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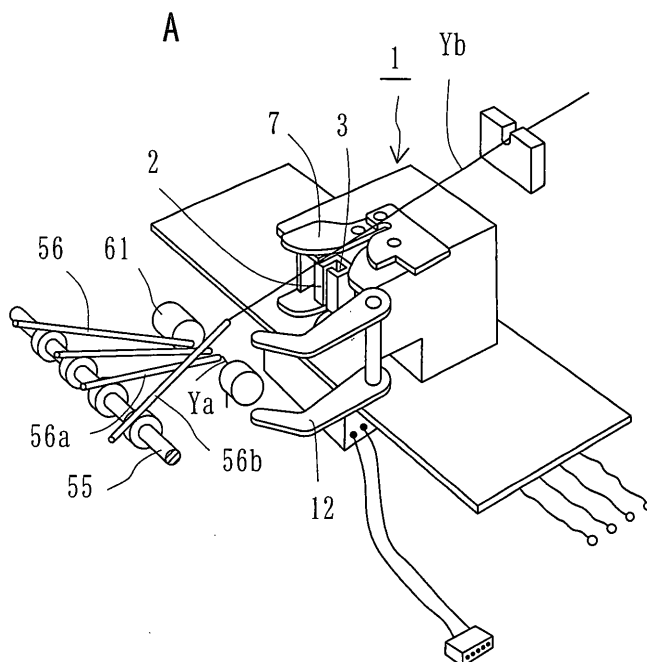
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(54) Yarn joining device and handy splicer

(57) The present invention provides a yarn joining device (1) for joining two yarns (Ya, Yb) with the tail ends (e_o, e_o) thereof aligned in the same direction. The yarn joining device reduces the size of the joint portion of the yarns even if the yarn joining is successively performed,

and also adjusts the yarn joining length, and thereby forms the joint portion of yarns uniformly and reliably. In the yarn joining device for joining tail ends of two yarns with the tail ends aligned in the same direction, loosening and twining of the tail ends of the yarns is performed successively by a single air jet nozzle (2).

Fig. 1



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Description

[Technical Field]

[0001] The present invention relates to a yarn joining device for joining tail ends of two yarns and, more particularly, a splicer type yarn joining device arranged to join two yarns with the tail ends thereof aligned in the same direction and a handy splicer which is a portable type of the yarn joining device.

[Related Background Art]

[0002] As well known, conventional yarn joining devices include a yarn joining device called yarn knotter which forms a knot to join yarns, and a yarn joining device called splicer which loosens the tail ends of two yarns in advance, disposes the tail ends within a yarn joining hole in such a manner that they extend in opposite directions and overlap with each other, and joins the yarns by blowing onto the overlapping tail ends a swirl jet of compressed fluid, such as compressed air, so that the tail ends swirl and vibrate to twine with each other.

[0003] In the yarn joining process in which the yarn joining device called knotter is utilized, the knotted portion protrudes in the radial direction of the yarn with respect to other portions along the whole periphery thereof. This knotted portion causes the yarn to get caught on and break when passing through a knitting needle in the subsequent braiding process, for example. In the yarn joining process in which the yarn joining device called splicer is utilized, the joint portion protrudes less than the knot portion mentioned above. However, the joint still issues the problem of getting caught on and broken by the knitting needle.

[0004] To solve the problems described above, the applicants of the present invention has proposed a spun yarn joining method and device such as that described in Patent Document 1. The yarn joining method and device described in Patent Document 1, however, still fails to form joint of yarns uniformly and reliably, which is the most important point in the yarn joining.

[Patent Document 1] Japanese Patent Application Laid-Open No. 2004-27463. (Abstract, Fig. 1)

SUMMARY OF THE INVENTION

[0005] The present invention solves the above mentioned problems of conventional arts. The especially important point of the present invention is that it provides a yarn joining device for joining two yarns with the tail ends thereof aligned in the same direction, which yarn joining device further reduces the size of the joint portion of the yarns even when the yarn joining is successively performed, and also adjusts the yarn joining length, and therefore being capable of forming the joint portion of yarns uniformly and reliably.

[0006] In order to achieve the above mentioned ob-

ject, the present invention provides a yarn joining device for joining two yarns with the tail ends thereof aligned in the same direction, in which device loosening and twining of the tail ends of the yarns is performed successively by a single air jet nozzle.

[0007] Further, in the present invention, the invention described in claim 2 is the device according to claim 1 in which the air jet nozzle comprises a yarn receiving hole for receiving the two yarns to be joined with the tail ends thereof aligned in the same direction, and an air issuing means including an electromagnetic valve for issuing an air jet in a direction crossing the yarn receiving hole.

[0008] Still further, in the present invention, the invention described in claim 3 is the device according to claim 1 or 2, in which a clamping means for clamping the two yarns received in the yarn receiving hole and a yarn joining length adjusting means for closing one side of the yarn receiving hole and adjusting the yarn joining length are provided on the one side of the yarn receiving hole of the air jet nozzle, and a cutter means for cutting the tail ends of the two yarns is provided on the other side of the yarn receiving hole of the air jet nozzle.

[0009] Still further, in the present invention, the invention described in claim 4 is the device described in any of claims 1 to 3, in which the air issuing means, the clamping means, the yarn joining length adjusting means, and the cutter means respectively include actuating cams fixed to a single cam rotating shaft, and a yarn joining operation of the yarn joining device completes within a single rotation of the cam rotating shaft.

[0010] Further, in the present invention, the invention described in claim 5 is a handy splicer for joining two yarns with the tail ends thereof aligned in the same direction, the handy splicer having a base member and a movable base member connected with each other so as to be pivotable about a pivot connection point. A yarn joining portion including an air jet nozzle is provided between the movable ends of the base member and the movable base member, so that loosening and twining of the tail ends of the yarns are performed successively by the single air jet nozzle when the handy splicer is clenched once.

[0011] Still further, in the present invention, the invention described in claim 6 is the handy splicer according to claim 5, in which the air jet nozzle comprises a yarn receiving hole for receiving the two yarns to be joined with the tail ends thereof aligned in the same direction, and an air issuing means for issuing an air jet in a direction crossing the yarn receiving hole.

[0012] Further yet, in the present invention, the invention described in claim 7 is the handy splicer according to claim 5 or 6, in which a yarn joining length adjusting means for clamping the two yarns received in the yarn receiving hole while closing one side of the yarn receiving hole and adjusting the yarn joining length is provided on the one side of the yarn receiving hole of the air jet nozzle, and a cutter means for cutting the tail ends of

the two yarns is provided on the other side of the yarn receiving hole of the air jet nozzle.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013]

Figs. 1A and 1B show an example of a yarn joining device according to the present invention, Fig. 1A is a schematic perspective view showing an exemplary arrangement of the yarn joining part of a wind-
er to which the present invention is applied, Fig. 1B is a schematic sectional side view showing a sub-
stantial part of the yarn joining device.

Figs. 2A through 2D show different mechanisms for actuating different means of the yarn joining device according to the present invention, Fig. 2A is a schematic perspective view of a clamping means actuating mechanism for clamping two yarns with the tail ends thereof aligned in the same direction, Fig. 2B is a schematic perspective view of a yarn joining length adjusting means actuating mechanism for closing one end of a yarn receiving hole and adjusting the yarn joining length, Fig. 2C is a schematic perspective view of a cutting means actuating mechanism for cutting the tail ends of the two yarns, Fig. 2D is a schematic perspective view of an electromagnetic valve actuating mechanism for picking up a splice signal for opening/closing the electromagnetic valve of an air jet nozzle.

Figs. 3A through 3G are schematic sectional side views of the yarn joining device according to the present invention illustrating the operation thereof. Fig. 3H is an enlarged schematic side view illustrating a joint of the joined yarns.

Figs. 4A through 4D show schematic side views illustrating steps of gathering two yarns into the yarn receiving hole 3 of the air jet nozzle 2 of the yarn joining device 1 when the yarn joining device according to the present invention is applied to a wind-
er W.

Fig. 5A is a schematic top view illustrating the whole arrangement of the wider W.

Fig. 5B is a schematic side view of the wider W.

Fig. 6 is a schematic perspective view of an embodiment of a handy splicer according to the present invention.

Fig. 7 is a schematic perspective view of the handy splicer with a yarn guiding member and a movable base member removed to show the detail of the inner structure thereof.

Figs. 8A through 8C illustrate the operation of the handy splicer, Fig. 8A is a schematic side view of the side of the handy splicer at which a cutter means is located against a nozzle member, Fig. 8B is a schematic perspective view of the side of the handy splicer at which a yarn joining length adjusting means is located, Fig. 8C is a schematic side view

of the handy splicer showing the detail of the yarn joining length adjusting means.

Figs. 9A through 9C illustrate the usage of the handy splicer, Fig. 9A is a schematic side view showing the handy splicer brought to a desired work area for yarn joining, Fig. 9B is a schematic side view showing the handy splicer guiding yarns Ya and Yb, aligning the two yarns, and catching them, Fig. 9C is an enlarged schematic sectional side view of the area in Fig. 9B encircled with a chain double-dashed line.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0014] Hereinafter, a yarn joining device according to the present invention will be described based on the specific embodiment illustrated in the accompanying drawings.

[0015] The yarn joining device 1 according to the present invention is a splicer type yarn joining device that is arranged to join two yarns, Ya and Yb, with the tail ends e_0 , e_0 thereof aligned in the same direction and by blowing compressed air thereon. The yarn joining device 1 includes an air jet nozzle 2. As shown in Figs. 1A, 1B, and Figs. 3A through 3G, the air jet nozzle 2 has a yarn receiving hole 3 for receiving two yarns to be joined, Ya and Yb, with the tail ends e_0 , e_0 thereof aligned in the same direction. Further, the air jet nozzle 2 is provided with an air issuing means 5 having a nozzle orifice 4 from which a jet of compressed air issues in a direction crossing the yarn receiving hole 3. The air issuing means 5 is provided with an electromagnetic valve 6 that opens/closes to control the air jet.

[0016] A clamping means 7 for clamping the two yarns Ya and Yb received in the yarn receiving hole 3 and a yarn joining length adjusting means 8 for closing one side 3a of the yarn receiving hole 3 and adjusting the yarn joining length are provided on the one side 3a of the yarn receiving hole 3 of the air jet nozzle 2, while a cutter means 11 for cutting the tail ends of the two yarns Ya and Yb is provided on the other side 3b of the yarn receiving hole 3 of the air jet nozzle 2. The yarn joining length adjusting means 8 includes a yarn receiving hole closing member 9 for closing the first side 3a of the yarn receiving hole 3, and a yarn joining length adjusting member 10 for adjusting the yarn joining length. In Figs. 1A and 1B, the reference number 12 indicates a yarn gathering means for gathering the two yarns Ya and Yb into the yarn receiving hole 3 of the air jet nozzle 2.

[0017] In the yarn joining device 1 according to the present invention, the air issuing means 5, the clamping means 7, the yarn joining length adjusting means 8, and the cutter means 11 include actuating cams 14, 15, 16, and 17, respectively, which are fixed to a single cam rotating shaft 13, as shown in Figs. 2A through 2D. That is, the air issuing means 5, the clamping means 7, the yarn joining length adjusting means 8, and the cutter means 11 are arranged so that the yarn joining operation

completes within a single rotation of the cam rotating shaft 13.

[0018] Now, the arrangement of the air issuing means 5, the clamping means 7, the yarn joining length adjusting means 8, and the cutter means 11 will be described in more detail with reference to Figs. 2A through 2D. As shown in Fig. 2D, the air issuing means 5 is a combination of the actuating cam 14 fixed to the cam rotating shaft 13 and a detector 18. The actuating cam 14 serves as a splice signal timing cam and has a protrusion 14a. The detector 18 generates an electromagnetic valve operating signal for actuating the electromagnetic valve 6 when it has detected the protrusion 14a.

[0019] The clamping means 7 includes the actuating cam 15 fixed to the cam rotating shaft 13, as shown in Fig. 2A. The cam working surface 15a of the actuating cam 15 is in contact with a cam follower 21 mounted to an actuating lever 20 swingably supported by an actuating lever supporting shaft 19. Thus, the rotation of the actuating cam 15 actuates the cam follower 21 and causes the actuating lever 20 to swing in the direction indicated by arrow a. The actuating lever 20 has a working end 20a connected to a link mechanism 24. The link mechanism 24 is arranged to actuate one of a pair of clamp pieces 22, 23, i.e. the clamp piece 23, in the direction of arrow b to sandwich the yarns Ya and Yb between the pair of clamp pieces 22, 23.

[0020] The yarn joining length adjusting means 8 is an important constituent of the present invention and is arranged as shown in Fig. 2B. The yarn joining length adjusting means 8 includes the actuating cam 16 fixed to the cam rotating shaft 13. The cam working surface 16a of the actuating cam 16 is in contact with a cam follower 26 mounted to an actuating lever 25 swingably supported by an actuating lever supporting shaft 19. Thus, the rotation of the actuating cam 16 actuates the cam follower 26 and causes the actuating lever 25 to swing in the direction of arrow c.

[0021] The actuating lever 25 has a working end 25a connected to a link mechanism 27. The link mechanism 27 urges the yarn receiving hole closing member 9 in the direction of arrow d to close the first end 3a of the yarn receiving hole 3, and also the yarn joining length adjusting member 10 in the direction indicated by arrow e to adjust the yarn joining length. As shown in Figs. 3A and 3G, the yarn receiving hole closing member 9 of the yarn joining length adjusting means 8 moves between positions P_1 and P_2 at which the yarn receiving hole is open and closed, respectively. The yarn joining length adjusting member 10 is arranged so as to move as illustrated in Figs. 3A through 3F.

[0022] As shown in Fig. 2C, the cutter means 11 includes the actuating cam 17 fixed to the cam rotating shaft 13. The cam working surface 17a of the actuating cam 17 is in contact with a cam follower 29 mounted to an actuating lever 28 swingably supported by an actuating lever supporting shaft 19. Thus, the rotation of the actuating cam 17 actuates the cam follower 29 and

causes the actuating lever 28 to swing in the direction of arrow f. The actuating lever 28 has a working end 28a connected to a link mechanism 32. The link mechanism 32 actuates one of the pair of cutter pieces 30, 31, i.e. the cutter piece 30, in the direction of arrow g to cut the yarns Ya and Yb by the pair of cutter pieces 30, 31.

[0023] Now, the process of joining the tail ends of the yarns Ya and Yb with the yarn joining device 1 will be described with reference to Figs. 3A through 3H. Shown in Fig. 3A are, for example, the yarn Ya from a bobbin Bo and the yarn Yb from a package Pa, both introduced into the yarn receiving hole 3 of the air jet nozzle 2 by the yarn gathering means 12 shown in Fig. 1A and 1B. Note that the reference mark Ba in Fig. 3A indicates an sucking means for sucking the tail ends of the yarns. In Fig. 3B, the yarns Ya and Yb are clamped together by the clamping means 7, and the yarn receiving hole closing member 9 and the yarn joining length adjusting member 10 of the yarn joining length adjusting means 8 move to the yarn receiving hole closing position P_2 . Then, in Fig. 3C, the two yarns Ya and Yb are cut by the cutter means 11 in a predetermined length.

[0024] After the cutter means 11 has cut the tail ends of the two yarns Ya and Yb, the yarn joining length adjusting member 10 of the yarn joining length adjusting means 8 slightly moves, as shown in Fig. 3D, in the direction of arrow e to adjust the joining length of the two yarns Ya and Yb. At this stage, the yarns Ya and Yb are securely caught between the air jet nozzle 2 and the yarn receiving hole closing member 9.

[0025] Next, with the device 1 being as shown in Fig. 3D, the air issuing means 5 is operated, as shown in Fig. 3E, to blow compressed air onto the two yarns Ya and Yb through the nozzle orifice 4 and loosen the tail ends of the yarns. After the tail ends of the yarns have been loosened in Fig. 3E, the yarn joining length adjusting member 10 of the yarn joining length adjusting means 8 further moves in the direction of arrow e to pull out the yarns Ya and Yb from the yarn receiving hole 3 of the air jet nozzle 2. As the loosened portions of the yarns pass by the nozzle orifice from which the compressed air issues, the fibers twine with each other to join the yarns Ya and Yb. This joined portion is pressed by the yarn receiving hole closing member 9 as it is pulled out from the air jet nozzle. Thus, the joined portion is prevented from being frizzled and also from forming a swelling.

[0026] After the yarns Ya and Yb are fully pulled out from the yarn receiving hole 3 of the air jet nozzle 2, the clamping means 7 is opened and each means of the device 1 moves back to its initial position to complete the yarn joining process.

[0027] It should be noted that, in the present invention, the twined portion of the yarns can be made shorter by adjusting the length of the yarns within the yarn receiving hole 3 by the yarn joining length adjusting member 10. Alternatively, the twined portion of the yarns may be made shorter by providing an additional cutter (not

shown) for cutting the redundant joint portion No after the yarn is pulled out from the yarn receiving hole 3. It should be also noted that, in the present invention, the joint portion No of the joined yarns inclines towards the downstream side of the yarn conveying direction St, as shown in Fig. 3H, which minimize the possibility of catching on of the joint portion No. The above is also advantageous in that the boundary of the joined yarns becomes like a point.

[0028] The yarn joining device 1 according to the present invention can be advantageously applied to an arrange winder AW as shown in Fig. 5. The arrange winder AW is a device for joining and winding different yarns, and essentially includes, as shown in Fig. 5, a yarn supplying portion 41, a yarn selecting portion 42, a yarn joining portion 43, a length measuring and storing portion 44, and a winding portion 45, which are placed in a line, and also a controller 46.

[0029] The yarn supplying portion 41 is constituted by a yarn supplying package creel 47 on which several different yarn supplying packages can be set. For example, n varieties of yarn supplying packages SPa, SPb, ..., and SPn, each containing the color yarn Ya of color a, color yarn Yb of color b, ..., and color yarn Yn of color n, respectively, are set on the creel 47 so that the yarns can be pulled out therefrom without interfering with each other. The color yarns Ya, Yb, ..., and Yn pulled out from the yarn supplying packages SPa, SPb, ..., and SPn, respectively, are passed through guides 51 and tension devices (not shown) to be provide to a yarn selecting apparatus 48.

[0030] In order to produce a yarn of a predetermined design, the color yarns Ya, Yb, ..., and Yn provided from the yarn supplying packages are selected one after another by the yarn selecting apparatus 48 placed in the yarn selecting portion 42, joined in sequence by the yarn joining device 49 of the yarn joining portion 43, and measured and stored by a length measuring and storing apparatus 50 placed in the length measuring and storing portion 44. Thus, a joined yarn CY in which the color yarns are joined in lengths and order determined in accordance with the predetermined design is obtained and formed into a warp package Pa, for example, by a winding apparatus WA including a traversing drum 52 placed in the winding portion 45.

[0031] The yarn selecting portion 42 includes the yarn selecting apparatus 48 arranged to hold the tail ends of the color yarns Ya, Yb, ..., and Yn pulled out from the yarn packages SPa, SPb, ..., and SPn, respectively. The yarn selecting apparatus 48 places at least one of the color yarns at a running position in accordance with the command from the controller 46.

[0032] Now, the yarn selecting apparatus 48 will be described in detail with reference to Figs. 1 and 5. As shown in Fig. 5, the yarn selecting apparatus 48 includes a frame 53 and is provided with guides 54 for separately guiding each of the color yarns Ya, Yb, ..., Yn. A common shaft 55 is mounted on the frame 53,

which shaft is provided with a plurality of yarn selecting guide members 56. Each of the yarn selecting guide members 56 allows the corresponding one of the color yarns to be passed and running therethrough. Each yarn selecting guide member 56 is provided with a hook plate. A tension spring is fixed between each hook plate and the frame in order to bias the yarn selecting guide member 56 towards a first position, or selected and running color yarn guiding position.

[0033] The yarn selecting apparatus 48 includes external force applying means for moving each yarn selecting guide member 56 to a second position, or selection waiting position, against the tension of respective tension springs. The yarn selecting guide member 56 positioned at the second position by the external force applying means is engaged with the hook portion of the hook plate by the action of a solenoid means mounted on the frame 53 to be held at the second position.

[0034] The yarn selecting apparatus 48 further includes a yarn tail end capturing means 61 for capturing the tail ends of the color yarns guided by the yarn selecting guide members 56 at the second position or selection waiting position. As shown in Fig. 1, the yarn tail end capturing means 61 is constituted so that it catches and holds the leading end of the color yarns cut by the yarn joining device.

[0035] In the illustrated embodiment, the yarn selecting guide member 56b is set at the first position, or selected and running color yarn guiding position, to guide the first color yarn, Yb, in a running state, and the yarn selecting guide member 56a is ready at the second position, or selection waiting position, with the color yarn Ya guided by it being captured by the yarn tail end capturing means 61 at the tail end thereof.

[0036] As described above, the yarn selecting apparatus 48 includes yarn selecting guide members 56 that are pivotably mounted on the common shaft 55. The yarn selecting apparatus 48 is constituted such that each yarn selecting guide member 56 can be selectively operated to the first position, or selected and running color yarn guiding position, and the second position, or selection waiting position. Thus, the yarn selecting apparatus 48 allows not only one but also more than one color yarn to be selected simultaneously to be joined in parallel to introduce variety into the resultant yarn.

[0037] Next, the steps of gathering the yarns Ya and Yb into the yarn receiving hole 3 of the air jet nozzle 2 of the yarn joining device 1 when the yarn joining device 1 according to the present invention is applied to the above-mentioned winder W will be described with reference to Figs. 4A through 4D. In the step shown Fig. 4A, the yarn selecting guide member 56b is set to the first position (selected and running color yarn guiding position) for guiding the first yarn Yb in its running state, and the yarn selecting guide member 56a is ready at the second position (selection waiting position) with the tail end of the color yarn Ya guided by it being held by the yarn tail end capturing means 61.

[0038] In the step shown Fig. 4B, the yarn selecting guide member 56b moves from the first position (selected and running color yarn guiding position) to the second position (selection waiting position) to locate the color yarn Yb such that the yarn gathering means 12 can gather it. Next, in the step shown in Fig. 4C, the yarn selecting guide member 56a moves from the second position (selection waiting position) to the first position (selected and running color yarn guiding position) to locate the color yarn Ya such that the yarn gathering means 12 can gather it. Thereafter, as shown in Fig. 4D, the yarn gathering means 12 is operated to gather and introduce the color yarns Ya and Yb into the yarn receiving hole 3 of the air jet nozzle 2 of the yarn joining device 1.

[0039] Next, a handy splicer will be describe with reference to Figs. 6 through 9, which is a portable yarn joining device according to the present invention capable of joining yarns at any desired places.

[0040] The handy splicer 101 is a portable splicer that joins two yarns Ya and Yb by blowing compressed air onto the tail ends e_0 , e_0 thereof aligned in the same direction, for example, as shown in Figs. 6 and 9. The handy splicer 101 is a stapler type apparatus in which the movable base member 112 is mounted on a pivot shaft 111 to pivot against the base member 110, so that the handy splicer 101 can be operated by clenching the base member 110 and movable base member 112. A yarn joining part SP is provided between the movable ends of the base member 110 and the movable base member 112 so that it is located inside the handy splicer 101. This yarn joining part SP includes an air jet nozzle 102 mounted to the base member 110.

[0041] The air jet nozzle 102 has a yarn receiving hole 103 for receiving and guiding the two yarns Ya, Yb to be joined with the tail ends e_0 , e_0 thereof aligned in the same direction. The air jet nozzle 102 includes an air issuing means 105 having a nozzle opening 104 for issuing a jet of compressed air or the like in a direction crossing the yarn receiving hole 103.

[0042] A yarn guiding member 113 having a pair of guiding slits 114, 114 for aligning and guiding the yarns Ya, Yb is mounted to the base member 110. By aligning and introducing the yarns Ya and Yb into the guiding slits 114, 114, the yarns Ya and Yb can be introduced into the yarn receiving hole 103 of the air jet nozzle 102 (see Figs. 6 and 9B).

[0043] A yarn joining length adjusting means 107 is provided on one side Sa of the yarn receiving hole 103 of the air jet nozzle 102 to grasp the two yarns Ya, Yb received in the yarn receiving hole 103 and adjust the yarn joining length thereof, while a cutter means 108 for cutting the two yarns Ya, Yb is provided on the other side Sb of the yarn receiving hole 103.

[0044] In the embodiment shown in Figs. 6 through 9, the yarn joining length adjusting means 107 includes a yarn guiding plate 116, which is actuated by a leaf spring member 115 mounted to the movable base member 112, and yarn guiding plates 117, 118 mounted to the

base plate 110.

[0045] In the handy splicer 101 according to the present invention, the movable base member 112 pivots as the handy splicer 101 is clenched, and causes the yarn guiding plate 116 to be pivoted by the leaf spring member 115 about the pivot shaft 119 in the direction indicated by arrow y_1 (see Fig. 8C). As shown in Fig. 8A, the movable ends of the base member 110 and the movable base member 112 of the handy splicer 101 is normally kept open by an open-state-keeping spring 133. Thus, when the base member 110 and the movable base member 112 are clenched, they move against the open-state-keeping spring 133.

[0046] The cutter means 108 includes a cutter plate 120 to which a bearing 121 is mounted. When the movable base member 112 pivots as a result of clenching the handy splicer 101, it comes into contact with the bearing 121 and causes the cutter plate 120 to pivot about the pivot shaft 122 in the direction of arrow y_2 . The cutter plate 120 is provided with a movable blade 123 so that the yarns Ya, Yb are cut between the movable blade 123 and a stationary blade 124 as the cutter plate 120 pivots in the direction of arrow y_2 (see Fig. 8A). The cutter plate 120 pivots in synchronization with the yarn guiding plate 116 when the handy splicer 101 is clenched.

[0047] The yarn guiding plates 117, 118 are mounted on the base member 110 so as to oppose with the yarn guiding plate 116. When the yarn guiding plate 116 is pivoted in the direction of arrow y_1 by clenching the handy splicer 101, the yarns Ya, Yb are held between the yarn guiding plate 116 and the yarn guiding plate 117, so that the yarn joining length is adjusted as shown in Fig. 9C. The yarn guiding plate 118 serves to close the opening at the side Sa of the yarn receiving hole 103.

[0048] The yarn joining length adjusting means 107 includes a yarn joining length adjustment stopper mechanism 125. The yarn joining length adjustment stopper mechanism 125 is mounted to the base member 110 by a shaft 126. The yarn joining length adjustment stopper mechanism 125 has a cam plate 127 including a peripheral cam working surface 128, a handle pin 129 fixed to the cam plate 127, and fixing bolt 130.

[0049] In the yarn joining length adjustment stopper mechanism 125, the yarn guiding plate 116 is provided with a protrusion 131 at the opposite side with respect to the pivot shaft 119 for restricting the pivoting motion of the yarn guiding plate 116 by coming into contact with the cam working surface 128 of the cam plate 127. Thus, the pivoting angle of the yarn guiding plate 116 can be changed by the adjustment of the yarn joining length adjustment stopper mechanism 125.

[0050] Further, in the handy splicer 101, the air issuing means 105 issues air into the yarn receiving hole 103 when an pressing rod 132 of an air valve is depressed by the movable base member 112 in the vicinity of the pivoting end of the movable base member 112 to loosen the tail ends e_0 , e_0 of the yarns Ya, Yb to be joined and

twine them to join the yarns.

[0051] Next, the process of joining the yarns Ya and Yb at the tail ends e_0 , e_0 thereof by the handy splicer 101 according to the present invention will be described. First, the proper yarn joining length is calculated in accordance with the type of the yarn, and then, the yarn joining length is set by adjusting the yarn joining length adjustment stopper mechanism 125 of the handy splicer 101.

[0052] Then, the yarns to be aligned, Ya and Yb, are aligned with each other and set into the guiding slits 114, 114 of the yarn guiding member 113. The yarns Ya and Yb are guided along the guiding slits 114, 114 and into the yarn receiving hole 103 of the nozzle 102. If the base member 110 and the movable base member 112 are clenched at this stage, the movable base member 112 pivots about the pivot shaft 111 and stops pivoting at a predetermined stop position defined by the yarn joining length adjustment stopper mechanism 125. Thus, from cutting the yarns to actuating the nozzle (i.e. twining or joining the yarns) is performed by only clenching the handy splicer 101.

[Industrial Applicability]

[0053] According to the yarn joining device of the present invention, the yarn joining device for joining two yarns with the tail ends thereof aligned in the same direction is adapted to successively perform loosening and twining of the tail ends of the yarns with a single air jet nozzle. The air jet nozzle comprises a yarn receiving hole for receiving the two yarns with the tail ends thereof aligned in the same direction, and an air issuing means including an electromagnetic valve for issuing an air jet in a direction crossing the yarn receiving hole. A clamping means for clamping the two yarns received in the yarn receiving hole and a yarn joining length adjusting means for closing one side of the yarn receiving hole and adjusting yarn joining length are provided on one side of the yarn receiving hole of the air jet nozzle, and a cutter means for cutting the tail ends of the two yarns is provided on the other side of the yarn receiving hole of the air jet nozzle. The yarn joining device constituted as above reduces the size of the joint portion of the yarns even when the yarn joining is successively performed and also adjusts the yarn joining length, and thereby forms the joint portion of yarns uniformly and reliably.

[0054] The handy splicer according to the present invention is for joining two yarns with the tail ends thereof aligned in the same direction. The handy splicer has a base member and a movable base member connected pivotably about a pivot connection point. A yarn joining portion including an air jet nozzle is provided between the movable ends of the base member and the movable base member, so that loosening and twining of the tail ends of the yarns are performed successively by a single air jet nozzle when the handy splicer is clenched once. The handy splicer is extremely advantageous in

that it can be brought to and used at any desired yarn joining work area, and in that the processes of loosening, twining, and joining the yarns can be performed easily and with saving labor by clenching the handy splicer once.

Claims

1. A yarn joining device for joining two yarns with the tail ends thereof aligned in the same direction, wherein loosening and twining of the tail ends of said yarns is performed successively by a single air jet nozzle.
2. The yarn joining device according to claim 1, wherein said air jet nozzle comprising:
 - a yarn receiving hole for receiving said two yarns to be joined with the tail ends thereof aligned in the same direction, and
 - an air issuing means including an electromagnetic valve for issuing an air jet in a direction crossing said yarn receiving hole.
3. The yarn joining device according to claim 1 or 2, wherein a clamping means for clamping said two yarns received in said yarn receiving hole and a yarn joining length adjusting means for closing one side of said yarn receiving hole and adjusting the yarn joining length are provided on said one side of said yarn receiving hole of said air jet nozzle, and wherein a cutter means for cutting the tail ends of said two yarns is provided on the other side of said yarn receiving hole of said air jet nozzle.
4. The yarn joining device according to any of claims 1 to 3, wherein said air issuing means, said clamping means, said yarn joining length adjusting means, and said cutter means respectively include actuating cams fixed to a single cam rotating shaft, and wherein a yarn joining operation of said yarn joining device completes within a single rotation of said cam rotating shaft.
5. A handy splicer for joining two yarns with the tail ends thereof aligned in the same direction, said handy splicer having a base member and a movable base member connected with each other so as to be pivotable about a pivot connection point, wherein a yarn joining portion including an air jet nozzle is provided between the movable ends of said base member and said movable base member, so that loosening and twining of the tail ends of said yarns are performed successively by a single air jet nozzle when said handy splicer is clenched once.
6. The handy splicer according to claim 5, wherein

said air jet nozzle comprising:

a yarn receiving hole for receiving said two
yarns to be joined with the tail ends thereof
aligned in the same direction, and
an air issuing means for issuing an air jet in a
direction crossing said yarn receiving hole.

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7. The handy splicer according to claim 5 or 6, wherein
a yarn joining length adjusting means for clamping
said two yarns received in said yarn receiving hole
while closing one side of said yarn receiving hole
and adjusting the yarn joining length is provided on
said one side of said yarn receiving hole of said air
jet nozzle, and wherein a cutter means for cutting
the tail ends of said two yarns is provided on the
other side of said yarn receiving hole of said air jet
nozzle.

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Fig. 1

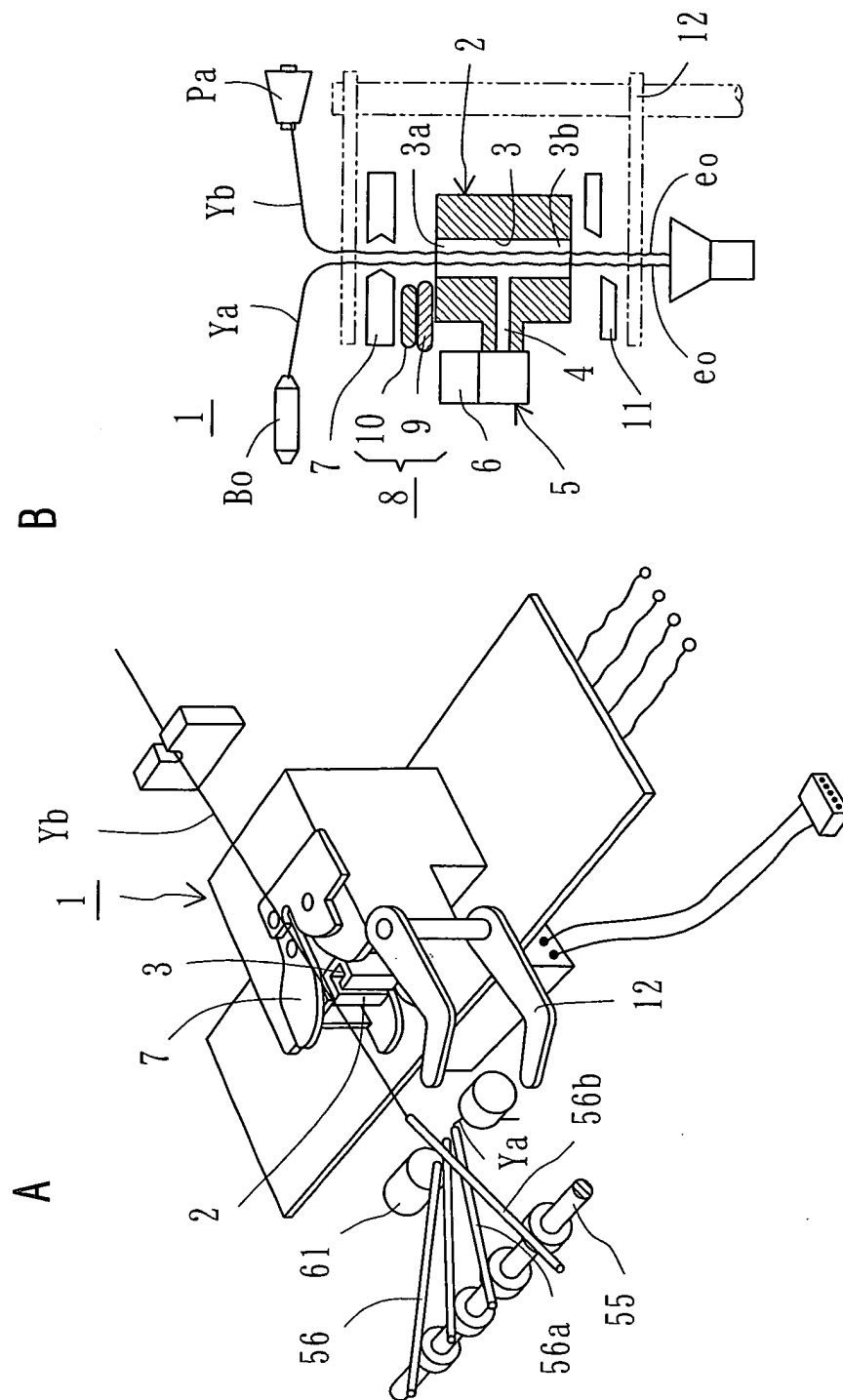
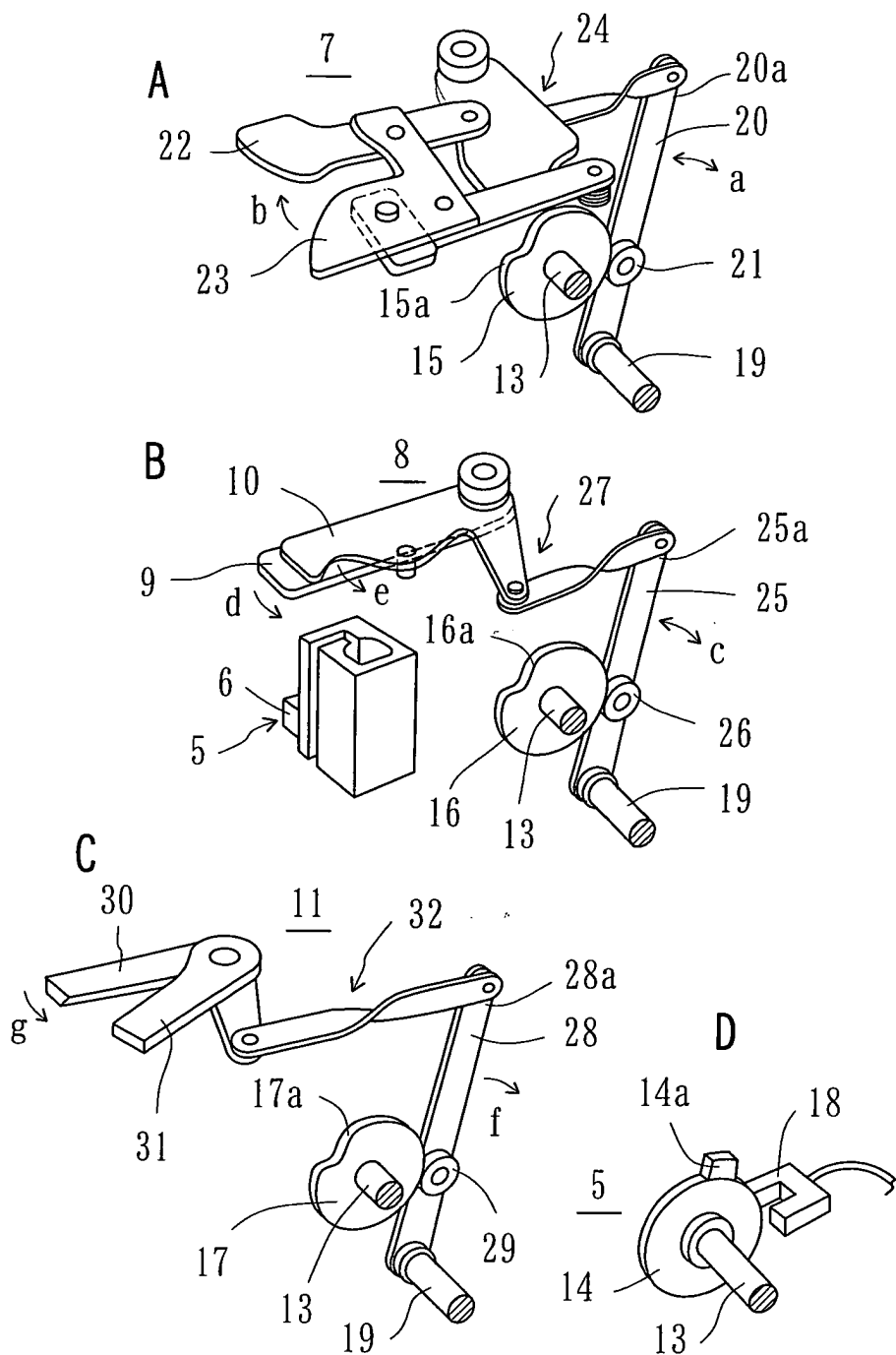


Fig. 2



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1
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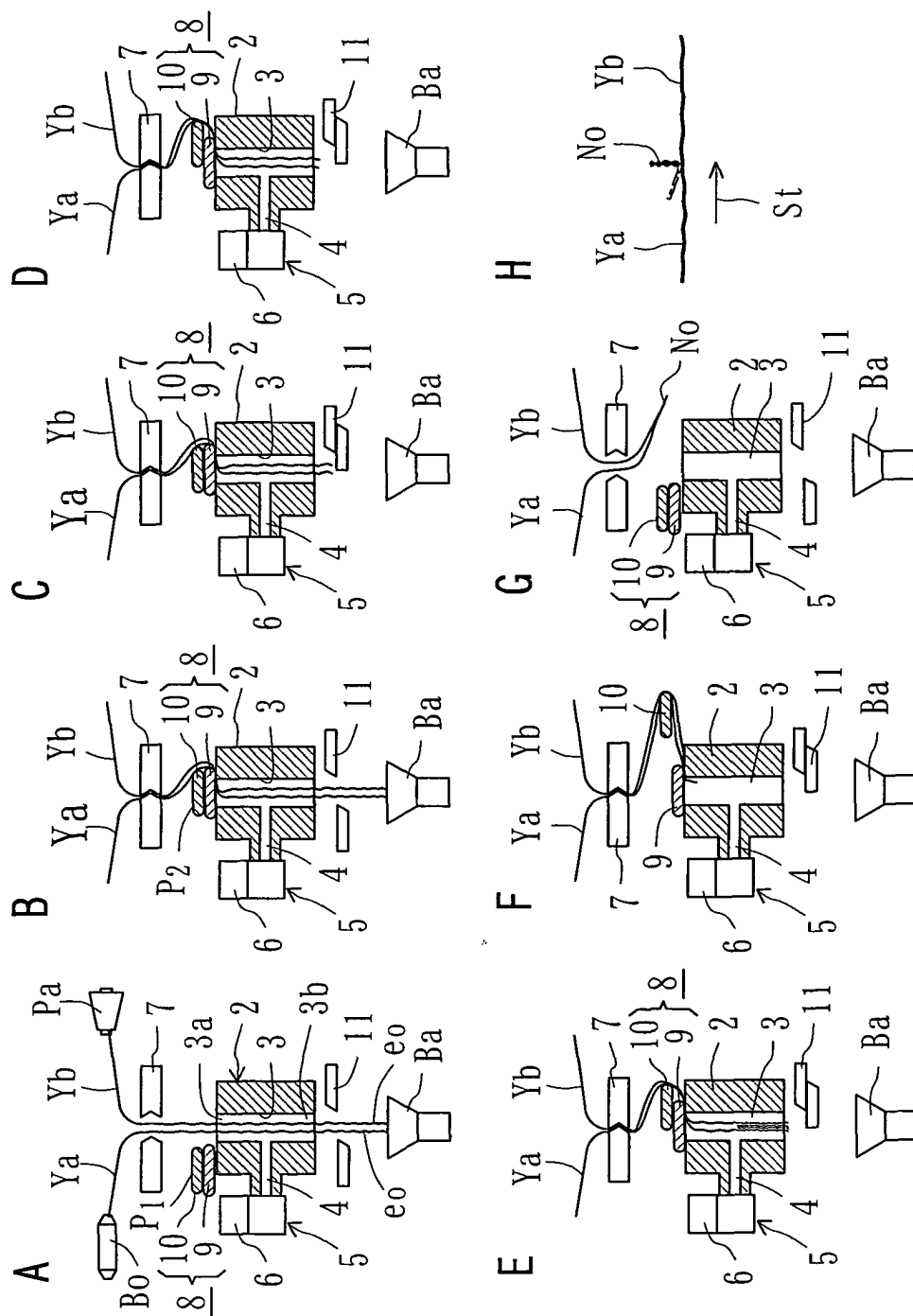


Fig. 4

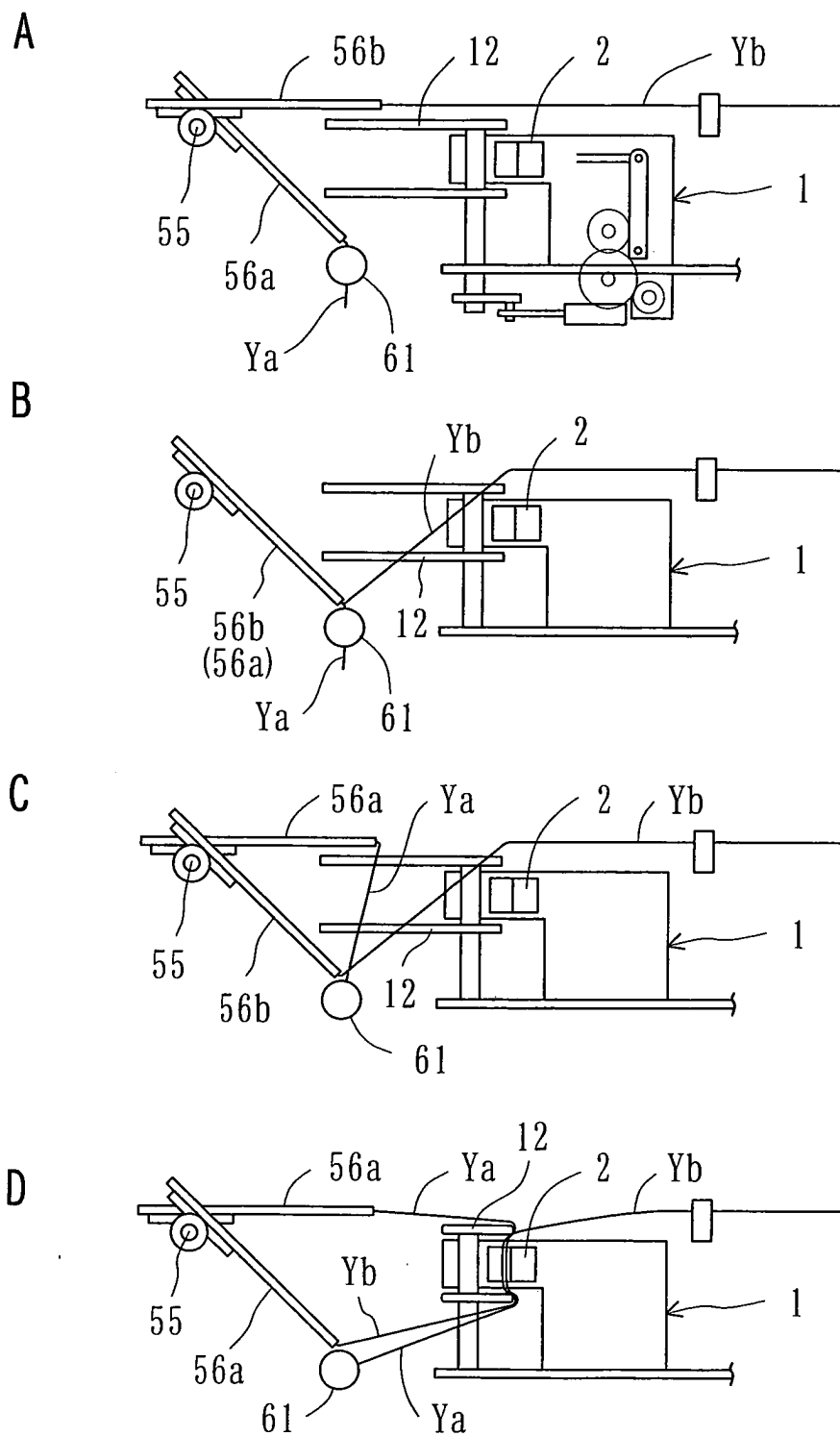


Fig. 6

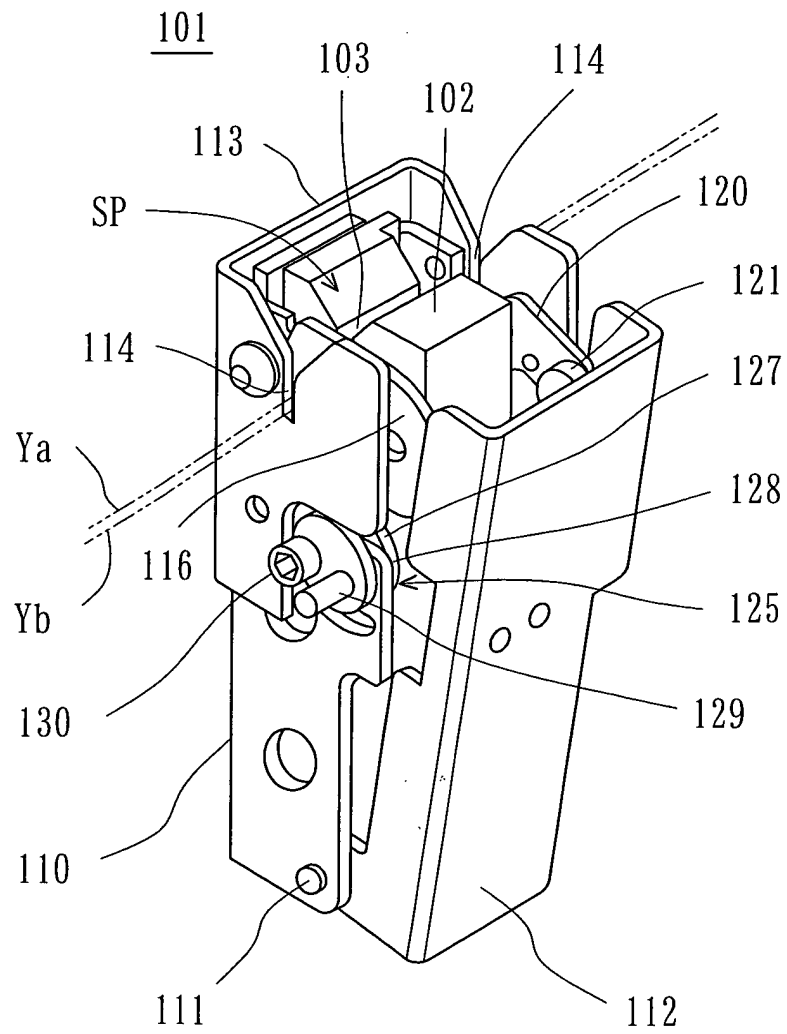


Fig. 7

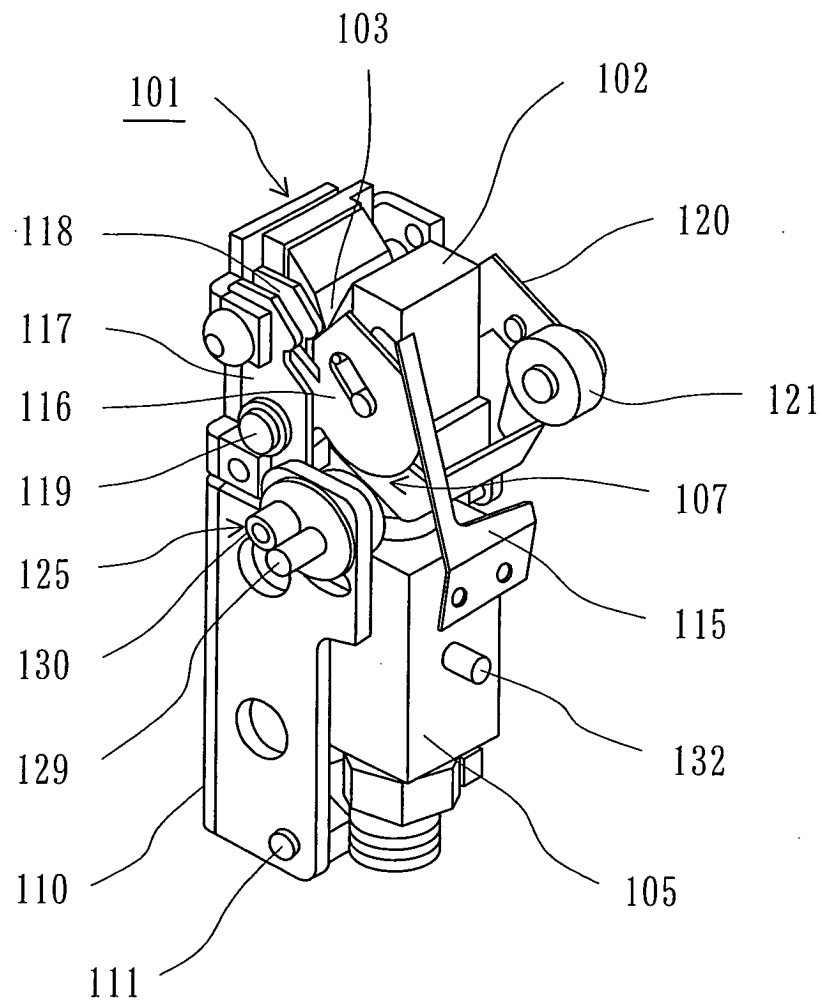


Fig. 8

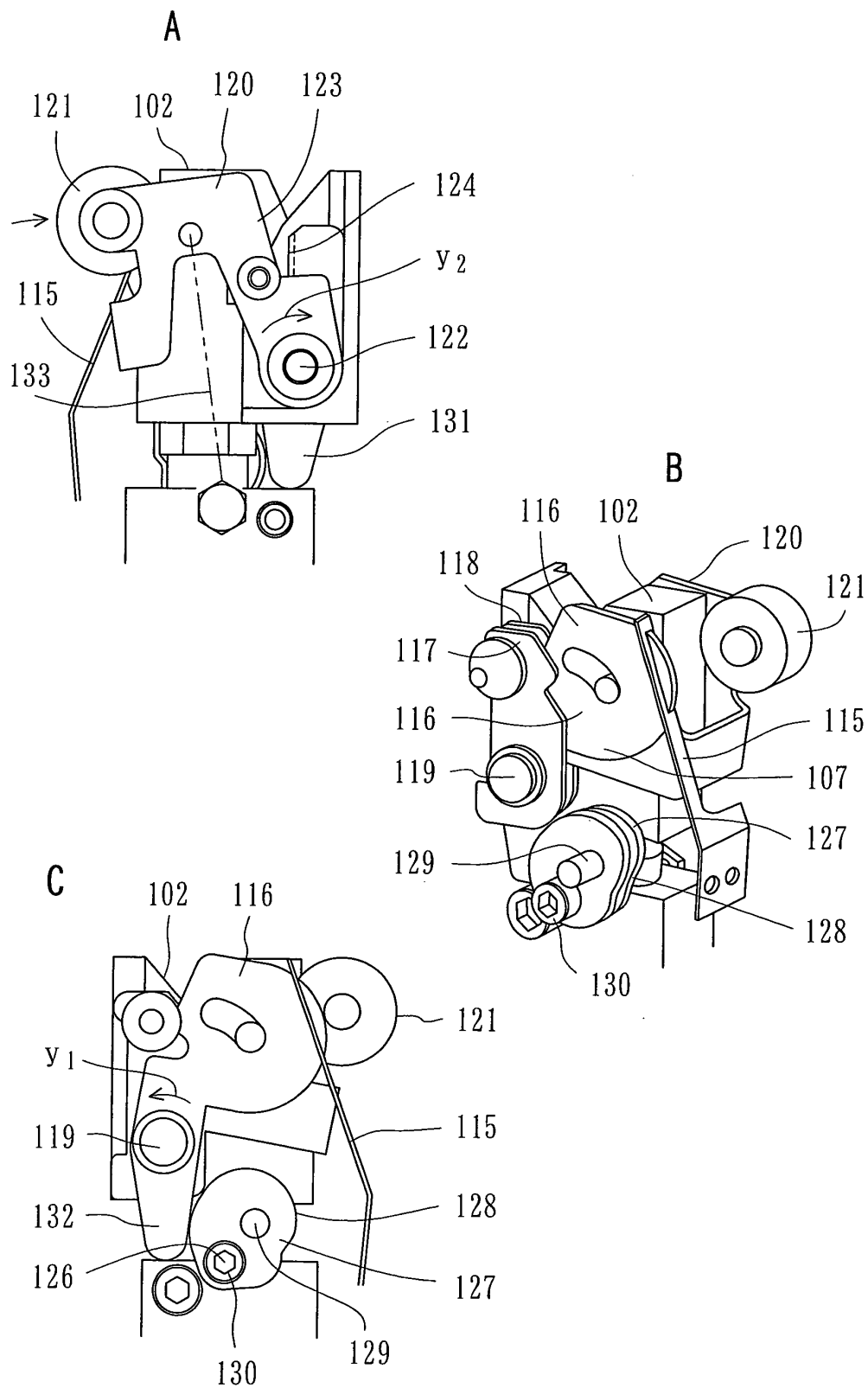
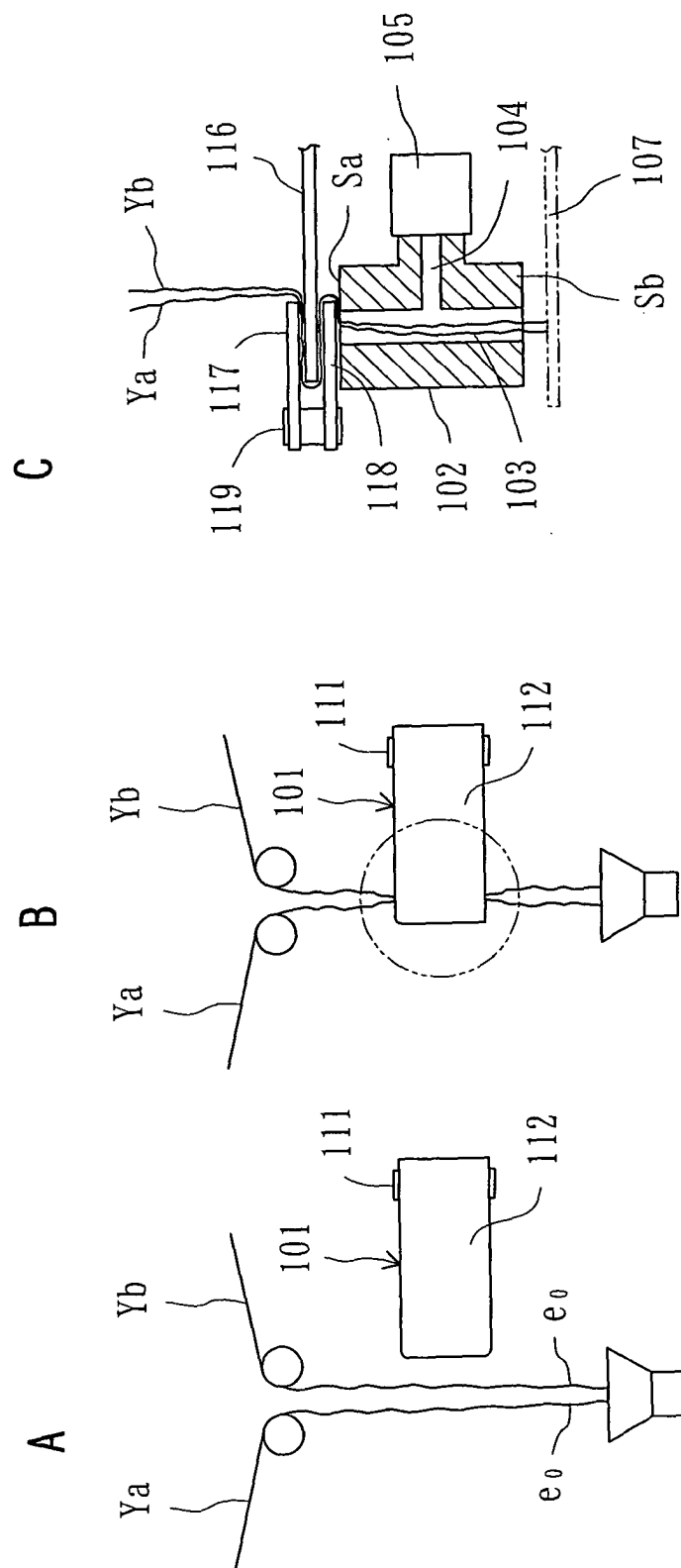


Fig. 9





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Place of search The Hague		Date of completion of the search 13 July 2005	Examiner Lemmen, R
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