the yarn threading performed by the automatic yarn threading device 24a.

[0101] Note that, in the case above, the operator is able to perform yarn threading at a desired timing and

hence the yarn threading by the operator is easily synchronized with the yarn threading by the automatic yarn threading device 24a, if, after the winding body 40 having two empty take up tubes 19B is supplied to the cradle 20 and supported by the bobbin holders 22a and 22b, the subsequent operation (swinging of the arms 53-55) is carried out by the automatic yarn threading device 24a when the operator starts the yarn threading by operating a switch or the like.

[0102] In addition to the above, while the embodiment above two yarns Ya and Yb are wound onto two take up tubes 19B so that two packages P are formed, this arrangement is not essential. Two packages P may be formed in such a manner that two yarns Ya and Yb are wound respectively onto two distant parts of a single take up tube 19A that is identical with the tube for winding the yarn Yg. In this case, two packages P are separated from each other by cutting the take up tube 19A after the completion of the winding.

[0103] In addition to the above, while the example of utilizing the present invention for the yarn winder that winds yarns Ya and Yb onto two take up tubes 19B has been described above, the present invention may be utilized for a yarn winder that winds yarns onto three or more take up tubes.

[0104] In such a case, yarn threading is carried out at the same timing onto all take up tubes 19B, when automatic yarn threading devices are provided for all take up tubes 19B and yarn threading is carried out onto all take up tubes 19B by the automatic yarn threading devices or when the number of automatic yarn threading devices provided is smaller by one than the number of take up tubes 19B and an operator performs yarn threading onto a single take up tube 19B whereas yarn threading onto the remaining take up tubes 19B is performed by the automatic yarn threading devices.

[0105] In addition to the above, even if the number of automatic yarn threading devices provided is smaller by two or more than the number of take up tubes 19B, the number of yarns manually threaded by an operator is smaller than the number of yarns in case where yarns are manually threaded onto all take up tubes 19B by an operator. It is therefore possible to reduce the timing differences in the yarn threading onto the take up tubes 19B. Alternatively, the number of operators required for performing the yarn threading onto the take up tubes 19B at the same timing is reduced.

Claims

1. A yarn winder comprising a cradle rotatably supporting a take up tube,
a plurality of supplied yarns being wound onto the take up tube so that a plurality of packages are formed, and
the yarn winder further comprising an automatic yarn threading device which is provided for at least one

of the packages to automatically perform yarn threading onto the take up tube.

2. the yarn winder according to claim 1, further comprising:

a doubling device for doubling the supplied yarns,
the yarn winder being switchable between (i) the formation of a plurality of packages by winding the supplied yarns onto the take up tube, and

(ii) the formation of a single package by doubling the supplied yarns in the doubling device and winding a yarn formed by the doubling onto the take up tube.

3. The yarn winder according to claim 2, wherein, automatic yarn threading devices are provided for two or more of the packages, respectively, one of the automatic yarn threading devices corresponding to one of the two or more of the packages is used for both the formation of the single package and the formation of the plurality of packages, and a part of each of the remaining automatic yarn threading devices is arranged to be detachable.

4. The yarn winder according to any one of claims 1 to 3, wherein, the automatic yarn threading devices are provided for all of the packages.

5. The yarn winder according to any one of claims 1 to 4, wherein, the automatic yarn threading device includes:

a yarn holding member for supporting a middle part of a yarn sent toward the take up tube;
a cutter provided between the take up tube and the yarn holding member to cut the yarn supported by the yarn holding member;
a yarn providing arm for positioning the yarn to oppose the take up tube in such a way that the yarn providing arm is swung about an axis in parallel to the axis of the take up tube so as to move a part of the yarn cut by the cutter, which part is upstream of the yarn holding member, to the winding section side; and

a yarn pressing arm which is provided on the opposite side to the take up tube over the yarn positioned to oppose the take up tube by the yarn providing arm, the yarn pressing arm being swung about an axis in parallel to the axis of the take up tube so as to cause the yarn to closely contact the take up tube.

6. The yarn winder according to claim 5, further comprising:

a yarn supporting arm for supporting the yarn closely contacting the outer circumference of the take up tube on account of the yarn pressing arm, by sandwiching the yarn with the pressing arm.

5

7. The yarn winder according to claim 5 or 6, further comprising:

a yarn guide unit for guiding the yarn, which has been wound onto the take up tube, to the yarn holding member.

10

8. The yarn winder according to claim 7, further comprising:

15

a traverse guide for traversing the yarn to be wound onto the take up tube, in axial directions of the take up tube,

a traversal range of the yarn traversed by the traverse guide extending over a guidable area in which the yarn guide unit is able to guide the yarn to the yarn holding member and a non-guidable area in which the yarn guide unit is unable to guide the yarn to the yarn holding member, the traverse guide temporarily stopping the traversal of the yarn when the yarn is in the guidable area during the yarn threading by the automatic yarn threading device, and

20

25

the yarn guide unit guiding the yarn to the yarn holding member while the traversal of the yarn is temporarily stopped by the traverse guide.

30

35

40

45

50

55

FIG.1

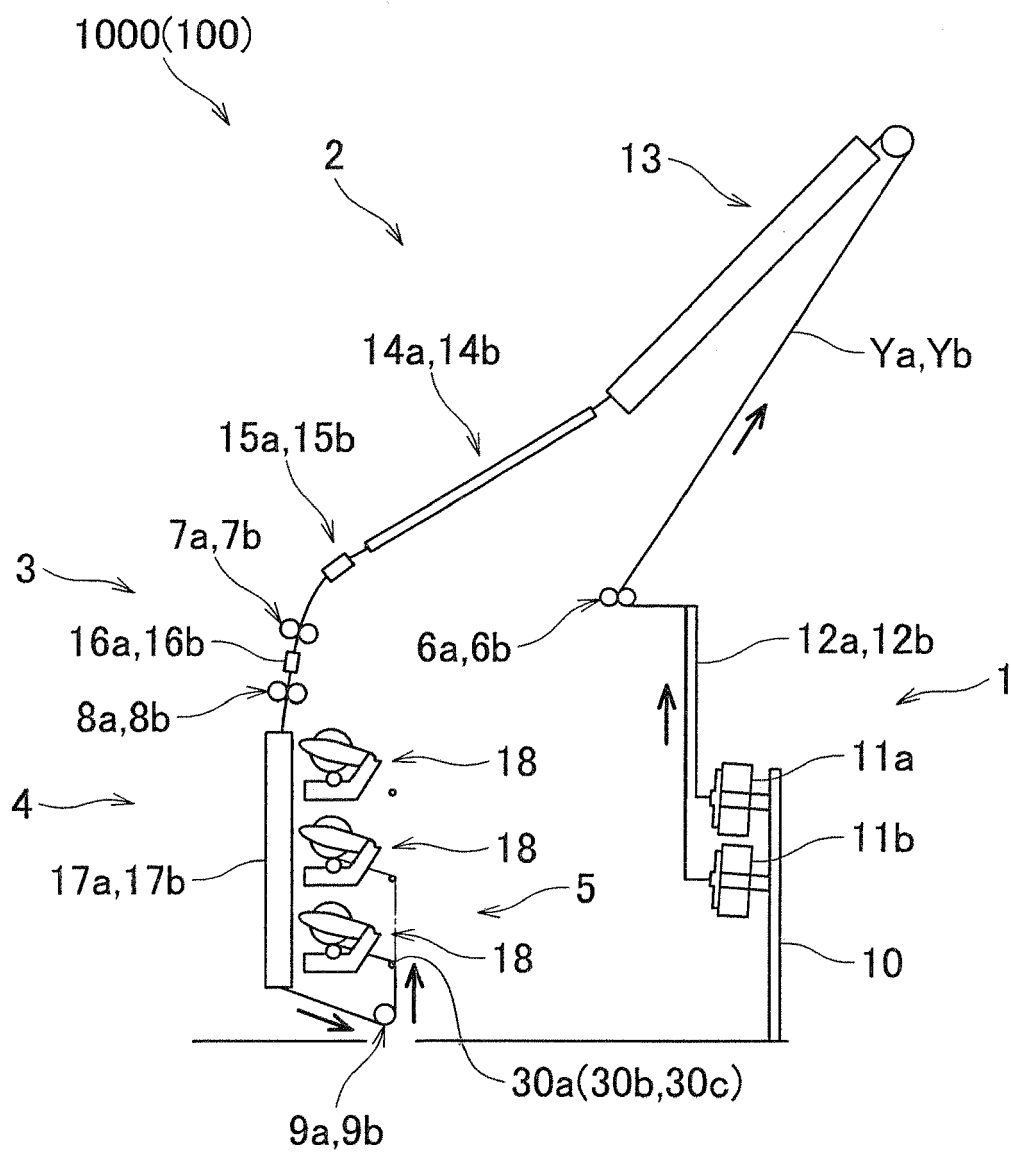


FIG.2

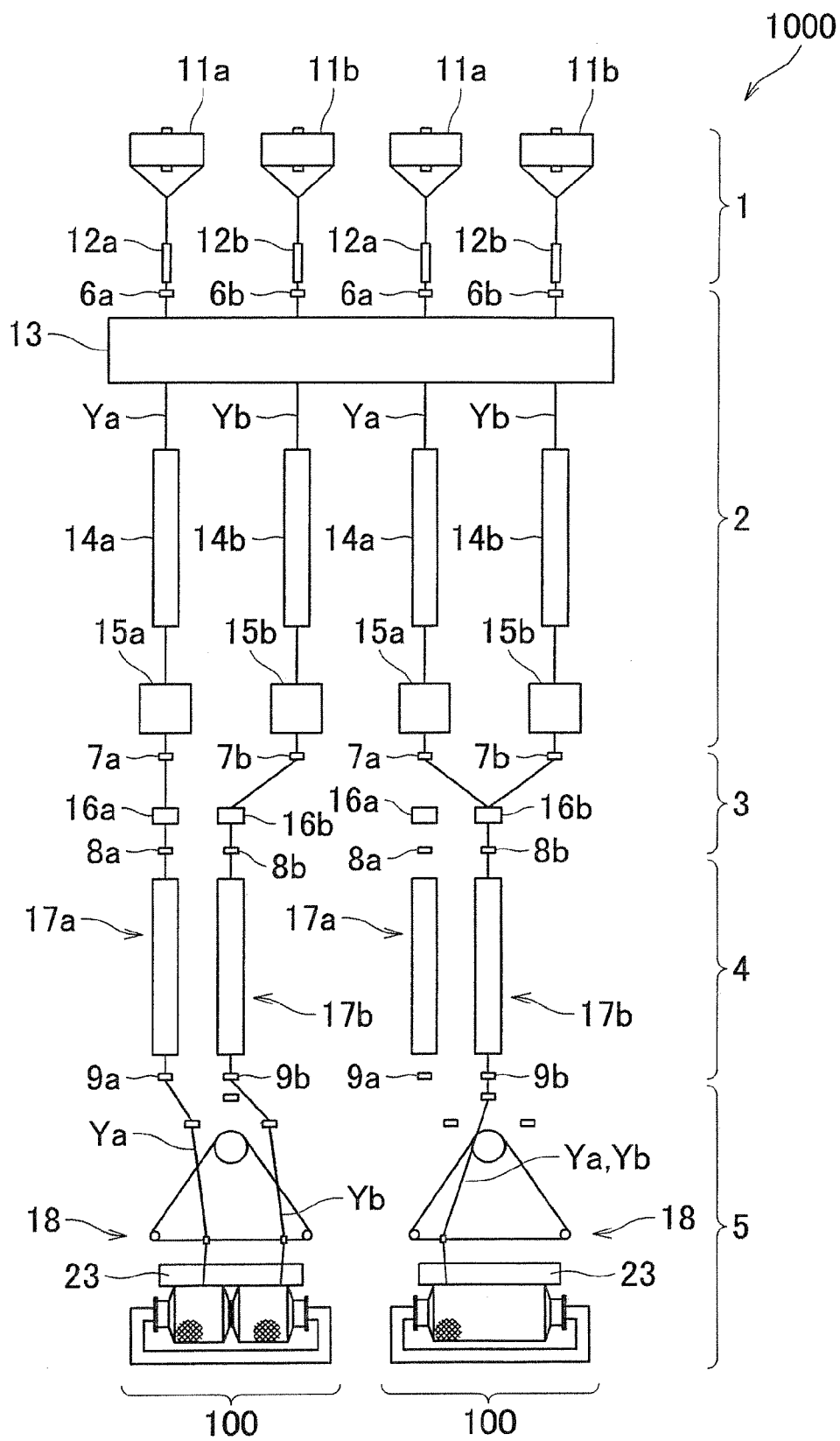


FIG.3(a)

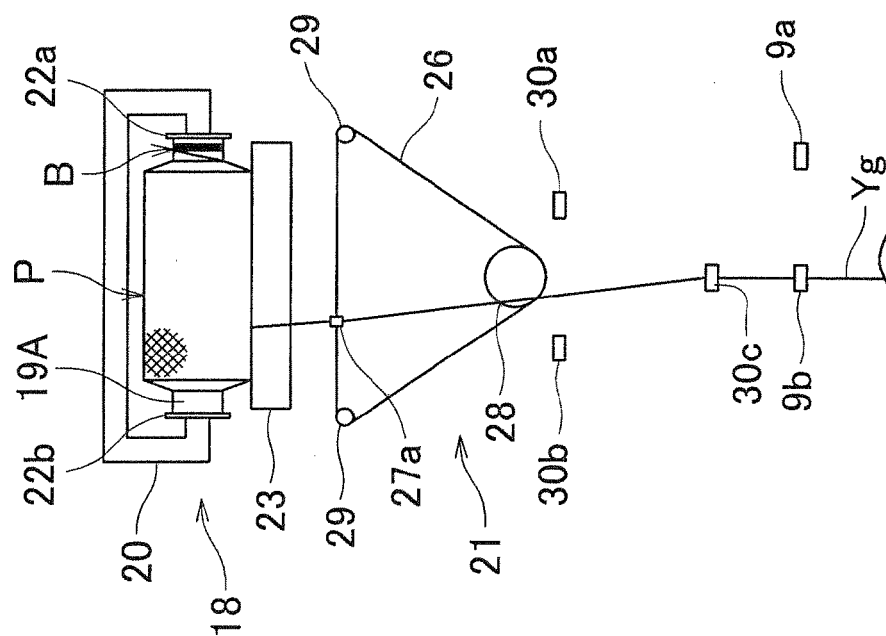


FIG.3(b)

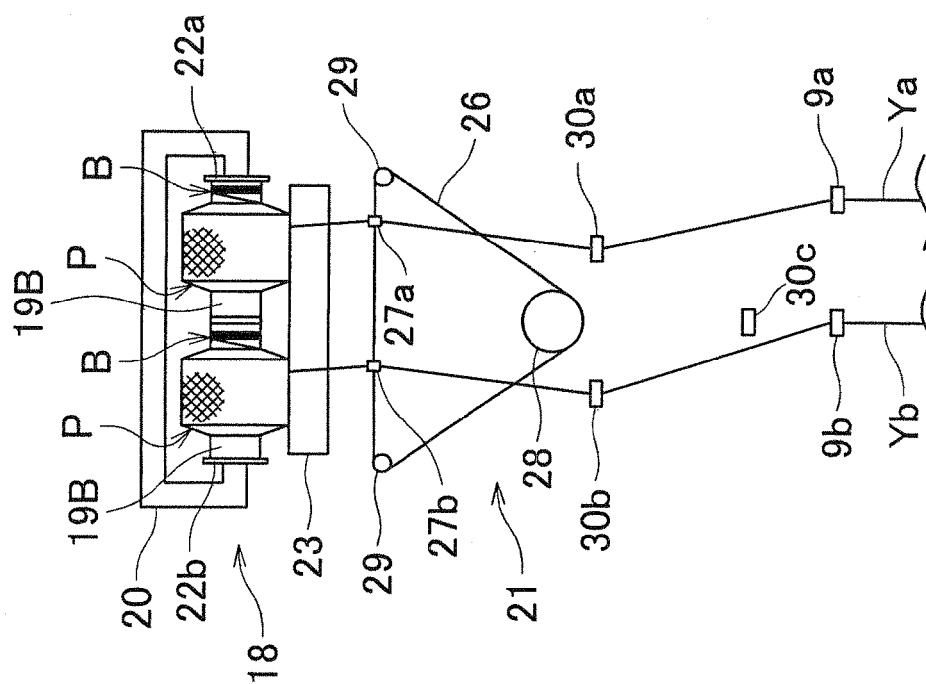


FIG.4

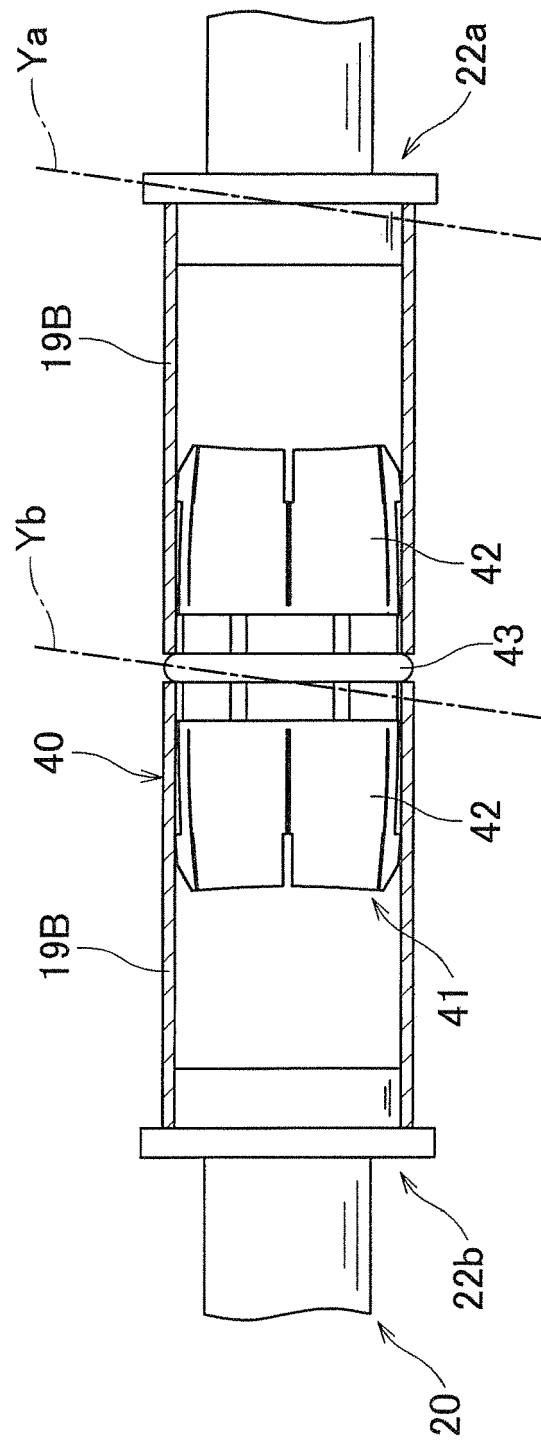


FIG.5 (a)

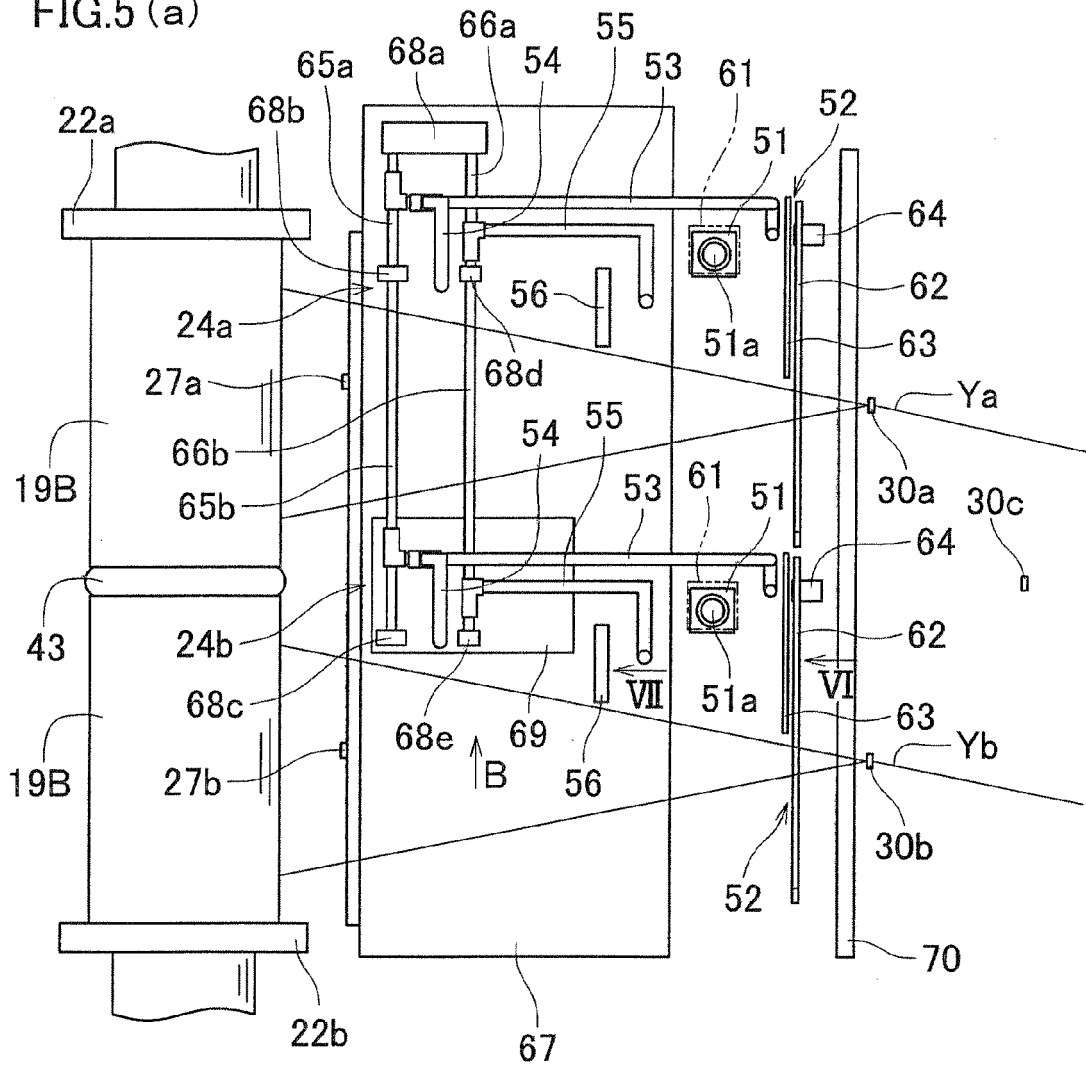


FIG.5 (b)

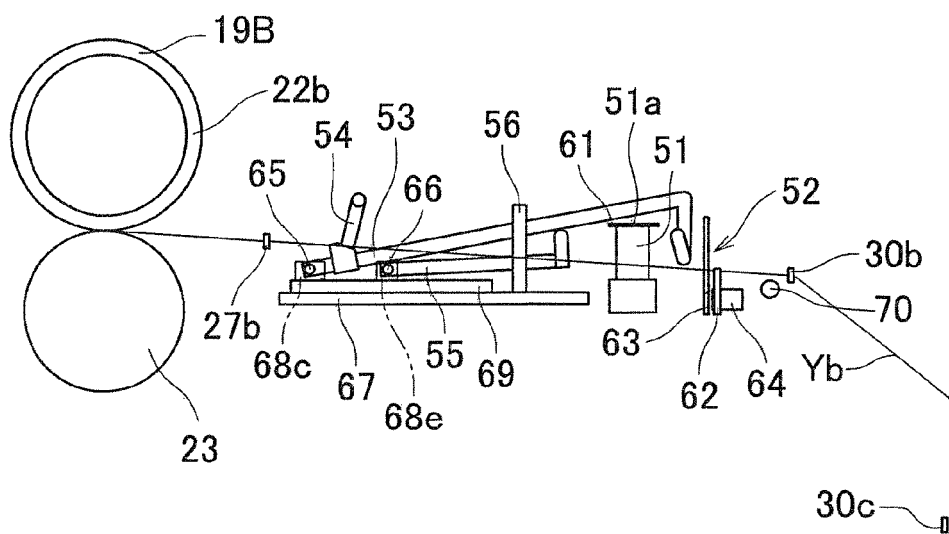


FIG.6 (a)

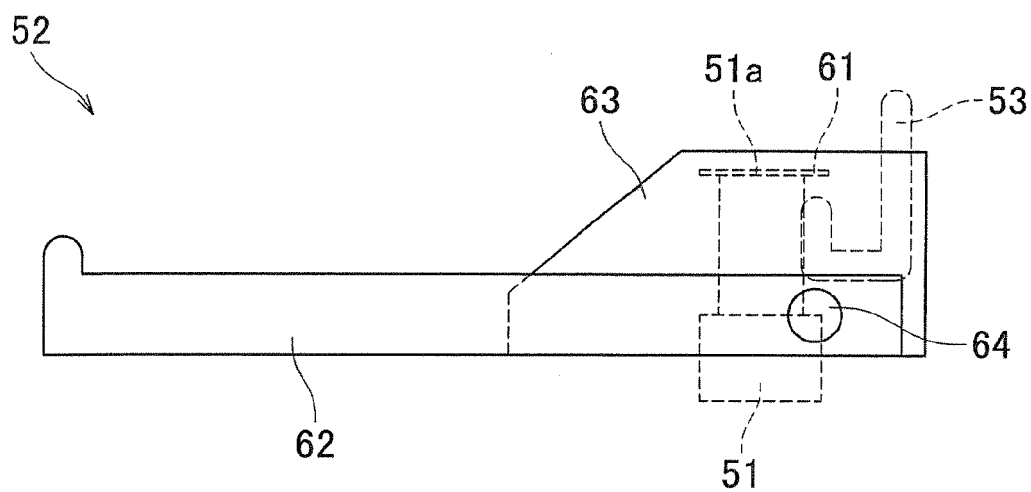


FIG.6 (b)

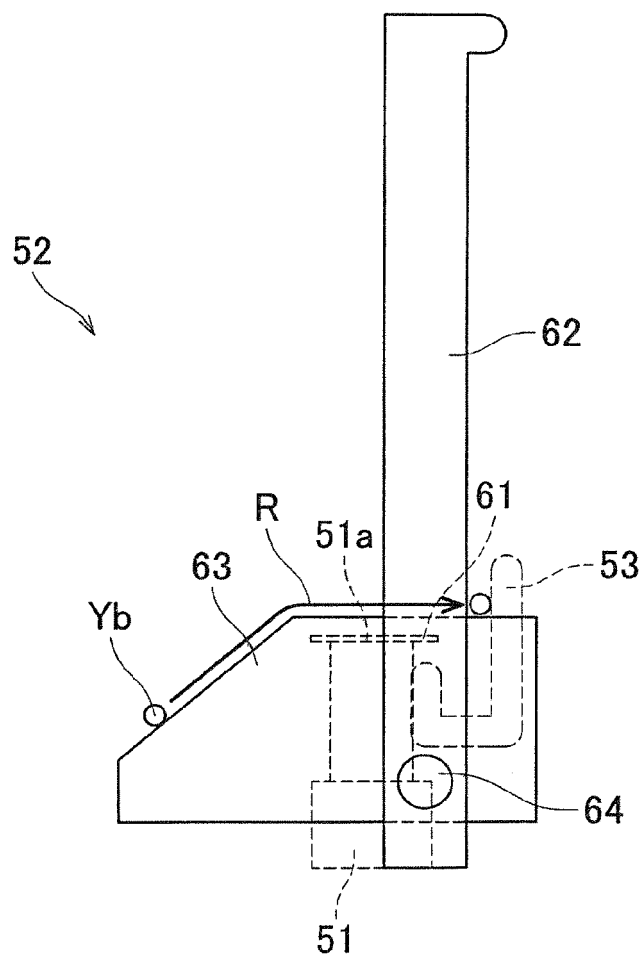


FIG.7(a)

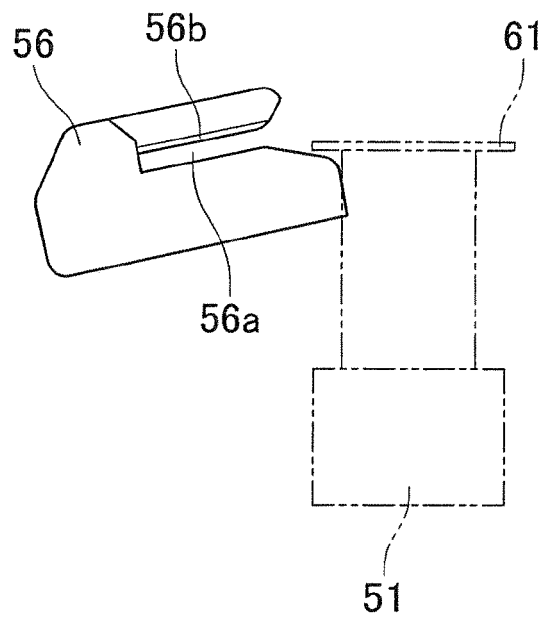


FIG.7(b)

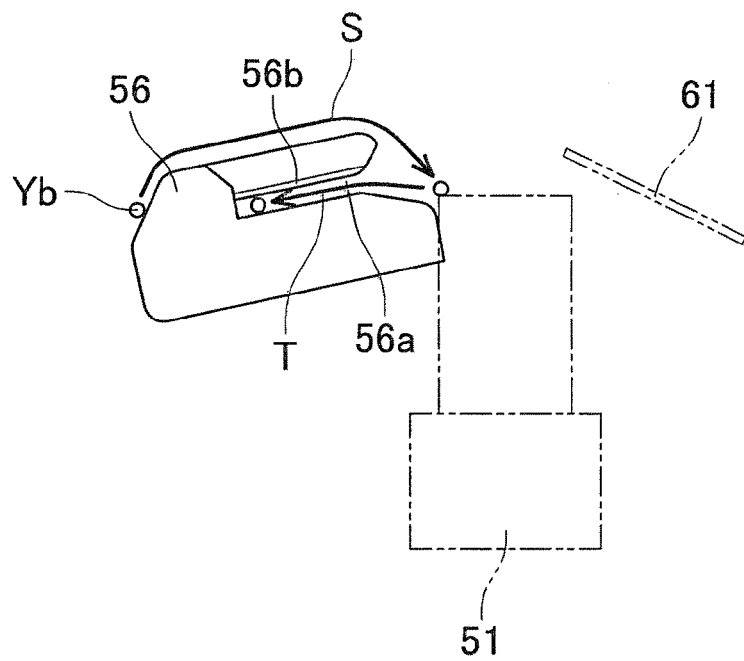


FIG.8 (a)

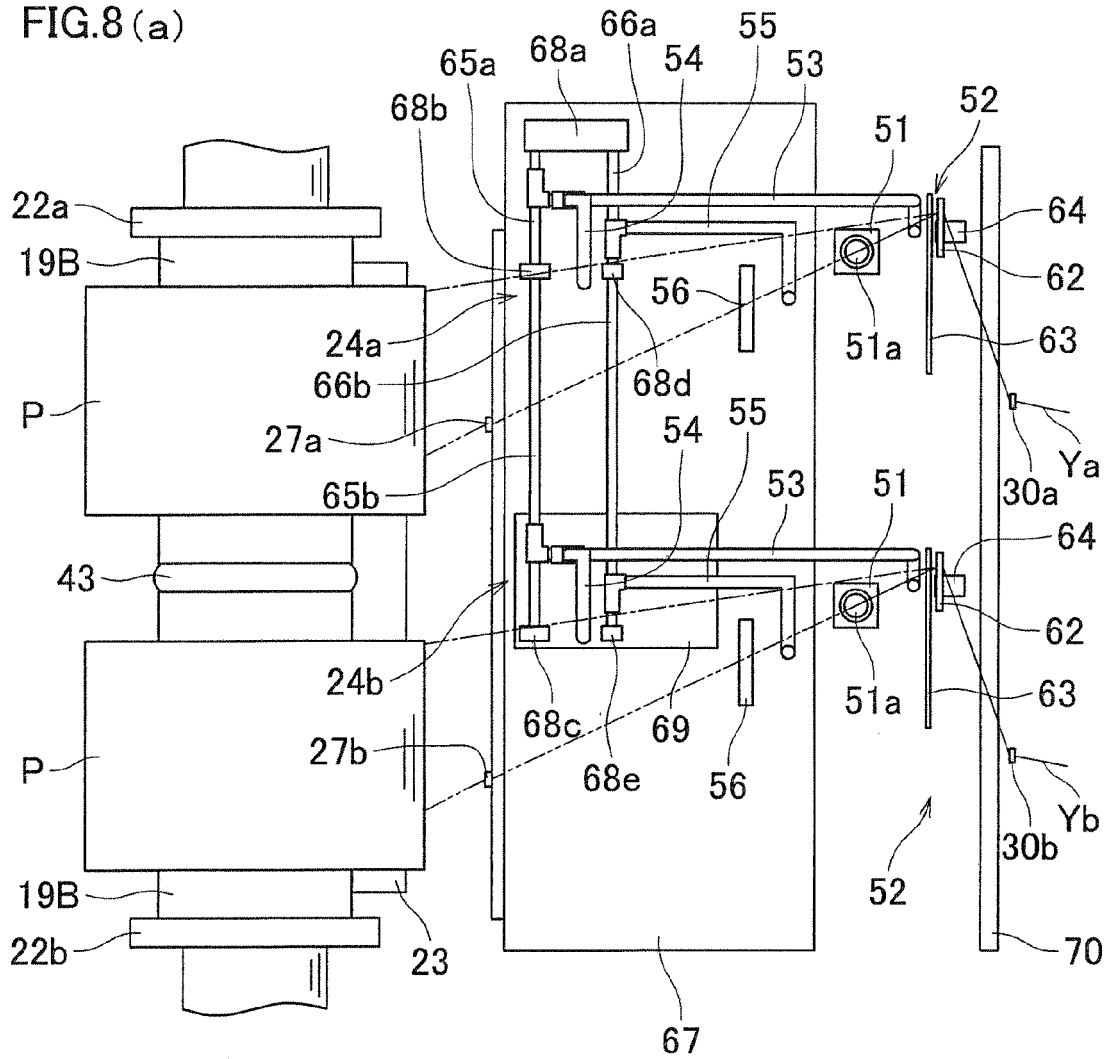


FIG.8 (b)

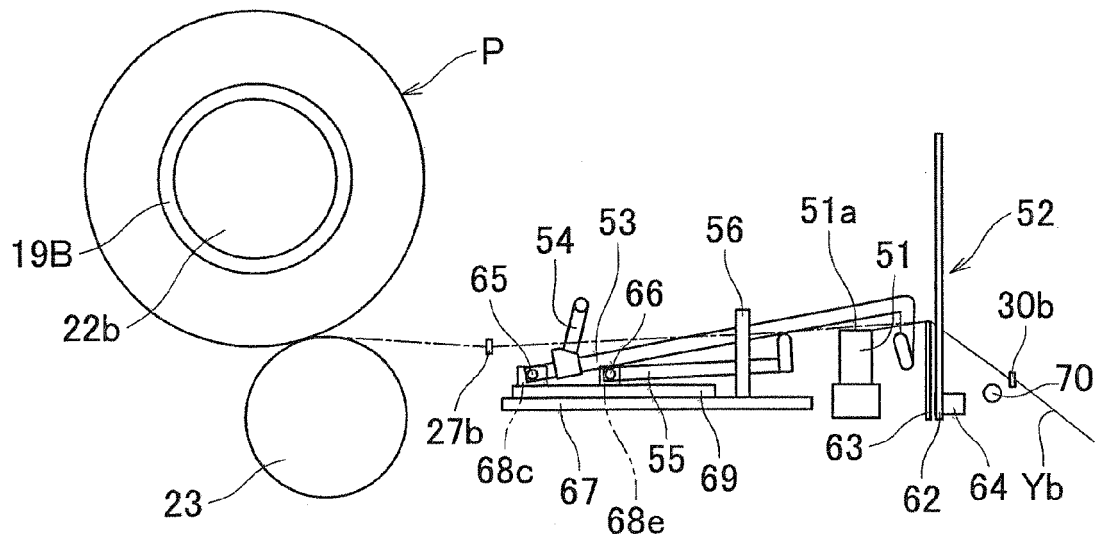


FIG.9(a)

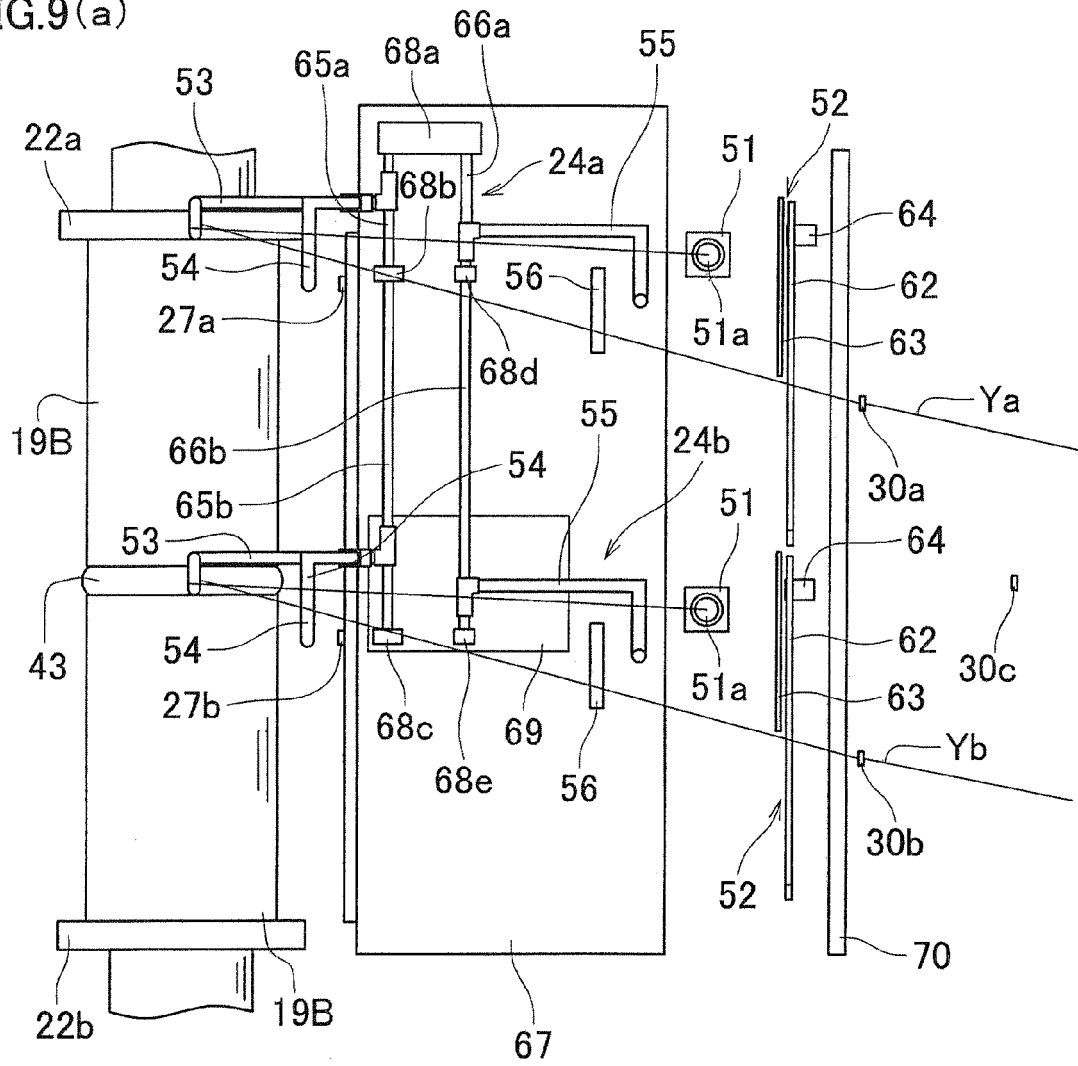


FIG.9(b)

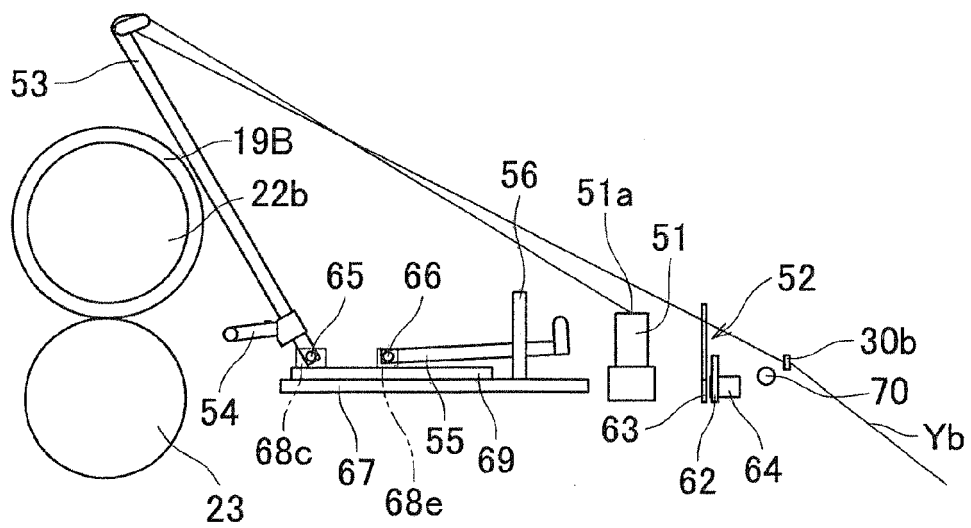


FIG.10 (a)

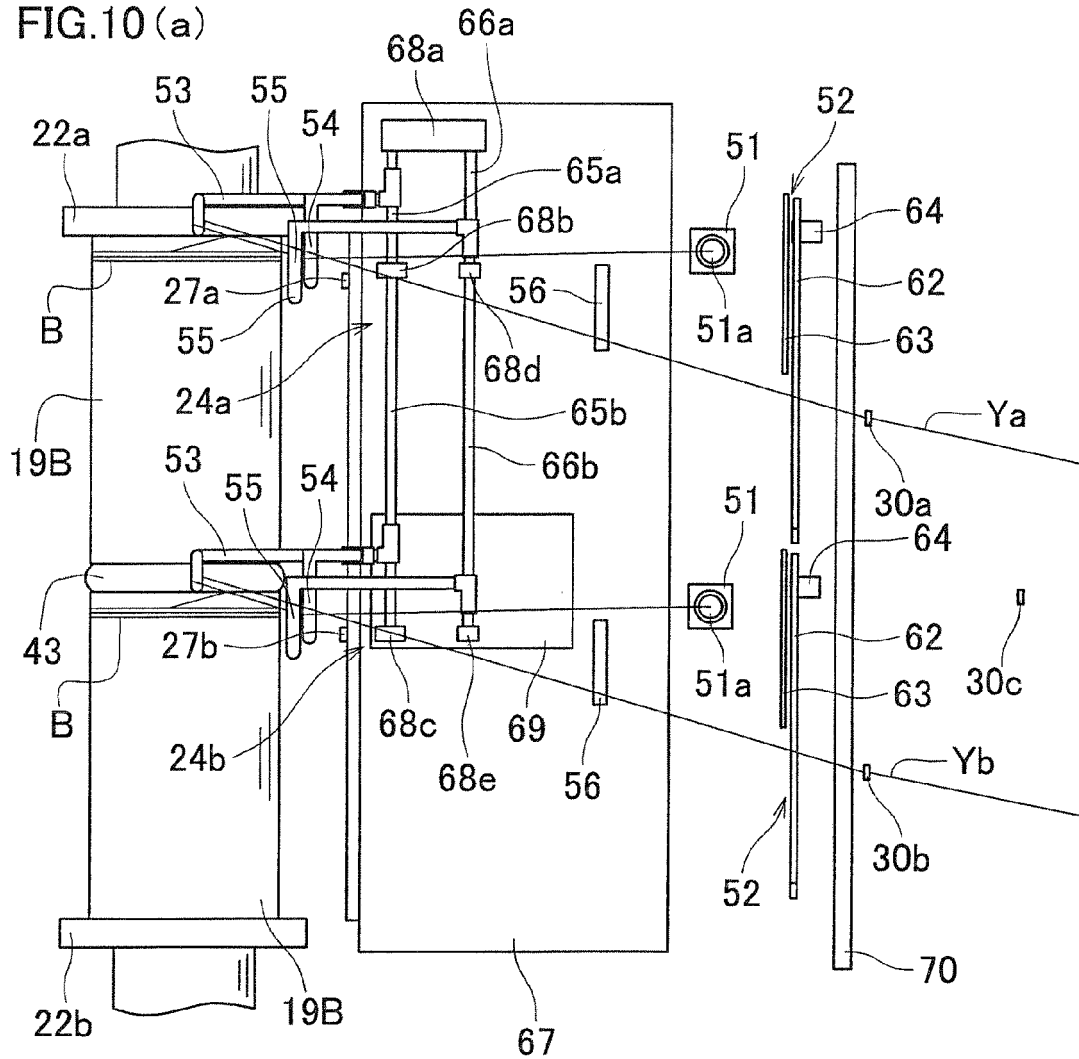


FIG.10 (b)

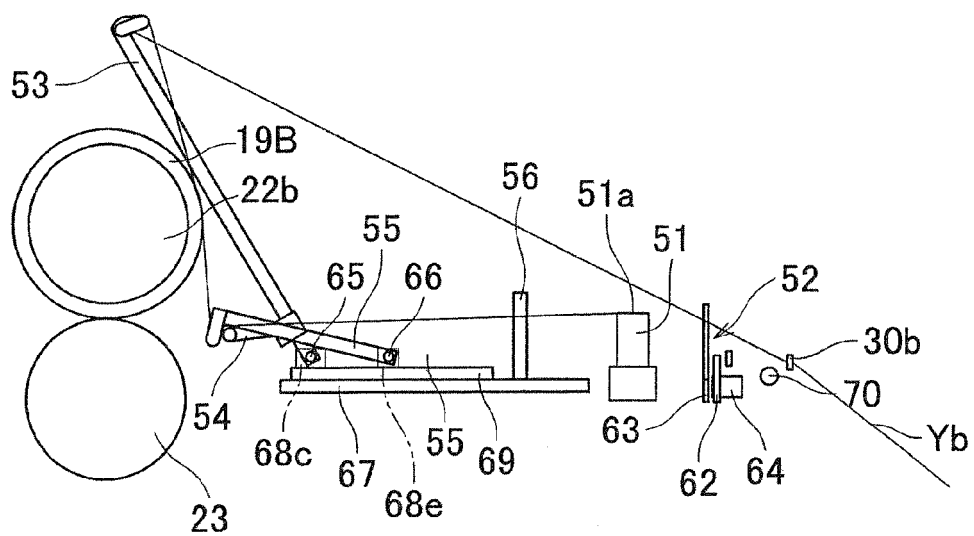


FIG.11(a)

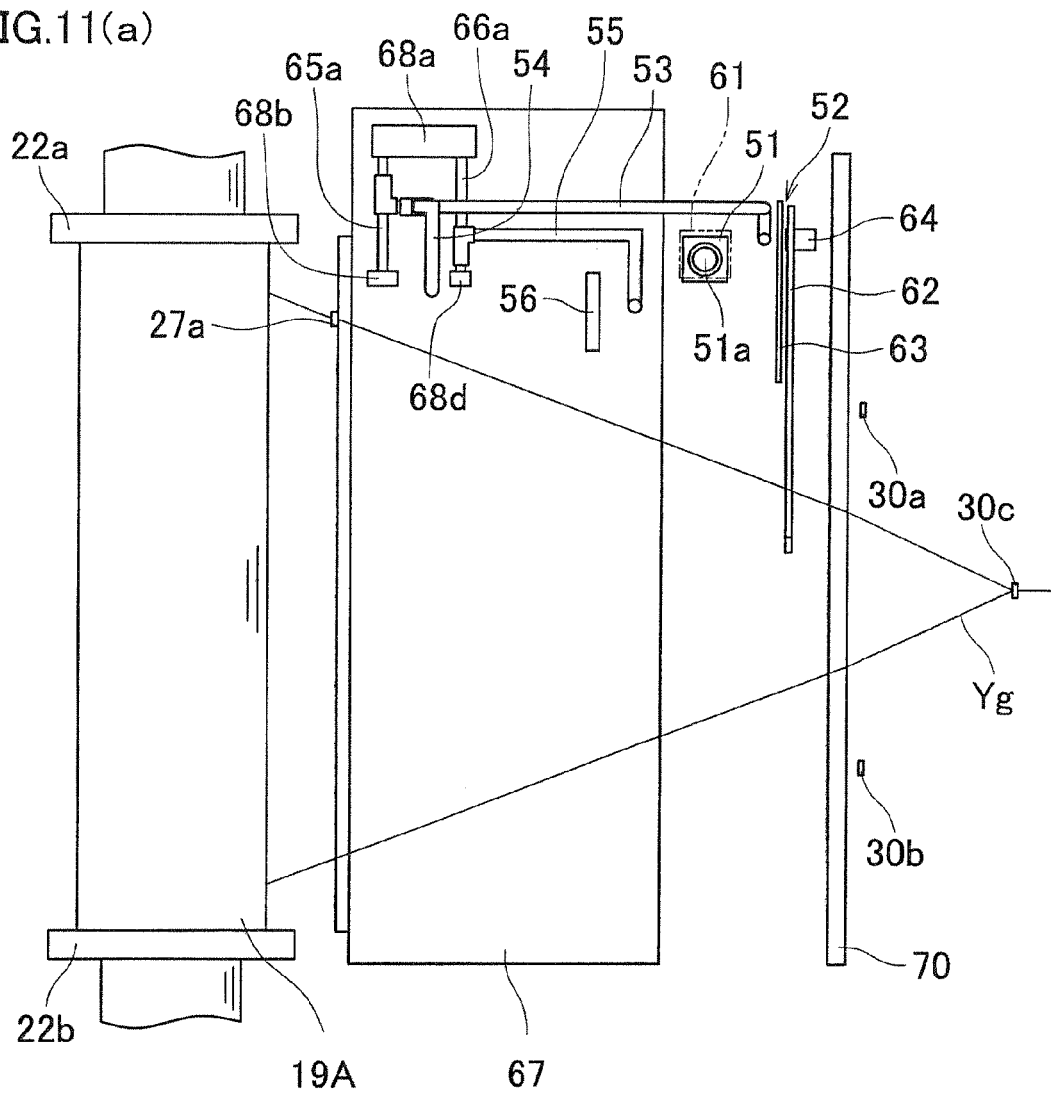
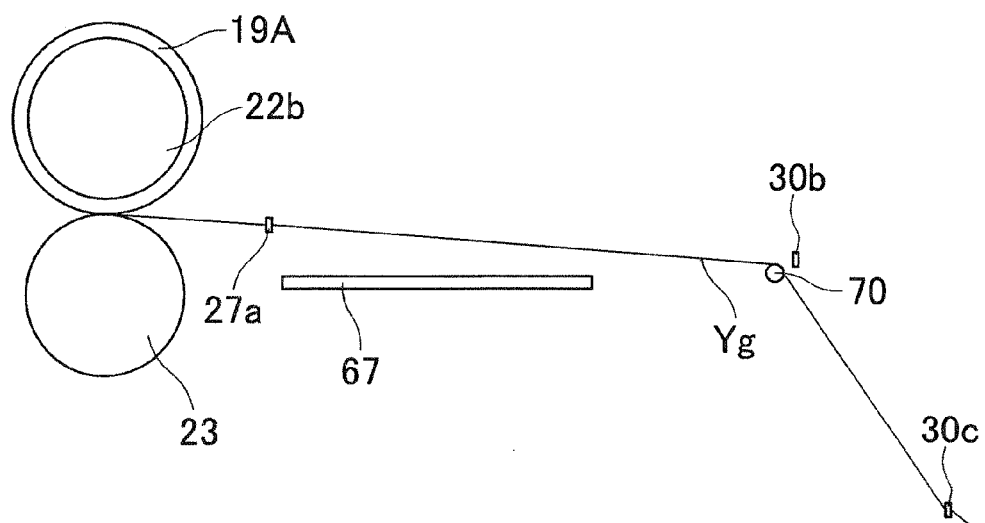


FIG.11(b)



REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 2009074219 A [0002]