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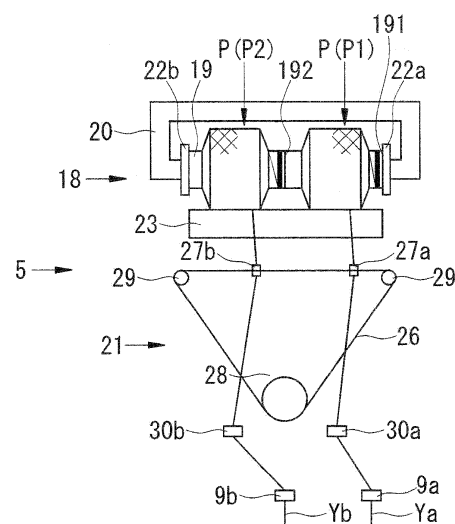
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(54) **Winding tube, packages wound on a tube and method for producing packages**

(57) [Problem to be Solved] An object is to provide a winding tube in which a yarn which is to be a tail yarn can be secured beforehand at winding start of a package when a plurality of packages are formed on the one winding tube by a winding device 18 of a false twisting machine.

[Solution] A winding tube 19 is held by one cradle 20 provided in a yarn winding device 18 of a false twisting machine 1000. Onto the winding tube 19, a plurality of supplied yarns Ya and Yb are wound so as to form a plurality of packages P. In the winding tube 19, at a position between a pair of adjacent packages P1 and P2 among the plurality of the packages P, a second capture part 192 is provided which captures a yarn winding start end YbS of at least one of the pair of the packages P1 and P2.

Fig. 3



Description

[The technical field to which the invention belongs]

[0001] The present invention relates to a winding tube used in a yam winding device of a false twisting machine, a plurality of packages formed on the winding tube, and a method for producing the plurality of the packages.

[Description of the Prior Art]

[0002] A yam winding device described in the Patent Literature 1 winds a plurality of yarns in a false twisting machine. One winding tube is held rotatably by a cradle. The plurality of the supplied yarns may not be doubled and wound respectively onto parts of the winding tube separated from each other, thereby forming a plurality of packages. The winding tube on which two packages are formed in the yam winding device is cut at a substantially center in the lengthwise direction so as to make two independent packages, and the packages are used in a post process (see the paragraph 0046 of the Patent Literature 1).

[0003] The formation of the plurality of the packages on the one winding tube advantageously improves the productivity of the packages. In the case of unwinding the yarn from each package in the post process, the unwinding characteristic of the yam is also improved advantageously. The reason why the unwinding characteristic of each package is improved is that the winding width of each package becomes small by forming the plurality of the packages on the one winding tube. For example, when one package is formed on one winding tube, the winding width is 250mm and the maximum package weight is 6kg, whereby the winding width is large. When the winding width is large, the unwinding tension is large and the yam is breakable. On the other hand, when two packages are formed on one winding tube, for example, the winding width is 110mm and the maximum package weight is 2kg, whereby the winding width of each package is small. When the winding width is small, the unwinding tension is small and the yam is not breakable easily.

[0004] However, when the plurality of the packages are formed on the one winding tube and divided into the individual packages, the yam amount of each of the individual packages is small. Then, when the packages are used in the post process, the number of times of exchange of the packages is increased, whereby the operation efficiency of the post process is reduced.

[0005] Therefore, by enabling the continuous unwinding of the yarns of the plurality of the packages formed on the one winding tube, it is considerable that the package can form which has enough large yam amount and good unwinding characteristic. The package can be handled easily because the number of the winding tube is one. As an art for connecting yarns of a plurality of packages, for example, arts described in the Patent Literatures 2 and 3 are known, though each of the arts is not

a winding device of a false twisting machine.

[0006] As described in the Patent Literature 2, it is necessary to form a tail yam to connect yarns of a plurality of packages. Then, a yam to be the tail yam must be secured beforehand at winding start of the package. After forming the packages, the tail yam is bonded and connected to a yam winding finish end of the next adjacent package so as to connect the yarns of the plurality of the packages.

[0007] In the Patent Literature 2, for securing beforehand the yam to be the tail yarn, a yam winding start end is inserted into a harness hole formed in the winding tube so as to fix the yam winding start end to the winding tube, and subsequently the formation of the package is started. The prior preparation work before forming the package is premised on manual labor of an operator and requires a long time. Accordingly, for example, when the package which is a full roll is doffed and exchanged with a new winding tube, it is considerable to be necessary to stop supply of the yam temporarily and perform the prior preparation work though it is not clearly shown in the Patent Literature 2. When the prior preparation work is finished and the new winding tube is attached, the supply of the yam is resumed and the formation of the package is resumed. The Patent Literature 3 does not disclose the prior preparation work before forming the package.

[Prior Art Reference]

[Patent Literature]

[0008]

[Patent Literature 1] the Japanese Patent Publication No. 4486115

[Patent Literature 2] the Japanese Patent Publication No. 2893470

[Patent Literature 3] the Japanese Patent Laid Open Gazette Hei. 10-212069

[Summary of the Invention]

[Problems to Be Solved by the Invention]

[0009] However, as described in the Patent Literature 1, since the yam is generated continuously in the false twisting machine, the supply of the yam cannot be stopped temporarily as the Patent Literature 2. Accordingly, in the false twisting machine, the yam to be the tail yam cannot be secured beforehand at the winding start of the package by using the art of the Patent Literature 2, and the tail yarn cannot be formed, whereby it is difficult to connect the yarns of the plurality of the packages formed on the one winding tube.

[0010] The present invention is provided for solving the above problem. The first purpose of the present invention is to provide a winding tube in which a yam to be a tail yam can be secured beforehand at winding start of a

package in the case in which the plurality of the packages are formed on the one winding tube. The second purpose of the present invention is to provide a package which has enough large yarn amount and good unwinding characteristic by connecting yarns of a plurality of packages formed on a winding tube, wherein the package can be handled easily because the number of the winding tube is one. The third purpose of the present invention is to provide a method for producing such the package.

[Means for Solving the Problems]

[0011] The problems to be solved by the present invention have been described above, and subsequently, the means of solving the problems will be described below.

[0012] A winding tube of the first invention is held by one cradle provided in a yarn winding device of a false twisting machine. Onto the winding tube, a plurality of supplied yarns are wound so as to form a plurality of packages. In the winding tube, at a position between a pair of adjacent packages among the plurality of the packages, a capture part is provided which captures a yarn winding start end of at least one of the pair of the packages.

[0013] A winding tube of the second invention is subject to the winding tube of the first invention. The capture part is a groove formed in an outer peripheral surface of the winding tube substantially along a peripheral direction of the winding tube.

[0014] A winding tube of the third invention is subject to the winding tube of the first or second invention. The false twisting machine includes a yarn supply part having a plurality of yarn supply packages and feeding out the plurality of the yarns and a false-twisting part performing false-twisting on the plurality of the yarns fed out from the yarn supply part.

[0015] A winding tube of the fourth invention is subject to the winding tube of the first to third inventions. The plurality of the supplied yarns are two yarns. The plurality of the packages are a first package and a second package. The capture part is a second capture part which is provided at a position between the first package and the second package and captures a yarn winding start end of the second package. The first package and the second package are formed by winding respectively the two yarns.

[0016] A package of the fifth invention is subject to a plurality of packages formed by winding a plurality of yarns onto the winding tube of the first to third inventions. A tail yarn is formed in the one package between the pair of the packages whose yarn winding start end is captured by the capture part, and the tail yarn is connected to a yarn winding finish end of the other package.

[0017] A package of the sixth invention is subject to a plurality of packages formed by winding two yarns onto the winding tube of the fourth invention. A second tail yarn is formed in the second package among the first

package and the second package whose yarn winding start end is captured by the second capture part, and the second tail yarn is connected to a yarn winding finish end of the first package.

[0018] A method for producing a package of the seventh invention is subject to a method for producing the plurality of the packages by winding a plurality of yarns onto the winding tube of the first to third inventions, comprising

a first process in which a yarn winding start end of each of the yarns forming the plurality of the packages is captured by the capture part or between the winding tube and the cradle,

a second process in which bunch winding of the plurality of the yarns is performed respectively,

a third process in which the packages are formed respectively by the plurality of the yarns,

a fourth process in which the bunch winding yarns of the packages except for the package the most close to a first end of the winding tube among the plurality of the packages formed in the third process are processed so as to form tail yarns, and

a fifth process in which the tail yarn of the package at a side of a second end of the winding tube between the pair of the adjacent packages of the plurality of the packages is bonded and connected to a yarn winding finish end of the package at the side of the first end of the winding tube.

[0019] A method for producing a package of the eighth invention is subject to a method for producing the plurality of the packages in which the first package and the second package are formed by winding two yarns onto the winding tube of the fourth invention, comprising

an eleventh process in which a yarn winding start end of the yarn forming the first package is captured by a first capture part formed between the winding tube and the cradle and a yarn winding start end of the yarn forming the second package is captured by the second capture part,

a twelfth process in which bunch winding of the yarn forming the first package and the yarn forming the second package is performed respectively,

a thirteenth process in which the first package and the second package are formed by the two yarns,

a fourteenth process in which the bunch winding yarn of the second package is processed so as to form a tail yarn, and

a fifteenth process in which the tail yarn of the second package is bonded and connected to a yarn winding finish end of the first package.

[Effect of the Invention]

[0020] The present invention constructed as the above brings the following effects.

[0021] According to the winding tube of the first invention, after forming the plurality of the packages, the tail yarn for bonding the adjacent two packages can be

formed by the yam winding start end captured by the capture part. Accordingly, when the plurality of the packages are formed on the one winding tube by the winding device of the false twisting machine, the yam which is to be the tail yam can be secured beforehand at the winding start of the package.

[0022] According to the winding tube of the second invention, the capture part is the groove formed in the outer peripheral surface of the winding tube substantially along the peripheral direction of the winding tube, whereby the capture part can be formed easily. The capture part hardly obstructs the winding and unwinding of the plurality of the packages.

[0023] According to the winding tube of the third invention, when the plurality of the packages are formed on the one winding tube by the winding device of the false twisting machine having the yam supply part feeding the plurality of the yarns and the false-twisting part, the yam which is to be the tail yam can be secured beforehand at the winding start of the package.

[0024] According to the winding tube of the fourth invention, after forming the first package and the second package, the tail yam for bonding the first package and the second package adjacent to each other can be formed by the yam winding start end captured by the second capture part. Accordingly, when the first package and the second package are formed on the one winding tube by the winding device of the false twisting machine, the yarn which is to be the tail yam can be secured beforehand at the winding start of the second package.

[0025] According to the plurality of the packages of the fifth invention, the yarns of the plurality of the packages formed on the one winding tube are connected and unwound continuously, whereby the packages have enough large amount of yam and good unwinding characteristic and can be handled easily.

[0026] According to the plurality of the packages of the sixth invention, the yarns of the plurality of the first package and the second package formed on the one winding tube are connected and unwound continuously, whereby the packages have enough large amount of yam and good unwinding characteristic and can be handled easily.

[0027] According to the method for producing the plurality of the packages of the seventh invention, the yarns of the plurality of the packages formed on the one winding tube are connected and unwound continuously, whereby the packages can be produced which have enough large amount of yarn and good unwinding characteristic and can be handled easily.

[0028] According to the method for producing the plurality of the packages of the eighth invention, the yarns of the first package and the second package formed on the one winding tube are connected and unwound continuously, whereby the packages can be produced which have enough large amount of yam and good unwinding characteristic and can be handled easily.

[Brief Description of the Drawings]

[0029]

[Fig. 1]

Fig. 1 is a drawing of entire construction of a stretching false twisting machine (false twisting machine) 1000.

[Fig. 2]

Fig. 2 is a schematic drawing in which devices of the stretching false twisting machine (false twisting machine) 1000 are developed along a route of a yam.

[Fig. 3]

Fig. 3 is a drawing of entire construction of a winding part 4 in which two yarns Ya and Yb are wound onto one winding tube 19 so as to form two packages P (first package P 1 and second package P2).

[Fig. 4]

Fig. 4(A) is a front view of the winding tube 19 according to an embodiment, and Fig. 4(B) is an arrow sectional view of the line A-A in Fig. 4(A).

[Fig. 5]

Figs. 5(A) and 5(B) are a front view and a side view of the yarns Ya and Yb are pressed to the winding tube 19.

[Fig. 6]

Figs. 6(A) and 6(B) are a front view and a side view of bunch winding yarns YaB and YbB formed on the winding tube 19.

[Fig. 7]

Fig. 7 is a front view of the two packages P (first package P1 and second package P2) which are full rolls.

[Fig. 8]

Fig. 8 is a front view of the bunch winding yam YbB at the side of the second package P2 unwound so as to form a tail yam YbT.

[Fig. 9]

Fig. 9 is a front view of the state in which a yam winding finish end YaE of the first package P1 is connected to the tail yam YbT formed in the second package P2 at a bond part TL.

[The Best Mode of Embodiment of the Invention]

[0030] A winding tube 19 according to this embodiment is held by one cradle 20 provided in a winding device (yam winding device) 18 of a stretching false twisting machine (false twisting machine) 1000, and two yarns Ya and Yb are wound respectively so as to form two packages P (first package P1 and second package P2). Below, the construction of the stretching false twisting machine 1000 is explained firstly, and then processes for forming the two packages P (first package P1 and second package P2) are explained.

[0031] In below explanation, ends of the yarns Ya and Yb (yam winding start end and yam winding finish end) include not only the ends of the yarns but also the parts

of the yarns including the ends with certain length (for example, length necessary to bond the end of the yarns to another end of the yarns).

[0032] Firstly, explanation will be given on the construction of the stretching false twisting machine 1000. The stretching false twisting machine 1000 has a plurality of false-twisting positions 100 aligned along the longitudinal direction in Fig. 2. In Fig. 2, two of the plurality of the false-twisting positions 100 is shown. In the false-twisting position 100, the two yarns Ya and Yb are wound onto the one winding tube 19 so as to form the two packages P (first package P1 and second package P2).

[0033] As shown in Figs. 1 and 2, each of the false-twisting positions 100 has a yarn supply part 1, a false-twisting part 2, a post-processing part 3 and a winding part 4. The yarn supply part 1 is a section upstream first feed rollers 6a and 6b discussed later, and the false-twisting part 2 is a section from the first feed rollers 6a and 6b to upstream side second feed rollers 7a and 7b. Similarly, the post-processing part 3 is a section from the upstream side second feed rollers 7a and 7b to third feed rollers 9a and 9b. The winding part 4 is a section downstream the third feed rollers 9a and 9b.

[0034] The yarn supply part 1 has two yarn supply packages 11a and 11b and feeds out the two yarns Ya and Yb. The yarns Ya and Yb sent from the yarn supply packages 11a and 11b go via pipes 12a and 12b and the first feed rollers 6a and 6b to the false-twisting part 2.

[0035] The false-twisting part 2 performs false-twisting on the pair of the yarns Ya and Yb sent from the yarn supply part 1. The false-twisting part 2 has a primary heater 13 heating the yarns Ya and Yb, cooling devices 14a and 14b cooling the yarns Ya and Yb, and false-twisting devices 15a and 15b applying twist on the yarns Ya and Yb in this order from the upstream side of running direction of the yarns Ya and Yb.

[0036] The post-processing part 3 forms a confounding part in the yarns Ya and Yb heat treatment is performed on the yarns Ya and Yb and has interlace nozzles 16a and 16b and secondary heaters 17a and 17b. The secondary heaters 17a and 17b may not be provided.

[0037] The winding part 4 winds the two yarns Ya and Yb false-twisted in the false-twisting part 2 onto the winding tube and has the winding device 18. The winding device 18 has the one cradle 20, a traverse device 21, a winding drum 23 and two auto threading devices (not shown). From a viewpoint of the space-saving of the stretching false twisting machine 1000, the winding device 18 is arranged so as to overlap substantially the winding devices 18 of the other false-twisting positions 100 in the vertical direction.

[0038] The cradle 20 has a pair of bobbin holders 22a and 22b facing each other, and holds rotatably the substantially cylindrical winding tube 19 via the bobbin holders 22a and 22b as shown in Fig. 3.

[0039] Explanation will be given on the winding tube 19. As shown in Figs. 3 and 4, the winding tube 19 is held by the one cradle 20, and the supplied two yarns Ya and

Yb are respectively wound onto the winding tube 19 so as to form the two packages P (first package P1 and second package P2). The positions at which the first package P1 and the second package P2 are formed are symmetrical about the center in the lengthwise direction of the winding tube 19. At the center in the lengthwise direction of the winding tube 19 between the first package P1 and the second package P2, a predetermined distance L (Fig. 7) is provided. At the center in the lengthwise direction of the winding tube 19, a second capture part 192 capturing a yarn winding start end YbS of the second package P2 is provided. The second capture part 192 is a groove formed in an outer peripheral surface of the winding tube 19 substantially along the peripheral direction of the winding tube 19. In this embodiment, the length of the second capture part 192 is about 1/4 of the perimeter of the winding tube 19. The yarn Ya is pinched by the groove so that the yarn winding start end YbS of the second package P2 is captured. The depth of the second capture part 192 is set shallower than the thickness of the winding tube 19.

[0040] When the winding tube 19 is held by the one cradle 20, a first capture part 191 capturing a yarn winding start end YaS of the yarn Ya in the boundary between the winding tube and the cradle 20 (bobbin holder 22a). The yarn winding start end YaS of the yarn Ya is pinched between the winding tube 19 and the bobbin holder 22a so as to be captured.

[0041] The traverse device 21 has a belt body 26 reciprocated by a motor (not shown) and two traverse guides 27a and 27b provided in the belt body 26 and guiding the yarns Ya and Yb. The belt body 26 is for example a toothed belt having many teeth in the inner perimeter thereof, and wound around a driving pulley 28 rotated forward and reversely by a driving motor (not shown) and a pair of driven pulleys 29. A running route of the belt body 26 between the driven pulleys 29 is substantially in parallel to the axis of the winding tube 19. The traverse guides 27a and 27b are provided in the belt body 26 between the driven pulleys 29 at predetermined intervals. Each of the two traverse guides 27a and 27b can be attached to and detached from the belt body 26.

[0042] At the upstream side of the traverse device 21, yarn guides 30a and 30b are provided. The yarn guide 30a guides a yarn passage of the yarn Ya sent from the third feed roller 9a to the front of the traverse center of the traverse guide 27a. The yarn guide 30b guides a yarn passage of the yarn Yb sent from the third feed roller 9b to the front of the traverse center of the traverse guide 27b.

[0043] The winding drum 23 is arranged so as to touch closely the outer peripheral surface of the winding tube 19 held by the cradle 20. The winding drum 23 is rotated by a motor (not shown), and when the winding drum 23 is rotated, the winding tube 19 touching closely the winding drum 23 is rotated followingly.

[0044] The construction of the stretching false twisting machine 1000 and the false-twisting position 100 has

been described above. Next, explanation will be given on the state in which the two yarns Ya and Yb are wound onto the one winding tube 19 so as to form the two packages P (first package P1 and second package P2) in the false-twisting position 100.

[0045] As shown by the false-twisting position 100 at the left side of Fig. 2 and shown in Fig. 3, the two yarns Ya and Yb respectively sent from the yarn supply packages 11 a and 11b are sent via the pipes 12a and 12b, the first feed rollers 6a and 6b, the primary heater 13, the cooling devices 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, downstream side second feed rollers 8a and 8b, the secondary heaters 17a and 17b, and the third feed rollers 9a and 9b to the winding device 18.

[0046] In detail, the yarn feeding speed of the upstream side second feed rollers 7a and 7b is set larger than the yarn feeding speed of the first feed rollers 6a and 6b. Accordingly, the yarns Ya and Yb are extended between the first feed rollers 6a and 6b and the upstream side second feed rollers 7a and 7b, and twisted by the false-twisting devices 15a and 15b between the first feed rollers 6a and 6b and the upstream side second feed rollers 7a and 7b while extended. The yarns Ya and Yb twisted while drawn are set thermally by the primary heater 13 and then cooled by the cooling devices 14a and 14b. The yarns Ya and Yb twisted, set thermally and cooled pass through the false-twisting devices 15a and 15b and then are canceled the twisting until reaching the upstream side second feed rollers 7a and 7b.

[0047] The yarn Ya passing through the upstream side second feed rollers 7a and 7b is guided to the interlace nozzle 16a and formed therein with the confounding part by the interlace nozzles 16a and 16b, and then sent to the downstream side second feed rollers 8a and 8b.

[0048] The yarn feeding speed of the downstream side second feed rollers 8a and 8b is set different from the yarn feeding speed of the third feed rollers 9a and 9b. Accordingly, the yarns Ya and Yb are loosened between the downstream side second feed rollers 8a and 8b and the third feed rollers 9a and 9b, and the yarns Ya and Yb are heat-treated while loosened by the secondary heaters 17a and 17b and sent to the third feed rollers 9a and 9b. The ratio of yarn feeding speed of the downstream side second feed rollers 8a and 8b and the third feed rollers 9a and 9b is set corresponding to the form of the yarns Ya and Yb.

[0049] The two yarns Ya and Yb fed out from the third feed rollers 9a and 9b respectively pass through the yarn guides 30a and 30b which are support points of traverse, and are respectively wound onto the winding tube 19 touching closely the rotating winding drum 23 and rotated followingly while traversed by the traverse guides 27a and 27b reciprocated in parallel to the axis of the winding tube 19 by the reciprocation of the belt body 26, whereby the two packages P (first package P1 and second package P2) are formed.

[0050] The formation of the two packages P (first package P1 and second package P2) has been described above. Next, explanation will be given on processes in which the new one winding tube 19 is supplied to the false-twisting position 100, the two packages P (first package P1 and second package P2) are formed, and the yarns Ya and Yb of the two packages P (first package P1 and second package P2) are connected.

[0051] Firstly, as shown in Fig. 5, when the one winding tube 19 is supplied to the cradle 20 and held by the bobbin holders 22a and 22b, the cradle 20 is rotated so as to make the winding tube 19 touch closely the winding drum 23. By touching the winding drum 23, the winding tube 19 starts rotating.

[0052] When the winding tube 19 starts rotating and reaches synchronous speed, a first process (eleventh process) is performed in which the yarn Yb forming the second package P2 sucked by a suction mouth (not shown) and running at high speed is captured by the second capture part 192 and the yarn Ya forming the first package P1 sucked by the same or another suction mouth (not shown) is captured by the first capture part 191 formed between the winding tube 19 and the cradle 20.

[0053] As shown in Fig. 5, the two auto threading devices (not shown) operate arms (not shown) so as to push the yarns Ya and Yb sucked by the suction mouth (not shown) and running at high speed toward the winding tube 19. As shown in Fig. 5A, when viewed in plan, the yarn Ya is arranged to cross the first capture part 191 formed between the winding tube 19 and the cradle 20, and the yarn Yb is arranged to cross the second capture part 192 of the winding tube 19. As shown in Fig. 5B, the yarn Ya touches closely the first capture part 191, and the yarn Yb touches closely the second capture part 192 of the winding tube 19. Accordingly, concerning the yarns Ya and Yb sucked respectively by the suction mouth (not shown), the yarn Ya is captured by the first capture part 191 and the yarn Yb is captured by the second capture part 192 of the winding tube 19. After captured by the first capture part 191, the yarn Ya is cut and the yarn winding start end YaS of the yarn Ya is captured by the first capture part 191, whereby the winding of the yarn Ya onto the winding tube 19 is started. After captured by the second capture part 192, the yarn Yb is cut and the yarn winding start end YbS of the yarn Yb is captured by the second capture part 192, whereby the winding of the yarn Yb onto the winding tube 19 is started.

[0054] Next, a second process (twelfth process) is performed in which bunch winding of each of the yarn Ya forming the first package P1 and the yarn Yb forming the second package P2 is performed. As shown in Fig. 6, when the winding tube 19 is rotated while the yarn winding start end YaS of the yarn Ya is captured by the first capture part 191 and the yarn winding start end YbS of the yarn Yb is captured by the second capture part 192, bunch winding yarns YaB and YbB are formed on the winding tube 19 and the threading is finished.

[0055] Next, a third process (thirteenth process) is performed in which the two packages P (first package P1 and second package P2) are formed by the two yarns Ya and Yb. The arms (not shown) of the two auto threading devices (not shown) are retracted, and the traverse of the yarns Ya and Yb by the traverse guides 27a and 27b is started, whereby the winding of the yarns Ya and Yb onto the new winding tube 19 is started.

[0056] As shown in Fig. 7, when the winding of the two packages P (first package P1 and second package P2) is finished, as mentioned above, the yarns Ya and Yb are cut by cutters provided in the two auto threading devices (not shown) while the traverse by the traverse guides 27a and 27b is continued. The ends of the parts of the yarns upstream the cutters are held by sucked respectively by the suction mouths (not shown) provided near the cutters. The parts of the yarns downstream the cutters are wound onto the winding tube 19. Subsequently, a doffing mechanism (not shown) rotates the cradle 20, whereby the two packages P (first package P1 and second package P2) are separated from the winding drum 23 and doffed.

[0057] Next, a fourth process (fourteenth process) is performed in which a tail yarn YbT is formed in the second package P2 of the doffed two packages P (first package P1 and second package P2). In this process, as shown in Fig. 8, an operator put a hand into a predetermined distance L (Fig. 7) between the two packages P (first package P1 and second package P2) and unwinds the bunch winding yarn YbB at the side of the second package P2, whereby the tail yarn YbT is formed by the yarn winding start end YaS of the yarn Ya. In this case, the predetermined distance L must have enough dimensions for putting the hand of the operator so as to perform the work, and the predetermined distance L is preferably not less than 70mm. The tail yarn YbT is a part of the second package P2 necessary to be bonded to the yarn winding finish end YaE. The tail yarn YbT is a yarn of a part of the bunch winding yarn YbB from the unwound part and the bunch winding yarn part to the second package P2.

[0058] Next, a fifth process (fifteenth process) is performed in which the tail yarn YbT of the second package P2 is united and connected to the yarn winding finish end YaE of the first package P1. In this process, as shown in Fig. 9, slightly the yarn winding finish end YaE of the first package P1 is unwound by an operator and connected to the tail yarn YbT formed in the second package P2 at a bond part TL.

[0059] By the above processes, the connection of the yarns Ya and Yb of the two packages P (first package P1 and second package P2) is finished.

[0060] The winding tube 19, the two packages P (first package P1 and second package P2) formed on the winding tube 19, and the method for producing the two packages P (first package P1 and second package P2) according to the above-mentioned embodiment bring the following effects.

[0061] According to the winding tube 19 of this embod-

iment, after forming the two packages P (first package P1 and second package P2), the tail yarn YbT for bonding the adjacent two packages P (first package P1 and second package P2) can be formed by the yarn winding start end YaS of the yarn Ya captured by the second capture part 192. Accordingly, when the two packages P (first package P1 and second package P2) are formed on the winding tube 19 by the winding device 18 of the stretching false twisting machine 1000, the yarn which is to be the tail yarn YbT can be secured beforehand at the yarn winding start end of the second package P2.

[0062] According to the winding tube 19 of this embodiment, the second capture part 192 is the groove formed in the outer peripheral surface of the winding tube 19 substantially along the peripheral direction of the winding tube 19, whereby the second capture part 192 can be formed easily. The second capture part 192 hardly obstructs the winding and unwinding of the plurality of the packages P (first package P1 and second package P2).

[0063] According to the winding tube 19 of this embodiment, when the plurality of the packages P (first package P1 and second package P2) are formed on the winding tube 19 by the winding device 18 of the stretching false twisting machine 1000 having the yarn supply part 1 feeding the plurality of the yarns Ya and Yb and the false-twisting part 2, the yarn which is to be the tail yarn YbT can be secured beforehand at the winding start of each of the packages P (first package P1 and second package P2).

[0064] According to the plurality of the packages P (first package P1 and second package P2) of this embodiment, the yarns Ya and Yb of the plurality of the packages P (first package P1 and second package P2) formed on the one winding tube 19 are connected, whereby the plurality of the packages P (first package P1 and second package P2) have large amount of yarn and can be unwound continuously, and have good unwinding characteristic and can be handled easily.

[0065] According to the method for producing the plurality of the packages P (first package P1 and second package P2) of this embodiment, the yarns Ya and Yb of the plurality of the packages P (first package P1 and second package P2) formed on the one winding tube 19 are connected and unwound continuously, whereby the packages can be produced which have enough large amount of yarn and have good unwinding characteristic.

[0066] The embodiment of the present invention has been described above. However, the present invention is not limited to the above-mentioned embodiment, and various modifications are possible.

[0067] In the above-mentioned embodiment, the yarn Ya is pinched between the winding tube 19 and the bobbin holder 22a so as to be captured in the first capture part 191 formed between the winding tube 19 and the cradle 20, and the yarn Yb is pinched by the second capture part 192 so as to be captured. However, the present invention is not limited thereto. It may alternatively be constructed so that the first capture part 191 similar to

the second capture part 192 is formed at the center in the lengthwise direction of the winding tube 19 between the first package P1 and the second package P2 and the yarns Ya and Yb are captured respectively by the first capture part 191 and the second capture part 192. However, in the construction in which the yarns Ya and Yb are captured by the winding tube 19 and the bobbin holders 22a and 22b, even if the yarns Ya and Yb of the two packages P (first package P 1 and second package P2) are connected, the unwinding cannot be performed continuously. Therefore, at least one of the yarns Ya and Yb must be captured at a position between the first package P1 and the second package P2.

[0068] In the above-mentioned embodiment, the two auto threading devices are provided. However, the present invention is not limited thereto. For example, one auto threading device may alternatively be provided. In this case, one of the yarns Ya and Yb is threaded by the auto threading device, and the other thereof is threaded manually by an operator.

[0069] In the above-mentioned embodiment, the case in which the two yarns Ya and Yb are wound onto the one winding tube 19. However, the present invention is not limited thereto, and the present invention can be applied on a yarn winding device in which three or more yarns are wound onto the one winding tube 19.

[0070]

[Description of Notations]

16s, 16b	interlace nozzles
18	winding device
19	winding tube
191	first capture part
20	cradle
24a, 24b	auto threading devices
51	suction mouth
52	yarn handler mechanism
53	yarn arranging arm
54	yarn holding arm
55	yarn pushing arm
65, 66	shafts

Claims

1. A winding tube which is held by one cradle provided in a yarn winding device of a false twisting machine and onto which a plurality of supplied yarns are wound so as to form a plurality of packages, **characterized in that** in the winding tube, at a position between a pair of adjacent packages among the plurality of the packages, a capture part is provided which captures a yarn winding start end of at least one of the pair of the packages.

2. The winding tube according to claim 1, wherein the capture part is a groove formed in an outer peripheral surface of the winding tube substantially along a peripheral direction of the winding tube.
3. The winding tube according to claim 1 or 2, wherein the false twisting machine includes a yarn supply part having a plurality of yarn supply packages and feeding out the plurality of the yarns and a false-twisting part performing false-twisting on the plurality of the yarns fed out from the yarn supply part.
4. The winding tube according to one of claims 1 to 3, wherein the plurality of the supplied yarns are two yarns, wherein the plurality of the packages are a first package and a second package, wherein the capture part is a second capture part which is provided at a position between the first package and the second package and captures a yarn winding start end of the second package, and wherein the first package and the second package are formed by winding respectively the two yarns.
5. A plurality of packages formed by winding a plurality of yarns onto the winding tube according to one of claims 1 to 3, **characterized in that** a tail yarn is formed in the one package between the pair of the packages whose yarn winding start end is captured by the capture part, and the tail yarn is connected to a yarn winding finish end of the other package.
6. A plurality of packages formed by winding two yarns onto the winding tube according to claim 4, **characterized in that** a second tail yarn is formed in the second package among the first package and the second package whose yarn winding start end is captured by the second capture part, and the second tail yarn is connected to a yarn winding finish end of the first package.
7. A method for producing the plurality of the packages by winding a plurality of yarns onto the winding tube according to one of claims 1 to 3, comprising:
 - a first process in which a yarn winding start end of each of the yarns forming the plurality of the packages is captured by the capture part or between the winding tube and the cradle;
 - a second process in which bunch winding of the plurality of the yarns is performed respectively;
 - a third process in which the packages are formed respectively by the plurality of the yarns;
 - a fourth process in which the bunch winding yarns of the packages except for the package

the most close to a first end of the winding tube among the plurality of the packages formed in the third process are processed so as to form tail yams; and

a fifth process in which the tail yam of the package at a side of a second end of the winding tube between the pair of the adjacent packages of the plurality of the packages is bonded and connected to a yam winding finish end of the package at the side of the first end of the winding tube.

8. A method for producing the plurality of the packages in which the first package and the second package are formed by winding two yarns onto the winding tube according to claim 4, comprising:

an eleventh process in which a yam winding start end of the yarn forming the first package is captured by a first capture part formed between the winding tube and the cradle and a yam winding start end of the yarn forming the second package is captured by the second capture part;

a twelfth process in which bunch winding of the yam forming the first package and the yarn forming the second package is performed respectively;

a thirteenth process in which the first package and the second package are formed by the two yarns;

a fourteenth process in which the bunch winding yam of the second package is processed so as to form a tail yam; and

a fifteenth process in which the tail yam of the second package is bonded and connected to a yam winding finish end of the first package.

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Fig. 1

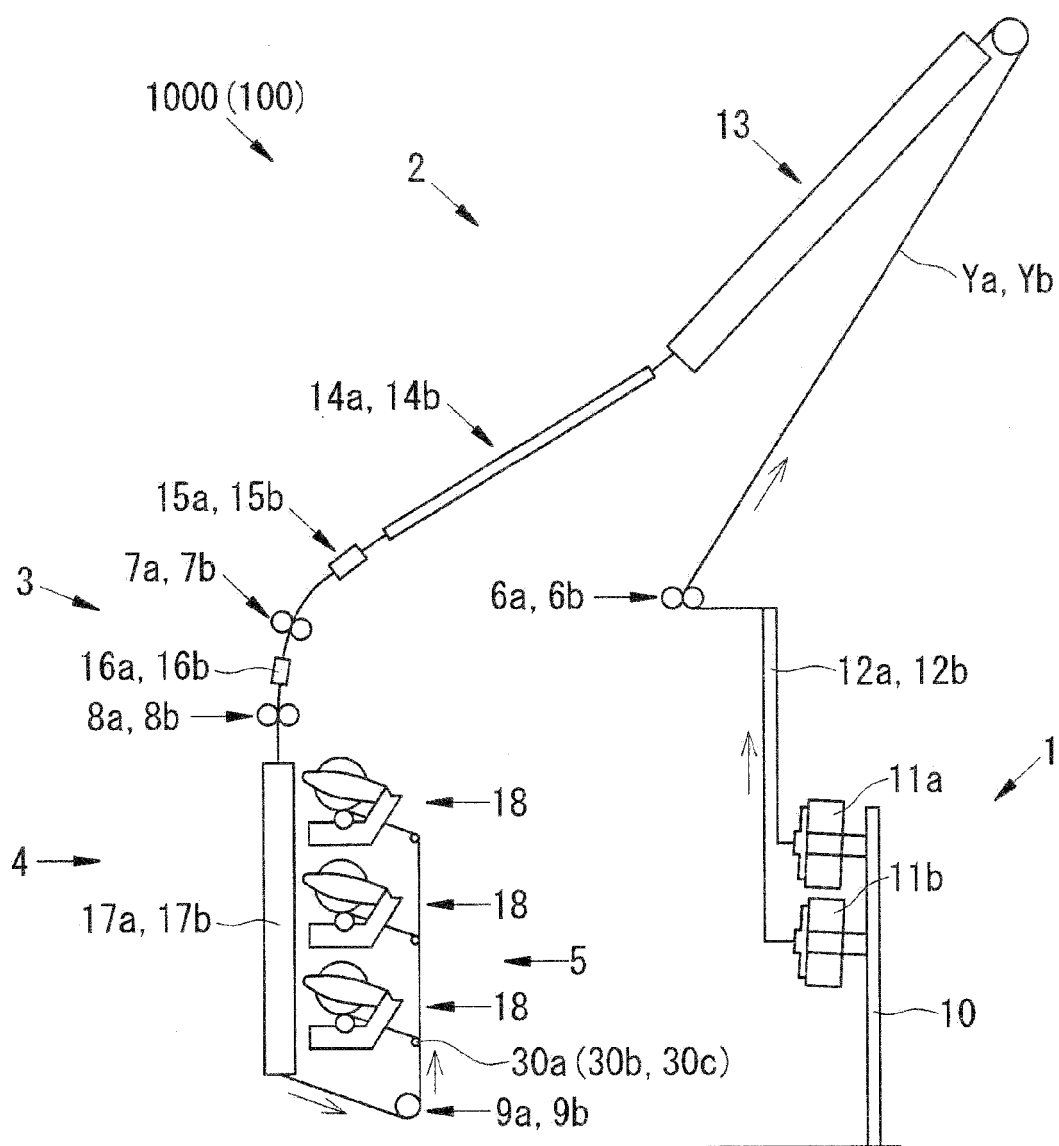


Fig. 2

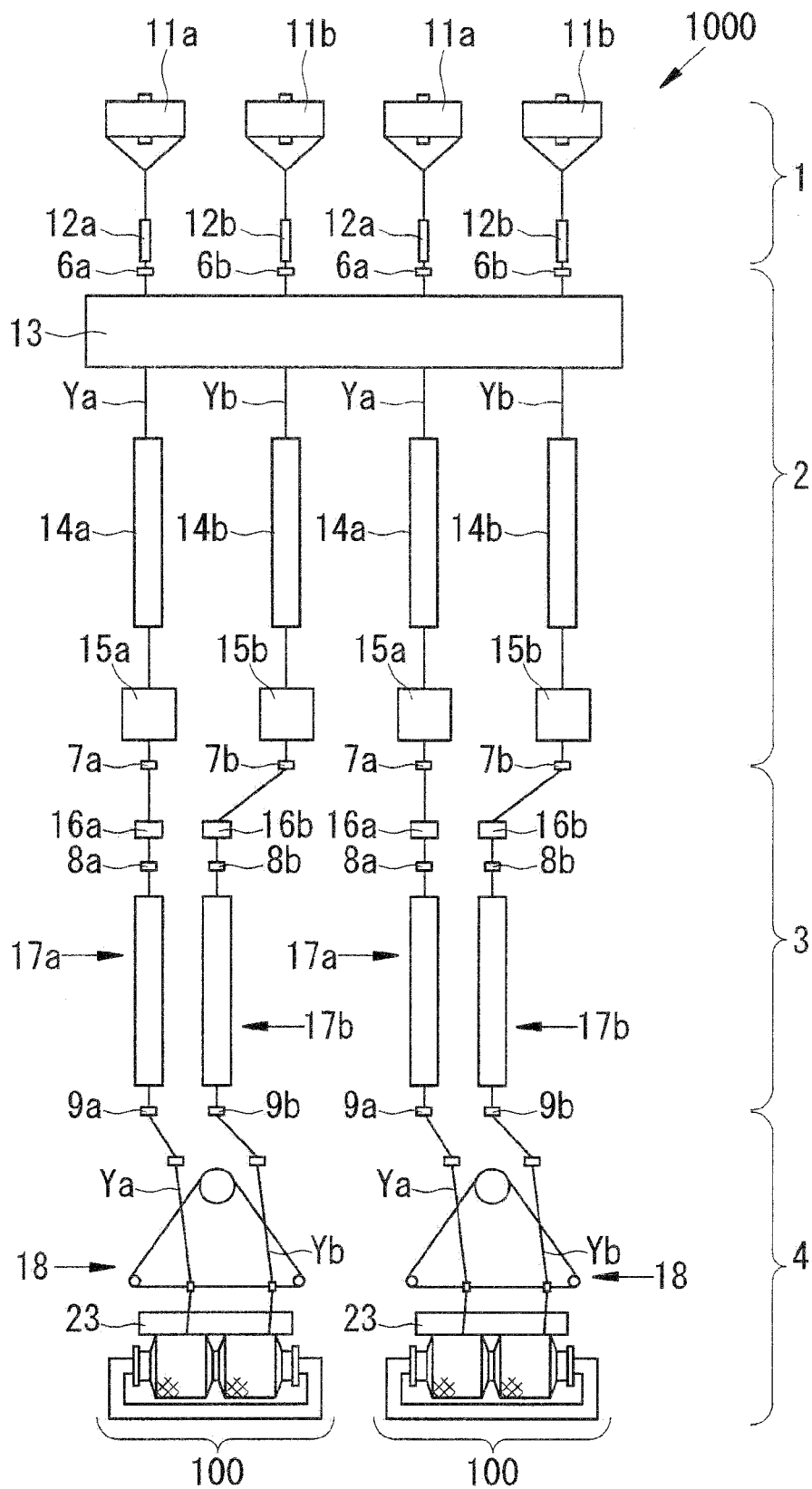


Fig. 3

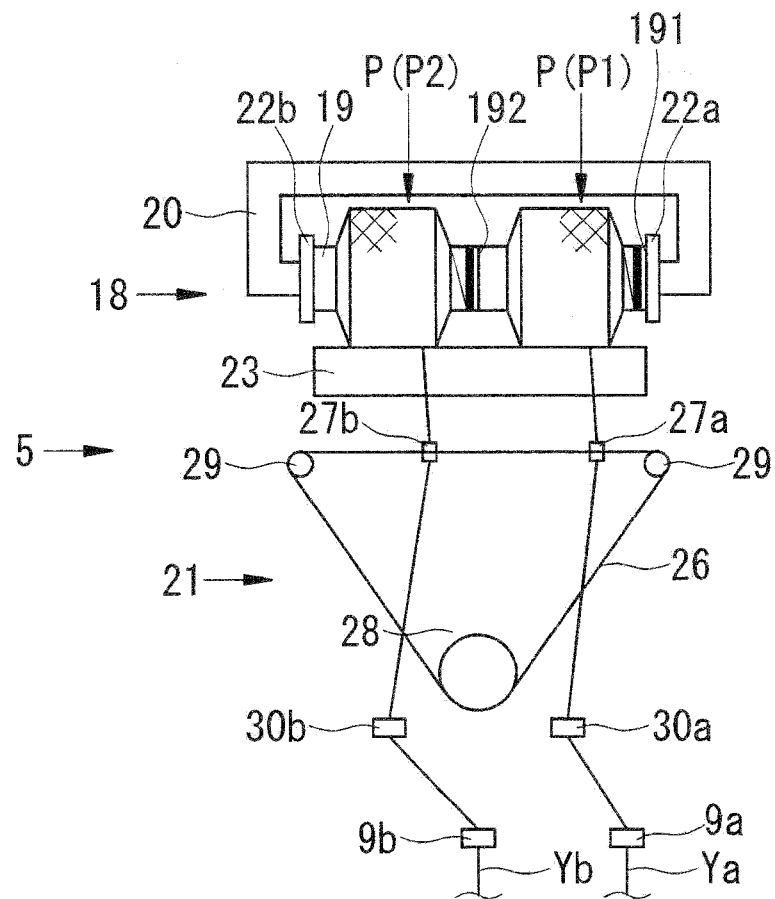


Fig. 4

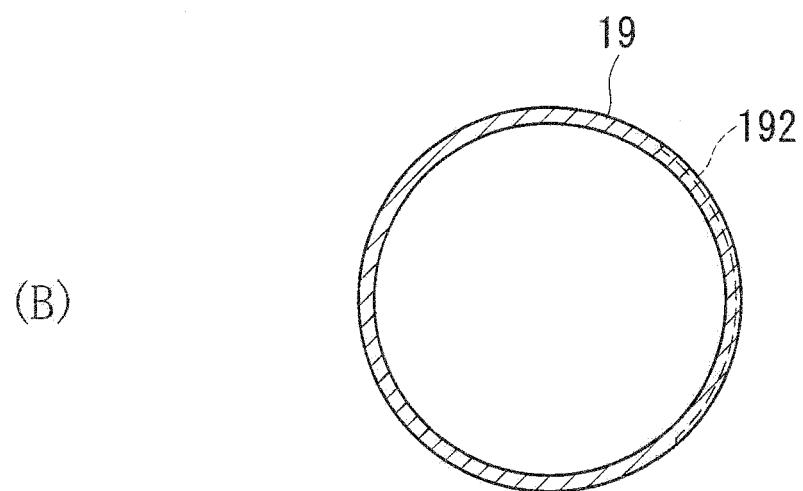
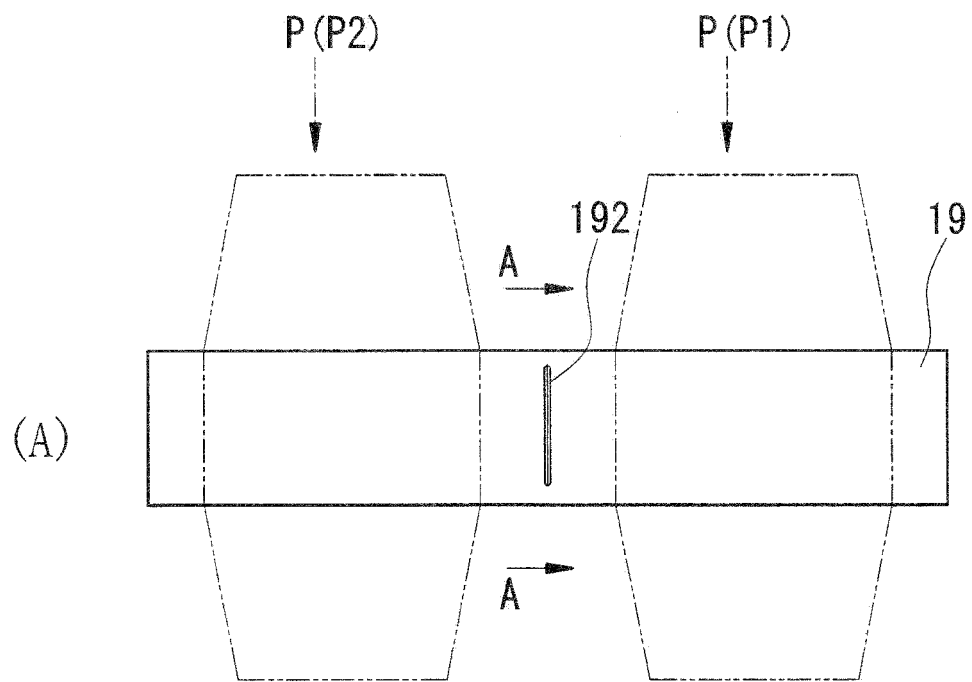


Fig. 5

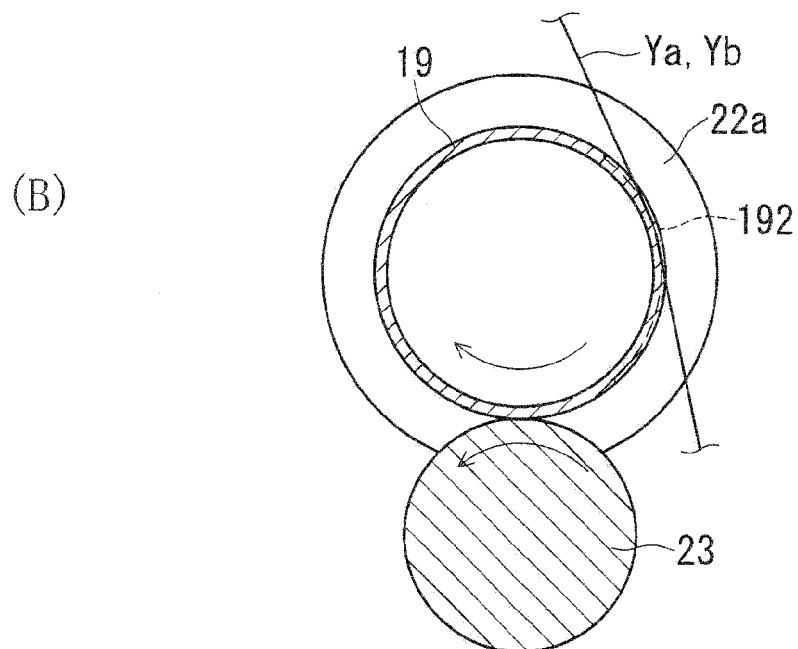
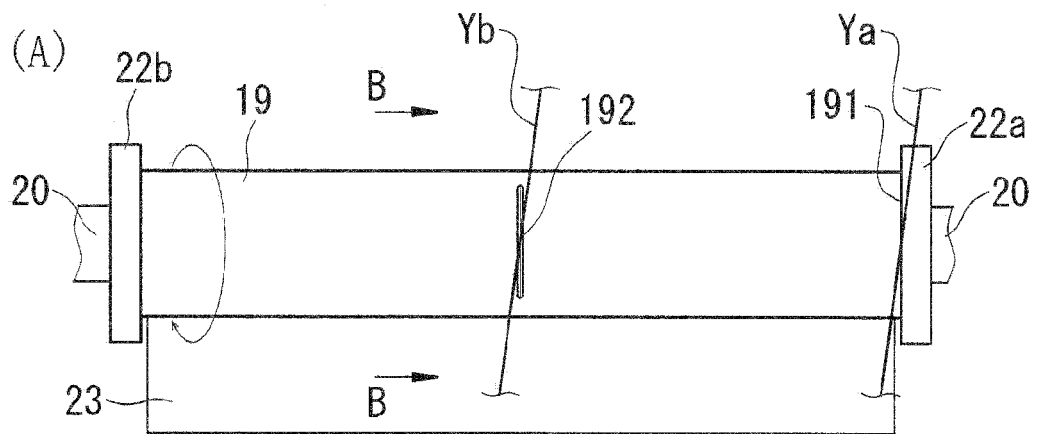


Fig. 6

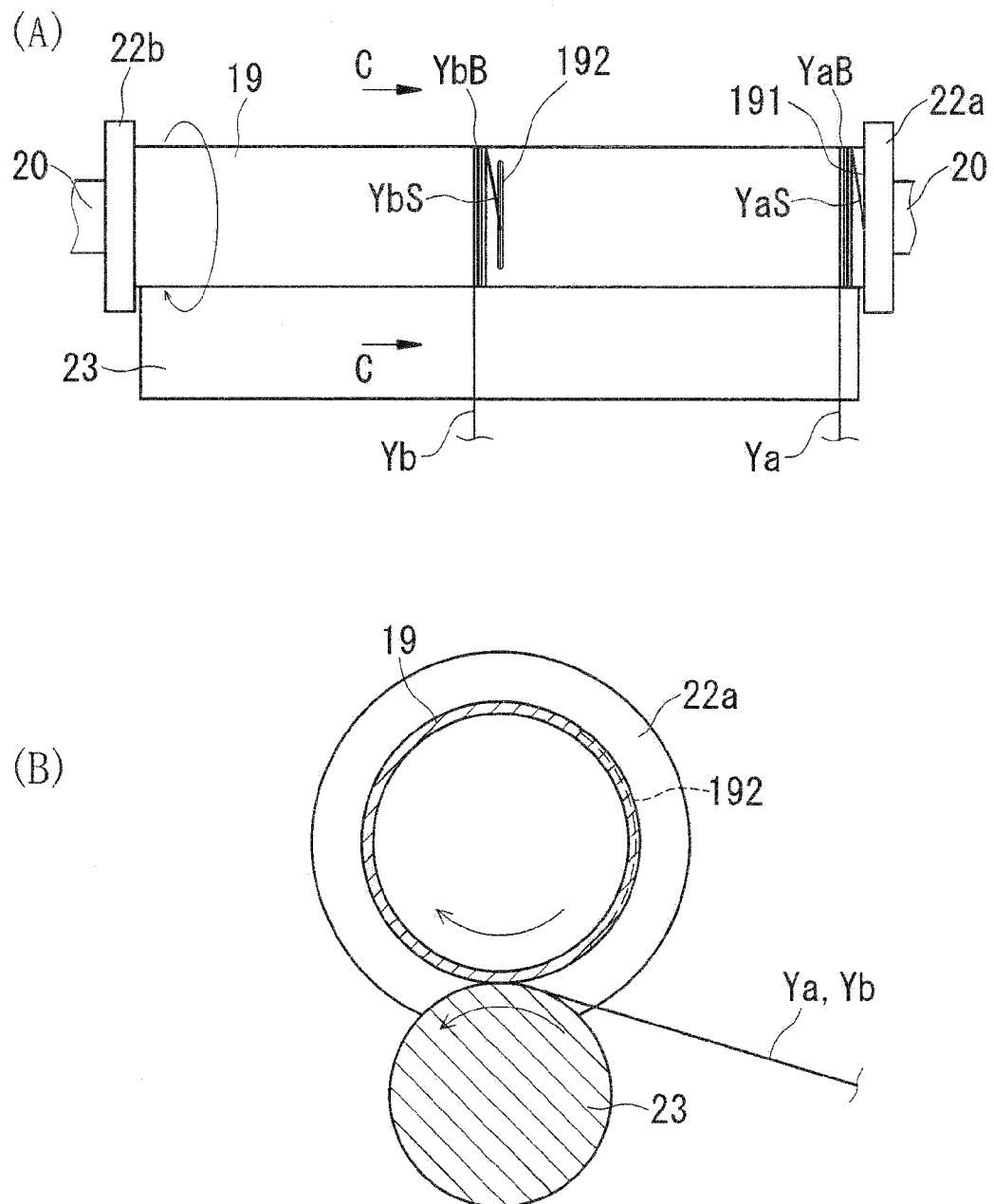


Fig. 7

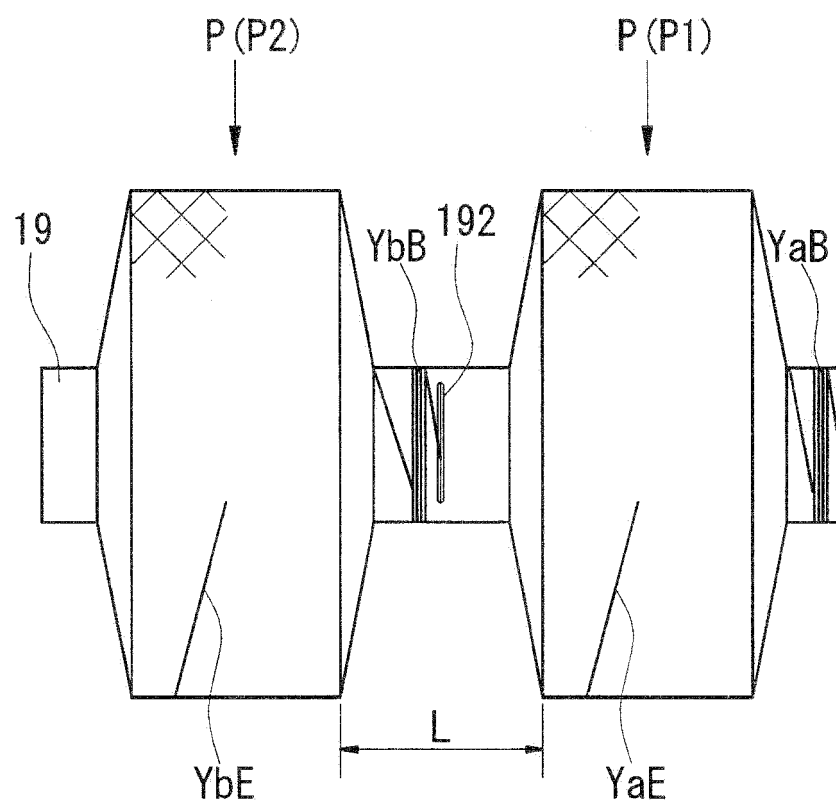


Fig. 8

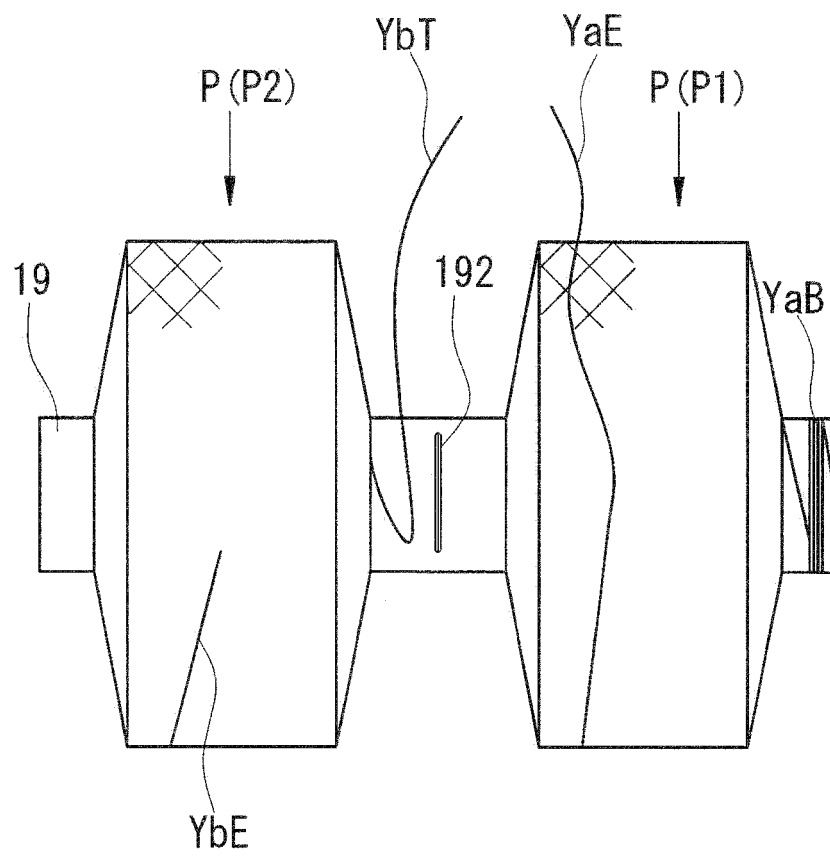
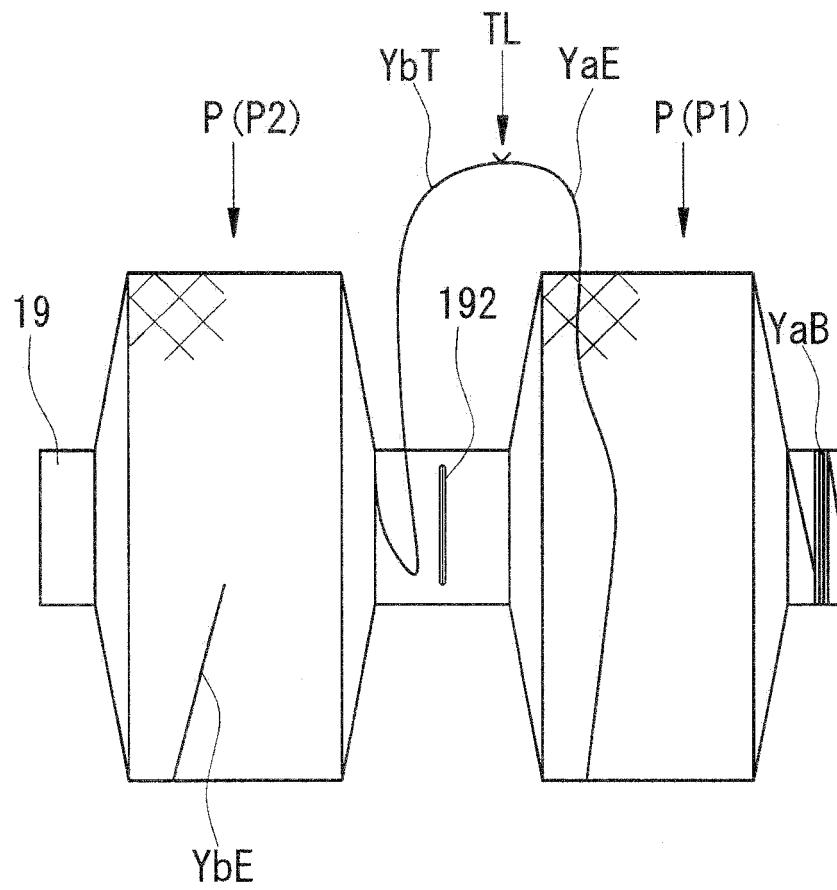


Fig. 9



REFERENCES CITED IN THE DESCRIPTION

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