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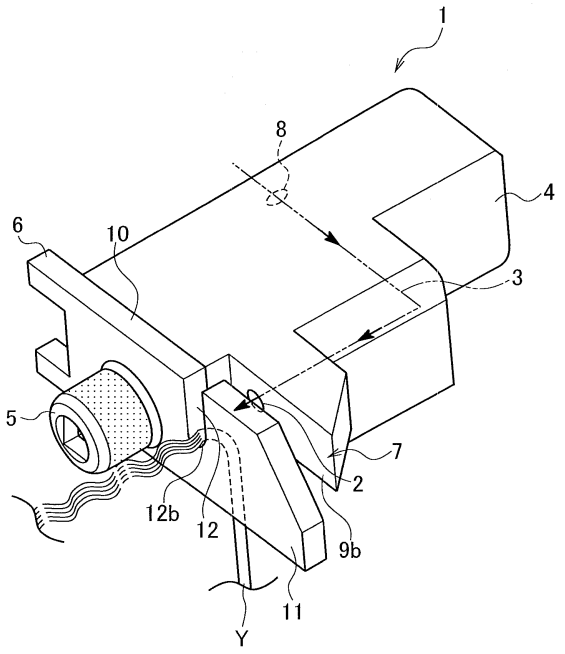
(54) **Untwisting Nozzle**

(57) The present invention provides an air blast type untwisting nozzle that can prevent a possible inappropriate untwisting operation to improve the reliability and process efficiency of an untwisting process. A guide piece 6 having a slit 12 for controlling the position of a yarn end Y is provided opposite to a nozzle hole 2 at a predetermined distance from the nozzle hole 2. An inner end 12h of the slit 12 is positioned opposite to the nozzle hole 2. Thus, the slit 12 can be used to reliably prevent the yarn end Y from deviating from a direction in which compressed air is ejected or from being pointed in a direction irrelevant to the ejecting direction. This allows an untwisting process to be executed with the yarn end Y held in an appropriate position. Therefore, the untwisting nozzle 1 can prevent a possible inappropriate untwisting operation to improve the reliability and process efficiency of an untwisting process.

FIGURE 1



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Description

Field of the Invention

[0001] The present invention relates to an air blast type untwisting nozzle that untwists a yarn end by ejecting compressed air from a nozzle hole to the yarn end. The untwisting nozzle is applied to a yarn splicing device that splices untwisted yarn ends together.

Background of the Invention

[0002] Some types of untwisting nozzles for yarn splicing devices apply whirling current to a yarn end drawn into a nozzle pipe to untwist the yarn end (see, for example, the Unexamined Japanese Patent Application Publication (Tokkai-Hei) No. 5-9824). Unfortunately, although such a whirling current type untwisting nozzle appropriately untwists a spun yarn comprising twisted short fibers such as a cotton yarn, the nozzle fails to successfully untwist a yarn end of a hemp yarn or the like formed by an wet spinning under the effect of paste or glue used to join fibers together. Further, the process executed in the nozzle pipe using the whirling current is disadvantageously likely to form a part that appears to have been untwisted but then twisted again (re-twisted part).

[0003] Thus, an air blast type untwisting nozzle using the compressed air is often used for a process of untwisting an wet spun yarn such as a hemp yarn. Such an air blast type untwisting nozzle positions a yarn end right opposite to a nozzle hole and ejects the compressed air to the yarn end to untwist the yarn end. This nozzle does not execute an untwisting process by ejecting the whirling current in the nozzle pipe. Thus, the re-twisted part is unlikely to be formed, and also in this regard, this nozzle is suitable for a process of untwisting long fibers such as a hemp yarn.

[0004] A problem with the above air blast type untwisting nozzle is that it is difficult to controllably position the yarn end right opposite to the nozzle hole, so that the yarn end may be displaced at the moment of blasting, resulting in an incomplete untwisting process. Further, disadvantageously, the displaced yarn end may make it difficult to efficiently execute an untwisting process by means of a single blasting operation, resulting in the need to take action such as multiple blasting operations.

Summary of the Invention

[0005] It is an object of the present invention to provide an air blast type untwisting nozzle that can prevent a possible inappropriate untwisting operation to improve the reliability and process efficiency of an untwisting process.

[0006] The present invention set forth in Claim 1 is an air blast type untwisting nozzle that untwists a yarn end by ejecting the compressed air from a nozzle hole to the yarn end, the untwisting nozzle being characterized in that a guide piece having a slit for position control of the yarn end is provided at a position opposite to the nozzle hole and at a predetermined distance from the nozzle hole.

[0007] As is the case with the present invention set forth in Claim 2, the untwisting nozzle may take a form such that the slit is formed by notching so as to extend inward from an edge of the guide piece and an inner end of the slit is formed at a position opposite to the nozzle hole.

[0008] As is the case with the present invention set forth in Claim 3, the untwisting nozzle may take a form such that the untwisting nozzle comprises a main body portion having the nozzle hole and an inner channel that is in communication with the nozzle hole, and the guide piece provided at a position opposite to the nozzle hole in the main body portion, and the main body portion and the guide piece are integrated into a unit part.

[0009] According to the present invention set forth in Claim 1, the guide piece having the slit for position control of a yarn end is provided at the position opposite to the nozzle hole and at the predetermined distance from the nozzle hole. Consequently, the slit can be used to reliably control the position of the yarn end so as to prevent the yarn end from deviating from the direction in which the compressed air is ejected or from being pointed in a direction irrelevant to the ejecting direction. This allows an untwisting process to be executed by ejecting the compressed air with the yarn end held in an appropriate position. Thus, a possible inappropriate untwisting operation can be prevented to improve the reliability and process efficiency of the untwisting process.

[0010] When the inner end of the slit is formed at a position opposite to the nozzle hole as is the case with the present invention set forth in Claim 2, an untwisting process can be executed with the yarn end located and held at the optimum position right opposite to the nozzle hole, where the untwisting action of the compressed air can be maximized. This makes it possible to significantly improve the reliability and process efficiency of an untwisting process executed by the untwisting nozzle.

[0011] Where the main body portion and the guide piece are integrated into a unit part to form an untwisting nozzle as is the case with the present invention set forth in Claim 3, the untwisting nozzle including the guide piece can be handled as a single part. This allows the untwisting nozzle to be easily and reliably assembled to a yarn splicing device with reduced amounts of time and effort. The main body portion and the guide piece integrated into a unit part make it possible to always provide stable untwisting performance without the need for the position adjustment of the slit with respect to the nozzle hole.

[0012] Other features, elements, processes, steps, characteristics and advantages of the present invention will become more apparent from the following detailed description of preferred embodiments of the present invention with reference to the attached drawings.

Brief Description of the Drawings

[0013]

Figure 1 is a perspective view showing the general configuration of an untwisting nozzle in accordance with the present invention.
Figure 2A is a side view of the untwisting nozzle in accordance with the present invention, Figure 2B is a plan view of the untwisting nozzle, and Figure 2C is a front view of the untwisting nozzle.
Figure 3 is a diagram of a yarn splicing device to which the untwisting nozzle in accordance with the present invention is applied.

Detailed Description of the Preferred Embodiments

(First Embodiment)

[0014] An untwisting nozzle in accordance with the present invention will be described below with reference to the drawings. Figure 1 is a perspective view showing the general configuration of the untwisting nozzle. Figure 2A is a side view of the untwisting nozzle. Figure 2B is a plan view of the untwisting nozzle.
Figure 2C is a front view of the untwisting nozzle. Figure 3 is a diagram of a yarn splicing device having the untwisting nozzle. In the description below, for convenience, the direction in which the compressed air is ejected from a nozzle hole 2 shown in Figure 1 is defined as a "forward direction", and the opposite to direction is defined as a "backward direction". Further, in Figure 1, a direction orthogonal to the forward-backward direction in a horizontal direction is defined as a "rightward-leftward direction", and a vertical direction is defined as an "upward-downward direction".

[0015] As shown in Figure 1 and Figure 2, an untwisting nozzle 1 is a unit part composed of a main body portion 4 having a nozzle hole 2 and an inner channel 3 that is in communication with the nozzle hole 2, and a guide piece 6 integrally installed on the main body portion 4 with a bolt 5 having a hexagonal hole. The front surface of the main body portion 4 comprises a pocket 7 that is open in the top surface, the bottom surface, and the right surface thereof.

[0016] The main body portion 4 is a plastic molded article shaped like a deformed column formed like a block and extending in the forward-backward direction. The main body portion 4 has the nozzle hole 2 formed in the front surface and serving as an air blowing opening for the compressed air, and an air introduction opening 8 for the compressed air formed in the left side surface. The inner channel 3 shaped like the letter U as viewed from above is formed in the block so as to connect the nozzle hole 2 and the air introduction opening 8 together.
Compressed air fed from the air introduction opening 8 passes through the inner channel 3 and is then ejected from the nozzle hole 2 into the pocket 7. As shown in Figure 2B, the front surface of the main body portion 4 is a stepped surface made of a first surface 9a on which the guide piece 6 is installed and a second surface 9b formed more rearward than the first surface 9a. A screw hole (not shown in the drawings) for the bolt 5 is formed in the first surface 9a. The nozzle hole 2 is formed in the second surface 9b. A corner portion defined by the top surface of the main body portion 4 and a part of the right side surface thereof is chamfered.

[0017] The guide piece 6 is a planar metal plate composed of a rectangular principal surface wall 10 fixed to the first surface 9b of the main body portion 4 with the bolt 5 and an arm wall 11 formed so as to extend in the rightward direction from the principal surface wall 10. The arm wall 11 lies near and opposite to the second surface 9b of the main body portion 4 across the pocket 7, and the arm wall 11 is tapered so that the width of the arm wall 11 in the upward-downward direction decreases as the arm wall 11 approaches its free end (rightward).

[0018] A slit 12 is formed, by notching, at a base end portion of the arm wall 11 to receive a yarn end Y to control the position of the yarn end Y, and extends downward direction from an upper edge of the arm wall 11. The slit 12 is straight and has a uniform lateral width dimension in the upward-downward direction. As shown in Figure 2C, when the guide piece 6 is installed on the main body portion 4, an inner end 12b of the slit 12 lies opposite to the nozzle hole 2 across the pocket 7. As shown in Figure 1 and Figure 3, the inner end 12b of the slit 12 is a recessed arcuate surface.

[0019] When an untwisting process is executed using the untwisting nozzle 1 configured as described above, the yarn end Y is passed through the pocket 7, and the compressed air is fed from the air introduction opening 8. Compressed air is thus ejected in the forward direction from the nozzle hole 2 via the inner channel 3. The ejection of the compressed air bends the yarn end Y at a right angle in front of the inner end 12b of the slit 12 to untwist a tip portion of the yarn end Y extending in the forward direction from the guide piece 6. That is, the yarn end Y is brought into a state suitable for yarn splicing.

[0020] In the untwisting process, the yarn end Y can be controllably positioned at the inner end 12b of the slit 12. The yarn end Y can thus be located and held at the optimum position where the yarn end Y directly receives the compressed air from the nozzle hole 2. This enables the untwisting process to be steadily and reliably executed to improve the process efficiency of the untwisting process. The relatively simple configuration can be used to reliably execute the untwisting process. Thus, the untwisting nozzle 1 is also excellent in that the nozzle 1 requires only a minimum increase in costs.

[0021] Further, the untwisting nozzle 1 is constructed by the unitization of the main body portion 4 and the guide piece 6-the portion 4 and the piece 6 are integrated together with the bolt 5 to constitute a unit part. This allows the untwisting nozzle 1 to be easily and reliably assembled to the yarn splicing device or the like with reduced

amounts of time and effort. The untwisting nozzle 1 also makes it possible to eliminate the need for the adjustment of the position of the slit 12 relative to the nozzle hole 2, which need is unavoidable for a form in which the main body portion 4 and the guide piece 6 are separate members. In particular, since the slit 12 can be disposed at the appropriate position with respect to the nozzle hole 2, the untwisting nozzle 1 is excellent in that it always exhibits stable untwisting performance.

[0022] With reference to Figure 3, a description will be given of the yarn splicing device to which the untwisting nozzle 1 is applied. The yarn splicing device is applied to a winding unit of a winder or the like. The yarn splicing device comprises a vertical pair of untwisting nozzles 1 (1a, 1b) and a yarn splicing nozzle 21 having a yarn splicing hole 20 in which untwisted yarn ends are entangled and thus spliced with each other under the effect of the whirling current. The yarn splicing nozzle 21 is disposed so that a yarn path in the yarn splicing hole 20 extends in a vertical direction. The untwisting nozzles 1a, 1b are disposed symmetrically with respect to the yarn splicing nozzle 21; the untwisting nozzles 1a, 1b are respectively disposed above and below the yarn splicing nozzle 21. The lower side untwisting nozzle 1b is assembled into the yarn splicing device in a position reverse to that of the upper side untwisting nozzle 1a in the vertical direction.

[0023] In Figure 3, reference numerals 23, 24 are yarn guides. The yarn guides 23, 24 have guide grooves 23a, 23b, 24a, 24b engraved therein to separate a yarn Ya from a yarn Yb. A yarn shifting lever 25 is provided inside the yarn guides 23, 24 to push the yarns Ya, Yb into the yarn guides 23, 24. Cutters 26, 26 are each provided between a corresponding one of the untwisting nozzles 1a, 1b and a corresponding one of the yarn guides 23, 24. Clamp devices 28, 29 are each provided outside a corresponding one of the yarn guides 23, 24.

[0024] When a yarn defect is detected, a yarn clearer (not shown in the drawings) cuts each yarn into two yarns, the downstream side yarn Ya and the upstream side yarn Yb, which are gripped by the clamp devices 28, 29, respectively. The yarns Ya, Yb gripped by the clamp devices 28, 29 are guided and inserted into the yarn spicing hole 20 or the like by the yarn shifting lever 25. Specifically, the downstream side yarn Ya is guided and inserted through the guide groove 23a, along a side surface of the upper side untwisting nozzle 1a, and then through the yarn splicing hole 20 and the pocket 7 in the lower side untwisting nozzle 1b and then into the guide groove 24a. The upstream side yarn Yb is guided and inserted through the guide groove 24b, along a side surface of the lower side untwisting nozzle 1b, and then through the yarn splicing hole 20 and the pocket 7 in the upper side untwisting nozzle 1a and then into the guide groove 23b. The yarns Ya, Yb are guided and inserted into the pockets 7 from the right side opening. Once the above guidance and insertion of the yarns Ya, Yb is finished, the yarns Ya, Yb are cut with the cutters 26, 26. Then, the yarn shifting lever 25 is returned to loosen both yarns Ya, Yb.

[0025] In this state, the compressed air is ejected from the nozzle holes 2 (see Figure 1 and other figures) in the untwisting nozzles 1b, 1a to the yarn ends of the yarns Ya, Yb to untwist the tips of the yarn ends. The details of the untwisting process are as described above. After the untwisting process, the yarn shifting lever 25 is actuated again to pull the untwisted yarn ends out of the untwisting nozzles 1b, 1a. The yarn ends of both yarns Ya, Yb are allowed to overlap each other in the yarn splicing hole 20 in the yarn splicing nozzle 21. In this state, the whirling current is allowed to flow through the yarn splicing hole 20 to entangle the overlapping portions of the two yarn ends into a single yarn.

[0026] According to the above embodiment, the slit 12 is straight and has the uniform lateral width dimension in the upward-downward direction. The present invention is not limited to this but the slit may be tapered so that the lateral width dimension at the upper end thereof is different from that at the lower end thereof. A very small projection for preventing the yarn end Y from slipping off may be provided on one or both of a right side wall and a left side wall forming the slit 12.

[0027] While the present invention has been described with respect to preferred embodiments thereof, it will be apparent to those skilled in the art that the disclosed invention may be modified in numerous ways and may assume many embodiments other than those specifically set out and described above. Accordingly, it is intented by the appended claims to cover all modifications of the present invention that fall within the true spirit and scope of the invention.

Claims

1. An air blast type untwisting nozzle that untwists a yarn end by ejecting compressed air from a nozzle hole to the yarn end, the untwisting nozzle being **characterized in that**:

   a guide piece having a slit for position control of the yarn end is provided at a position opposite to the nozzle hole and at a predetermined distance from the nozzle hole.

2. The untwisting nozzle according to Claim 1, **characterized in that** the slit is formed by notching so as to extend inward from an edge of the guide piece, and an inner end of the slit is formed at a position opposite to the nozzle hole.

3. The untwisting nozzle according to Claim 1 or Claim 2, **characterized in that** the untwisting nozzle comprises a main body portion having a nozzle hole and an inner channel that is in communication with the nozzle hole, and the guide piece provided at a position opposite to the nozzle hole in the main body

portion, and
the main body portion and the guide piece are integrated into a unit part.

FIGURE 1

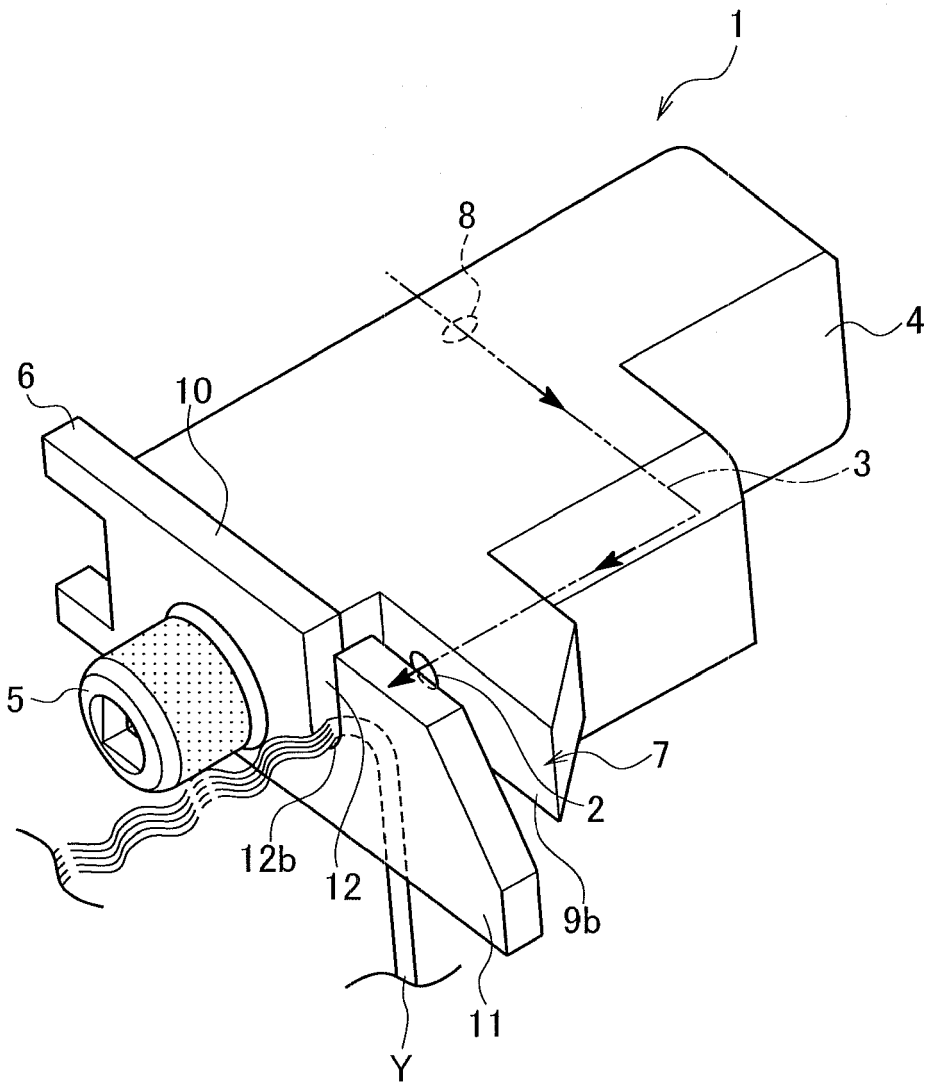


FIGURE 2A

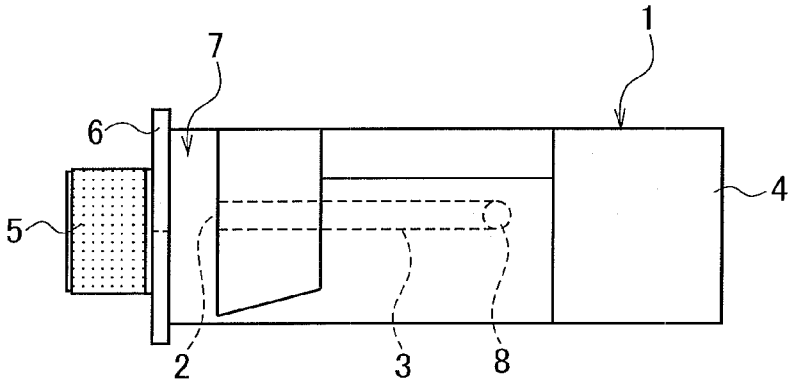


FIGURE 2B

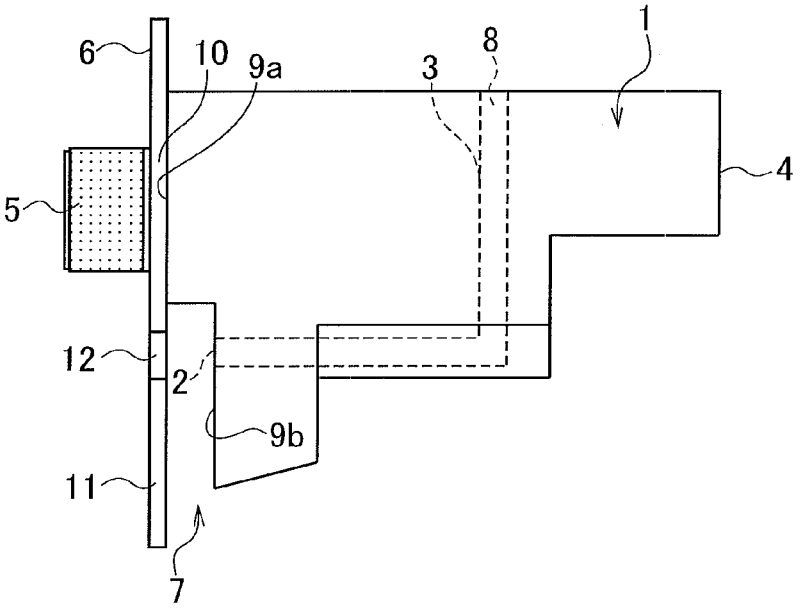


FIGURE 2C

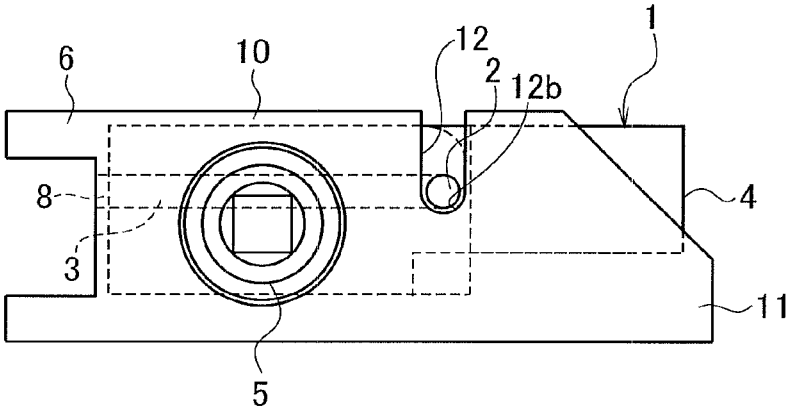
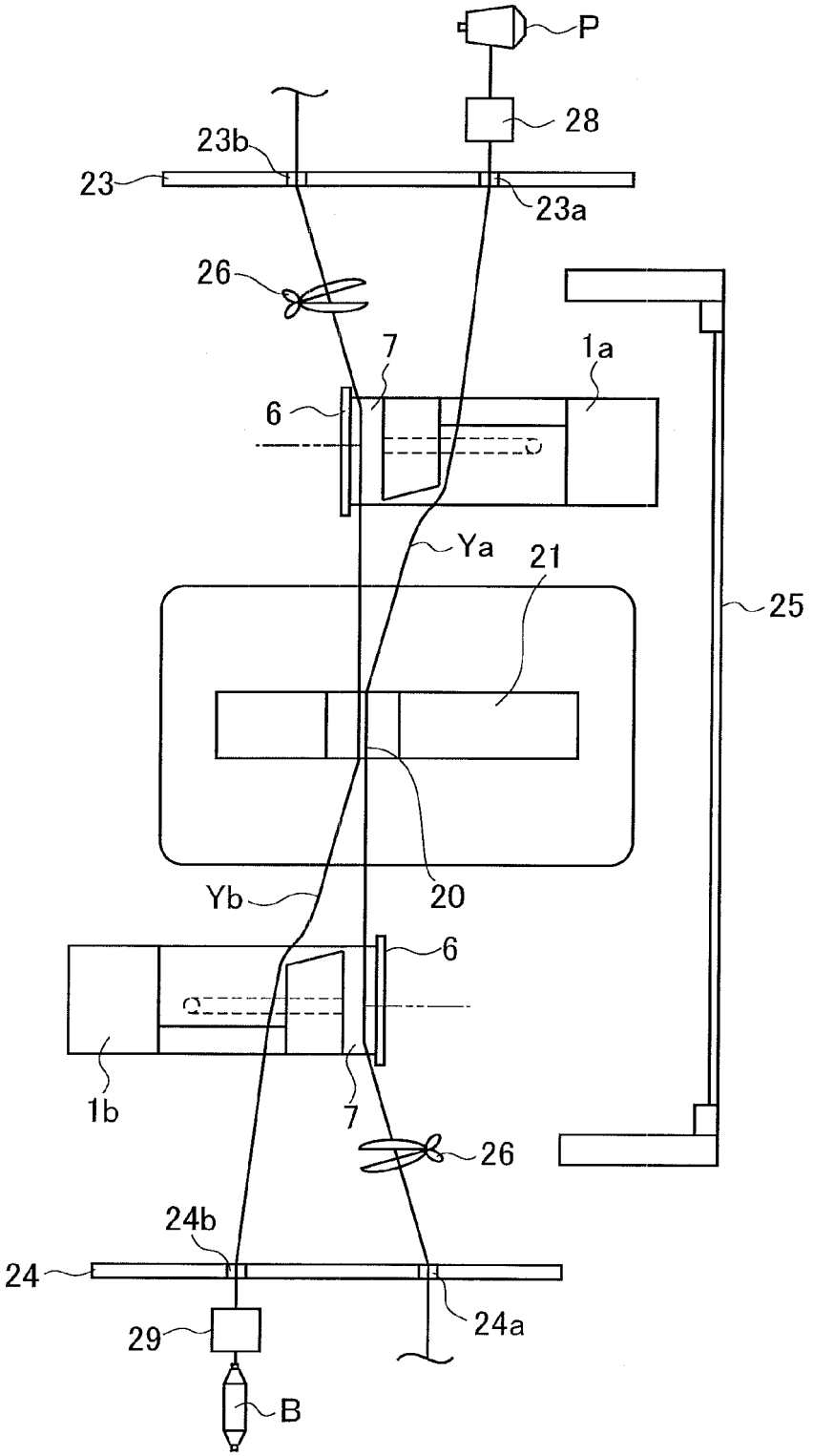


FIGURE 3



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EUROPEAN SEARCH REPORT

Application Number
EP 07 11 1717

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 5 289 673 A (COTTENCEAU REMI [FR] ET AL) 1 March 1994 (1994-03-01) * column 2, line 34 - line 38 * * column 3, line 22 - line 25 * * column 5, line 4 - line 14; claim 2; figures *	1-3	INV. B65H69/06
A	DE 199 14 788 A1 (MESDAN SPA [IT]) 7 October 1999 (1999-10-07) * figures 3,4 *	1-3	
D,A	JP 05 009824 A (MURATA MACHINERY LTD) 19 January 1993 (1993-01-19) * abstract; figures *	1-3	

TECHNICAL FIELDS SEARCHED (IPC)

B65H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	18 December 2007	Lemmen, René

CATEGORY OF CITED DOCUMENTS

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18-12-2007

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

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