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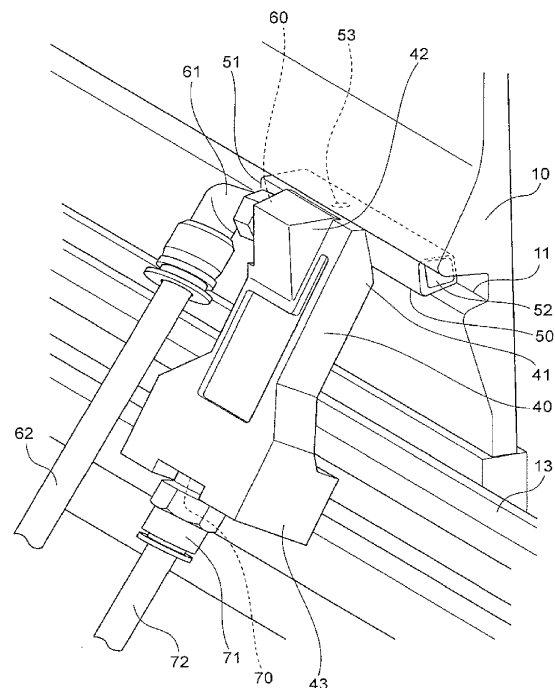
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(54) **WEFT YARN TENSIONING DEVICE**

(57) A weft yarn tensioning device (40) of an air jet loom in which a weft yarn (23) is inserted along a weft yarn guide passage (11) formed in a reed (10). The weft yarn tensioning device (40) includes a weft yarn travel passage (50) extending along the weft yarn guide passage (11), a first air discharge member (63) configured to discharge an air in a direction along the weft yarn travel passage (50), a second air discharge member (74) configured to discharge the air in a direction different from the direction along the weft yarn travel passage (50). The first air discharge member (63) discharges the air to introduce the weft yarn (23) into the weft yarn travel passage (50), and the second air discharge member (74) discharges the air to the weft yarn (23) in the weft yarn travel passage (50).

FIG. 1



## Description

### BACKGROUND ART

**[0001]** The present invention relates to a weft yarn tensioning device of an air jet loom.

**[0002]** In order to produce a high quality woven fabric, an air jet loom needs to be configured to suppress loosening of a weft yarn by applying an adequate tension to the weft yarn having been inserted. As a weft yarn tensioning device for applying a tension to a weft yarn, a weft yarn tensioning device disclosed in Japanese Patent Application No. 2010-285713 has been known. The weft yarn tensioning device disclosed in Japanese Patent Application No. 2010-285713 applies a tension to a weft yarn by discharging air from an air discharge nozzle disposed on a rear side of the air jet loom towards the front side thereof so as to bend the weft yarn and introducing such a weft yarn to a stretch pipe disposed on the front side of the air jet loom.

**[0003]** However, since the weft yarn tensioning device of the Publication applies a tension to the weft yarn by bending the weft yarn only in one direction from the rear side towards the front side of the air jet loom, a sufficient tension may not be applied to the weft yarn.

**[0004]** The present invention has been made to solve the above problem and is directed to providing a weft yarn tensioning device that can apply a sufficient tension to a weft yarn with a simple configuration.

### SUMMARY

**[0005]** In accordance with an aspect of the present disclosure, there is provided a weft yarn tensioning device of an air jet loom in which a weft yarn is inserted along a weft yarn guide passage formed in a reed. The weft yarn tensioning device is disposed in front of the reed. The weft yarn tensioning device includes a weft yarn travel passage extending along the weft yarn guide passage, a first air discharge member discharging an air in a direction along the weft yarn travel passage, and a second air discharge member discharging the air in a direction different from the direction along the weft yarn travel passage. The first air discharge member discharges the air to introduce the weft yarn into the weft yarn travel passage. The second air discharge member discharges the air to the weft yarn in the weft yarn travel passage.

**[0006]** Other aspects and advantages of the disclosure will become apparent from the following description, taken in conjunction with the accompanying drawings, illustrating by way of example the principles of the disclosure.

### BRIEF DESCRIPTION OF THE DRAWINGS

**[0007]** The disclosure, together with objects and advantages thereof, may best be understood by reference to the following description of the embodiments together with the accompanying drawings in which:

FIG. 1 is a partial perspective view, schematically illustrating an air jet loom according to an embodiment of the present invention;

FIG. 2 is a right side view of a weft yarn guide passage illustrated in FIG. 1;

FIG. 3 is a schematic plan view of the air jet loom illustrated in FIG. 1;

FIG. 4 is a perspective view of a stretch mechanism illustrated in FIG. 1;

FIG. 5 is a bottom view of the stretch mechanism illustrated in FIG. 3;

FIG. 6 is a cross-sectional plan view of an upper portion of the stretch mechanism illustrated in FIG. 3; and

FIG. 7 is a cross-sectional front view of the upper portion of the stretch mechanism, illustrating an operation of the stretch mechanism according to the embodiment of the present invention.

### DETAILED DESCRIPTION OF THE EMBODIMENTS

**[0008]** The following will describe an embodiment of the present invention in details with reference to the accompanying drawings.

**[0009]** FIG. 1 is a schematic perspective view of an air jet loom according to an embodiment of the present invention, illustrating a configuration of the air jet loom on the right side end or a weft yarn arrival side end thereof. FIG. 2 is a right side view of a weft yarn guide passage illustrated in FIG. 1. A modified reed 10 is disposed above a sley 13 that extends in a direction in which a weft yarn travels in the air jet loom. The modified reed 10 is disposed so as to extend in the weft yarn traveling direction, has a weft yarn guide passage 11 through which the weft yarn travels in a front surface of the modified reed 10. The weft yarn travels through the weft yarn guide passage 11 from an upstream to a downstream thereof along a flow of air discharged from a main nozzle and a sub-nozzle (not illustrated) for weft insertion. The main nozzle and the sub-nozzle are disposed on the upstream side of the air jet loom. The modified reed 10 corresponds to a reed of the present invention.

**[0010]** A stretch mechanism 40 is provided in front of the modified reed 10, i.e., on a front side of the air jet loom. The stretch mechanism 40 is disposed at an arrival side of the air jet loom. The stretch mechanism 40 is configured to apply an appropriate tension to the weft yarn so as to suppress loosening of the weft yarn. A weft yarn travel passage forming member 50 having a rectangular parallelepiped tubular shape is formed in an upper portion 41 of the stretch mechanism 40. The weft yarn travel passage forming member 50 has an inner space that serves as a weft yarn travel passage through which a weft yarn travels. The weft yarn travel passage forming member 50 is disposed in the weft yarn guide passage 11, and extends along the weft yarn guide passage 11. The weft yarn travel passage forming member 50 has a yarn inlet 51 from which a weft yarn is introduced on an

upstream side of the weft yarn travel passage forming member 50, and a yarn outlet 52 from which the weft yarn is drawn out on a downstream side of the weft yarn travel passage forming member 50. Thus, the weft yarn traveling through the weft yarn guide passage 11 of the modified reed 10 may travel through the weft yarn travel passage forming member 50. The stretch mechanism 40 is made of any suitable material such as resin and metal. The stretch mechanism 40 corresponds to a weft yarn tensioning device.

**[0011]** A projection 42 is formed in an upper portion 41 of the stretch mechanism 40, and the projection 42 projects from a main body of the stretch mechanism 40 towards the front side of the air jet loom. An air blow hole 60 is formed on a left side of the projection 42, i.e., on the upstream side in the weft travelling direction, as viewed from the front side of the air jet loom, which is used for air blow to the weft yarn in the weft yarn travel passage forming member 50. An air blow hose 62 is connected to the air blow hole 60 via an air blow joint 61. The air blow hose 62 is connected via a known air valve (not illustrated) to an air supply source (not illustrated) installed in a weaving factory.

**[0012]** A stretch air hole 70 is formed in a lower portion 43 of the stretch mechanism 40 so as to discharge stretch air to the weft yarn in the inner space of the weft yarn travel passage forming member 50. A stretch air hose 72 is connected to the stretch air hole 70 via a stretch air joint 71. The stretch air hose 72 is connected via a known air valve (not illustrate) to an air supply source (not illustrated) in the plant. The air jet loom has a control device (not illustrated) for controlling air supplies to the air blow hole 60 and the stretch air hole 70.

**[0013]** FIG. 3 is a schematic plan view of the air jet loom of FIG. 1 in which the modified reed 10 and the stretch mechanism 40 are illustrated in cross section, taken along a horizontal direction along the weft yarn guide passage 11. The modified reed 10 includes a plurality of dents 12 arranged at regular intervals along the weft travelling direction and extending perpendicularly to the weft travelling direction. A warp yarn 21 to form a woven fabric 31 with weft yarns 23, or a selvage yarn 22 to form selvages 32 with the weft yarns 23, are disposed between any two of the dents 12. The weft yarns 23 travel through the weft yarn guide passage 11 of the modified reed 10 and through the inner space of the weft yarn travel passage forming member 50 disposed in the weft yarn guide passage 11. A known optical weft yarn detection device 14 is provided on a right side of the stretch mechanism 40, i.e., on the downstream in the weft travelling direction, as viewed from the front side of the air jet loom, and the weft yarn detection device 14 is configured to detect a long pick and yarn breakage caused by air blow of the weft yarns 23.

**[0014]** FIG. 4 is a perspective view of the stretch mechanism 40 illustrated in FIG. 1. As illustrated in FIG. 4, the air blow hole 60 of the stretch mechanism 40 is opened at a left side surface of the projection 42 of the stretch

mechanism 40. An air release hole 53 is opened at an upper surface of the weft yarn travel passage forming member 50. The air release hole 53 is connected to the inner space of the weft yarn travel passage of the weft yarn travel passage forming member 50. The stretch mechanism 40 has a stretch air passage 73 extending in a vertical direction in an inside of the stretch mechanism 40. The inner space of the weft yarn travel passage forming member 50 is connected to the stretch air passage 73. The stretch air passage 73 is connected to the stretch air hole 70 of the lower portion 43. Thus, the stretch air hole 70 is configured to be in communication with the air release hole 53 through the stretch air passage 73 and the inner space of the weft yarn travel passage forming member 50. FIG. 5 is a bottom view of the stretch mechanism 40 illustrated in FIG. 3. As illustrated in FIG. 5, the stretch air hole 70 is opened at a bottom surface of the lower portion 43 in a central portion thereof.

**[0015]** FIG. 6 is a cross-sectional plan view of the upper portion 41 of the stretch mechanism 40 illustrated in FIG. 3. As illustrated in FIG. 6, the weft yarn travel passage forming member 50 of the stretch mechanism 40 has a bending portion 54 near the projection 42 between the yarn inlet 51 and the yarn outlet 52 in an inside of the weft yarn travel passage forming member 50. The bending portion 54 has a generally trapezoidal shape, projecting from a rear side towards the front side of the air jet loom. Here, a dimension of an inside (inner space) of the weft yarn travel passage forming member 50 in a horizontal direction along the front-rear direction of the air jet loom will be referred to as a width of the inside of the weft yarn travel passage forming member 50. A width of the inside of the weft yarn travel passage forming member 50 at the bending portion 54 is formed narrower than widths of the inside of the weft yarn travel passage forming member 50 at the yarn inlet 51 and the yarn outlet 52. As a result, the weft yarn travel passage forming member 50 is formed so that a center line of the inner space of the weft yarn travel passage forming member 50 is bent toward the front of the air jet loom at the bending portion 54.

**[0016]** The bending portion 54 has a stretch air discharge port 74 that is connected to the stretch air passage 73 (see FIG. 4) at a position where the width of the inner space of the weft yarn travel passage forming member 50 is the narrowest and is opened upwardly in a substantially vertical direction. Thus, the stretch air hole 70 is in communication with the stretch air discharge port 74 through the stretch air passage 73. The stretch air discharge port 74 and the air release hole 53 are opened so that opening of the stretch air discharge port 74 and the air release hole 53 substantially overlap with each other, as viewed in the vertical direction. The stretch air discharge port 74 corresponds to a second air discharge member.

**[0017]** An air blow nozzle 63 is formed in the projection 42, and the air blow nozzle 63 has the air blow hole 60 as an inlet through which air flows into the air blow nozzle

63. The air blow nozzle 63 extends along a part of the inner wall of the weft yarn travel passage forming member 50 between the bending portion 54 and the yarn outlet 52, to a position between the bending portion 54 and the yarn outlet 52. The air blow nozzle 63 has an air blow port 64 at a tip end that is opposite from the air blow hole 60. The air blow port 64 is opened to the inner space of the weft yarn travel passage forming member 50 on the right side of the bending portion 54, i.e., on the side of the weft yarn travel passage adjacent to the yarn outlet 52, and at a position between the bending portion 54 and the yarn outlet 52. A space is formed between the air blow port 64 and the part of the inner wall of the weft yarn travel passage forming member 50 between the bending portion 54 and the yarn outlet 52, which allows the weft yarn 23 to pass therethrough. The air blow nozzle 63 corresponds to a first air discharge member.

**[0018]** The following will describe the operation of the stretch mechanism 40 according to the present embodiment.

**[0019]** Referring to FIG. 3, at a weft insertion of the weft yarn 23, air discharged from the main nozzle and the sub-nozzle acts on the weft yarn 23, so that the weft yarn 23 travels through the weft yarn guide passage 11 of the modified reed 10 from the left side to the right side of the air jet loom illustrated in FIG. 3, i.e., from the upstream to the downstream of a flow of air discharged from the main nozzle. After the weft yarn 23 travels to a position of the selvage yarns 22, the weft yarn 23 is introduced to the inner space of the weft yarn travel passage forming member 50 of the stretch mechanism 40 through the yarn inlet 51.

**[0020]** As illustrated in FIG. 4, when the weft yarn 23 is introduced from the yarn inlet 51 in a direction indicated by an arrow A, the control device opens the air valve, thereby supplying air from the air supply source to the air blow hole 60 through the air blow hose 62 (see FIG. 3) in a direction indicated by an arrow F.

**[0021]** The air supplied to the air blow hole 60 in the direction indicated by the arrow F is discharged in a direction indicated by an arrow G from the air blow port 64 at the tip end of the air blow nozzle 63, as illustrated in FIG. 6. In other words, the air is discharged from the air blow nozzle 63 (air blow) in a direction along the weft yarn travel passage forming member 50, more specifically, in the direction along the part of the inner wall of the weft yarn travel passage forming member 50 extending between the bending portion 54 and the yarn outlet 52. This air flow causes the weft yarn 23 to be drawn in a direction indicated by an arrow B towards the yarn outlet 52, when the weft yarn 23 is introduced from the yarn inlet 51. This allows the weft yarn 23 to be smoothly introduced to the yarn inlet 51.

**[0022]** Then, the weft yarn 23 travels in the direction indicated by the arrow B, while being bent at the bending portion 54, towards the front side of the air jet loom. Thus, the weft yarn 23 travels while being in contact with the bending portion 54. A first tension is applied to the weft

yarn 23 by the bending of the weft yarn 23 at the bending portion 54 and friction generated by the contact of the weft yarn 23 with the bending portion 54. After a leading end of the weft yarn 23 passes the bending portion 54 and is drawn out of the yarn outlet 52, the control device opens the air valve to supply stretching air from the air supply source to the stretch air hole 70 illustrated in FIG. 4 through the stretch air hose 72 (FIG. 3) in a direction indicated by an arrow C. The stretching air supplied to the stretch air hole 70 flows through the stretch air passage 73 in a direction indicated by an arrow D, which is an upward direction. Then, the stretching air is discharged from the stretch air discharge port 74 illustrated in FIG. 6 in the substantially vertical direction. That is, the stretching air is discharged from the stretch air discharge port 74 in a direction different from the direction along the weft yarn travel passage forming member 50.

**[0023]** The stretching air is discharged preferably at a timing at which the weft yarn 23 is travelled and fully stretched. Then, the stretching air flows out mainly from the air release hole 53 (see FIG. 4) formed in the upper portion of the weft yarn travel passage forming member 50.

**[0024]** At the bending portion 54, the weft yarn 23 receives the stretching air discharged from the stretch air discharge port 74 upward in the substantially vertical direction that is different from the direction along the weft yarn travel passage forming member 50. Thus, the weft yarn 23 is bent in a direction indicated by an arrow H, i.e., upward in the substantially vertical direction, as illustrated in FIG. 7, and is pressed against an upper surface of the inner wall of the bending portion 54 and against a corner 53a of the air release hole 53. As a result, a second tension is applied to the weft yarn 23 by friction between the weft yarn 23 and the upper surface of the inner wall of the bending portion 54 and friction between the weft yarn 23 and the corner 53a of the air release hole 53.

**[0025]** A great tension may be applied to the weft yarn 23 by applying the first tension, which is applied to the weft yarn 23 when the weft yarn 23 travels while being bent, and the second tension, which is applied to the weft yarn 23 when the weft yarn 23 is pressed against the bending portion 54 in the direction of the arrow H by the stretching air. Therefore, the quality of woven cloth may be increased by suppressing loosening of the weft yarn 23, as compared with a case in which only one of the first tension and the second tension is applied to the weft yarn 23.

**[0026]** The control device stops supplying air to the air blow hole 60 after the stretching air is discharged from the stretch air discharge port 74. Thus, the air blow from the air blow port 64 stops. As a result, the cost for weaving may be reduced by reducing air consumption.

**[0027]** As another method for applying the tension to the weft yarn 23, the air blow (air discharge) from the air blow nozzle 63 illustrated in FIG. 6 in the direction along the weft yarn travel passage forming member 50 is in-

tensified may be considered. However, when a covered yarn is used for the weft yarn 23, a covering yarn may travel separately from and ahead of a core yarn of the weft yarn 23, and is discharged out from the yarn outlet 52 ahead of the core yarn. Consequently, the weft yarn detection device 14 for the weft yarn 23 disposed on the right of the stretch mechanism 40, as illustrated in FIG. 3, may detect the separated covering yarn, which may result in excessive detection of a long pick and yarn breakage of the weft yarns 23 caused by air-blow. Therefore, this method may cause unnecessary stops during the weaving process, which may lead to an increase the cost for weaving.

**[0028]** On the other hand, according to the present embodiment, strong air blow from the air blow nozzle 63 in the direction along the weft yarn travel passage forming member 50 does not takes place. Thus, even when the covered yarn is used for the weft yarn 23, the separation of the covering yarn from the core yarn is suppressed. Therefore, the occurrence of the unnecessary stopping during the weaving process is reduced.

**[0029]** Further, as a weft yarn tensioning device for the air jet loom, a device that applies a tension to the weft yarn by bending the weft yarn towards the rear of the air jet loom, i.e., towards the rear side of the reed, has been known. In such a weft yarn tensioning device, however, the weft yarn is bent towards the rear side of the reed, and pulls warp yarns, so that warp yarns are bent towards the rear side of the reed and pushes the dents of the reed. Especially, in a reed provided with dents highly densely, the reed may be damaged.

**[0030]** On the other hand, according to the present embodiment, air is discharged from the air blow nozzle 63 in the direction along the weft yarn travel passage forming member 50, and the stretching air is discharged from the stretch air discharge port 74 to the weft yarn introduced to the inner space of the weft yarn travel passage forming member 50 in the direction of the arrow H, i.e., upward in the substantially vertical direction. Therefore, the yarns is unlikely to push the dents of the modified reed 10, which prevents damaging the modified reed 10.

**[0031]** As has been described, the stretch mechanism 40 according to the present embodiment includes the weft yarn travel passage forming member 50 disposed in front of the modified reed 10 and extending along the weft yarn guide passage 11 in the air jet loom in which the weft yarn 23 is inserted along the weft yarn guide passage 11 formed in the modified reed 10, the air blow nozzle 63 from which air is discharged in the direction along the weft yarn travel passage forming member 50, and the stretch air discharge port 74 from which the stretch air is discharged in the direction different from the direction along the weft yarn travel passage forming member 50. The air blow nozzle 63 is configured to discharge air to cause the weft yarn 23 to be introduced to the inner space of the weft yarn travel passage forming member 50, and the stretch air discharge port 74 is configured to discharge air to the weft yarn 23 having been

introduced into the inner space of the weft yarn travel passage forming member 50. Thus, a sufficient tension may be applied to the weft yarn 23 with a simple configuration of the weft yarn tensioning device.

**[0032]** According to the stretch mechanism 40 of the present embodiment, since the weft yarn travel passage forming member 50 has the bending portion 54, a great yarn tension may be applied to the weft yarn 23 by the friction between the weft yarn 23 and the bending portion 54.

**[0033]** Further, in the stretch mechanism 40 of the present embodiment, air is discharged from the stretch air discharge port 74 at the bending portion 54. Thus, the weft yarn 23 that is bent towards the front side of the air jet loom at the bending portion 54 is bent upward in the substantially vertical direction, i.e., in the direction of the arrow H, and pressed against the upper surface of the inner wall of the bending portion 54 and against the corner 53a of the air release hole 53, so that a great frictional force is generated. As a result, a further greater tension may be applied to the weft yarn 23.

**[0034]** According to the stretch mechanism 40 of the present embodiment, air discharge from the air blow nozzle 63 stops after the stretching air is discharged from the stretch air discharge port 74, so that air consumption is reduced, thereby reducing the cost for the weaving process.

**[0035]** Although air discharge from the air blow nozzle 63 stops after the stretching air is discharged from the stretch air discharge port 74 in the above-described embodiment, air discharge from the air blow nozzle 63 may be continued after the air is discharged from the stretch air discharge port 74 when a yarn having a structure less likely to be split off such as filament is used for the weft yarn 23.

**[0036]** In this way, in the stretch mechanism 40 according to the above-described embodiment, the air blow nozzle 63 may continue the air discharge after the air is discharged from the stretch air discharge port 74. Thus, in addition to the above-described first tension and the second tension, a third tension may be applied to the weft yarn 23 by the air blown in the direction along the weft yarn travel passage forming member 50, which allows a further greater yarn tension to be applied to the weft yarn 23.

**[0037]** In order to increase an weft yarn fully stretched amount of the weft yarn 23 and a period of time in which the weft yarn 23 is fully stretched while traveling, the air blow nozzle 63 may continue blowing the air after the air is discharged from the stretch air discharge port 74. An air blow nozzle may be added to a position different from the position of the air blow nozzle 63 so as to add air blow.

**[0038]** Although the stretch air discharge port 74 is opened upward in the substantially vertical direction in the above-described embodiment, the stretch air discharge port 74 may be opened in a direction other than the direction in which air is discharged from the air blow nozzle 63. For example, the stretch air discharge port 74

may be opened towards the front side of the air jet loom, i.e., in a direction away from the modified reed 10. Thus, the stretch mechanism 40 applies a tension to the weft yarn 23 by discharging stretch air in a direction different from the direction along the travelling direction of the weft yarn 23, similarly to the above described embodiment.

**[0039]** The present invention is not limited to the above-described embodiments, but may be modified in various manner within the scope of the present invention.

**[0040]** A weft yarn tensioning device (40) of an air jet loom in which a weft yarn (23) is inserted along a weft yarn guide passage (11) formed in a reed (10). The weft yarn tensioning device (40) includes a weft yarn travel passage (50) extending along the weft yarn guide passage (11), a first air discharge member (63) configured to discharge an air in a direction along the weft yarn travel passage (50), a second air discharge member (74) configured to discharge the air in a direction different from the direction along the weft yarn travel passage (50). The first air discharge member (63) discharges the air to introduce the weft yarn (23) into the weft yarn travel passage (50), and the second air discharge member (74) discharges the air to the weft yarn (23) in the weft yarn travel passage (50).

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3. The weft yarn tensioning device (40) according to claim 2, **characterized in that** the second air discharge member (74) discharges the air at the bending portion (54).

4. The weft yarn tensioning device (40) according to any one of claims 1 to 3, **characterized in that** the first air discharge member (63) stops discharging air after the second air discharge member (74) discharges the air.

5. The weft yarn tensioning device (40) according to any one of claims 1 to 3, **characterized in that** the first air discharge member (63) continues discharging the air after the second air discharge member (74) discharges the air.

## Claims

1. A weft yarn tensioning device (40) of an air jet loom in which a weft yarn (23) is inserted along a weft yarn guide passage (11) formed in a reed (10), the weft yarn tensioning device (40) being disposed in front of the reed (10) at a weft yarn arrival side of the air jet loom, the weft yarn tensioning device (40) comprising:

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a weft yarn travel passage (50) extending along the weft yarn guide passage (11);

a first air discharge member (63) configured to discharge an air in a direction along the weft yarn travel passage (50); and

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a second air discharge member (74) configured to discharge the air in a direction different from the direction along the weft yarn travel passage (50),

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**characterized in that**

the first air discharge member (63) discharges the air to introduce the weft yarn (23) into the weft yarn travel passage (50),

the second air discharge member (74) discharges the air to the weft yarn (23) in the weft yarn travel passage (50).

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2. The weft yarn tensioning device (40) according to claim 1, **characterized in that** the weft yarn travel passage (50) includes a bending portion (54).

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FIG. 1

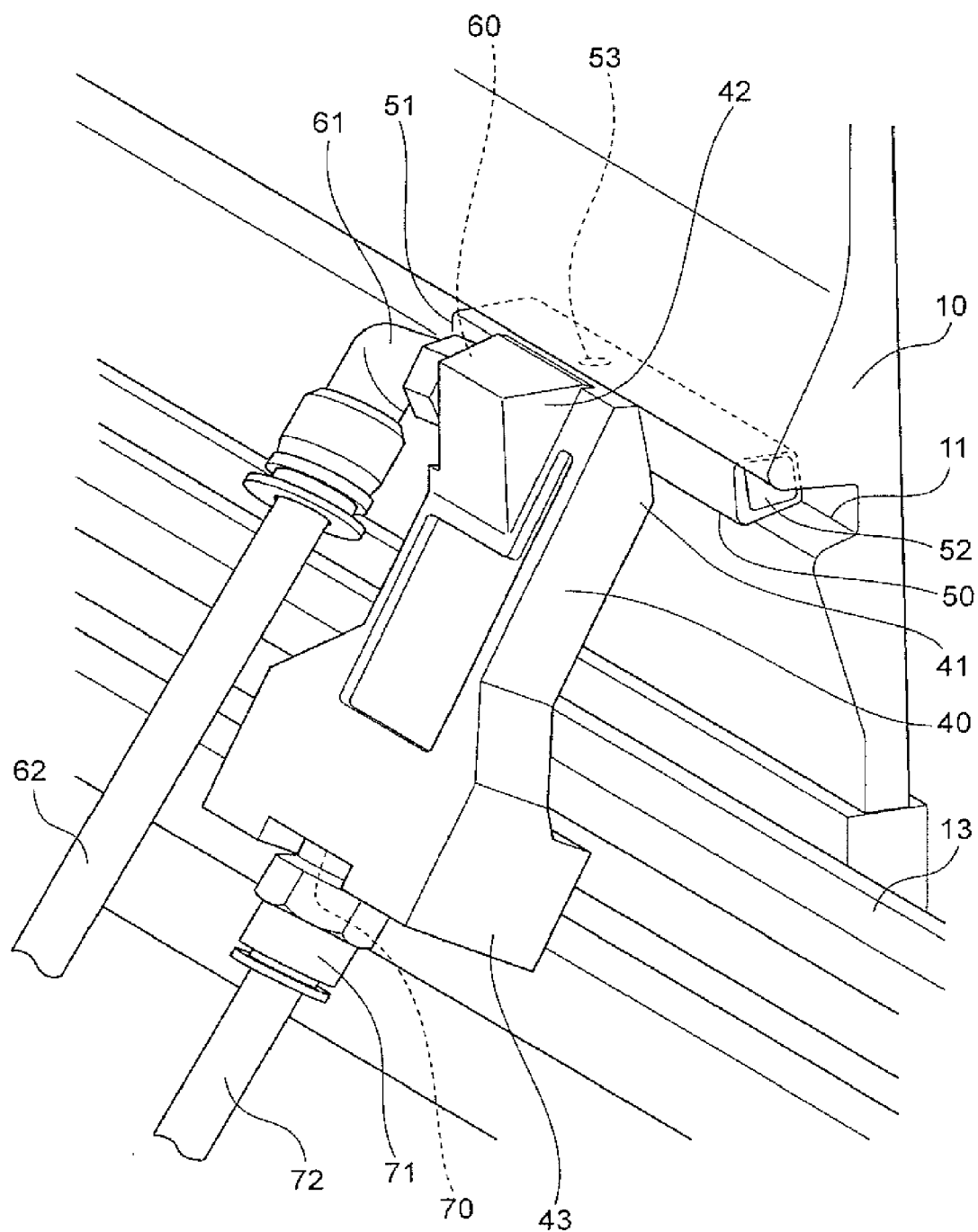


FIG. 2

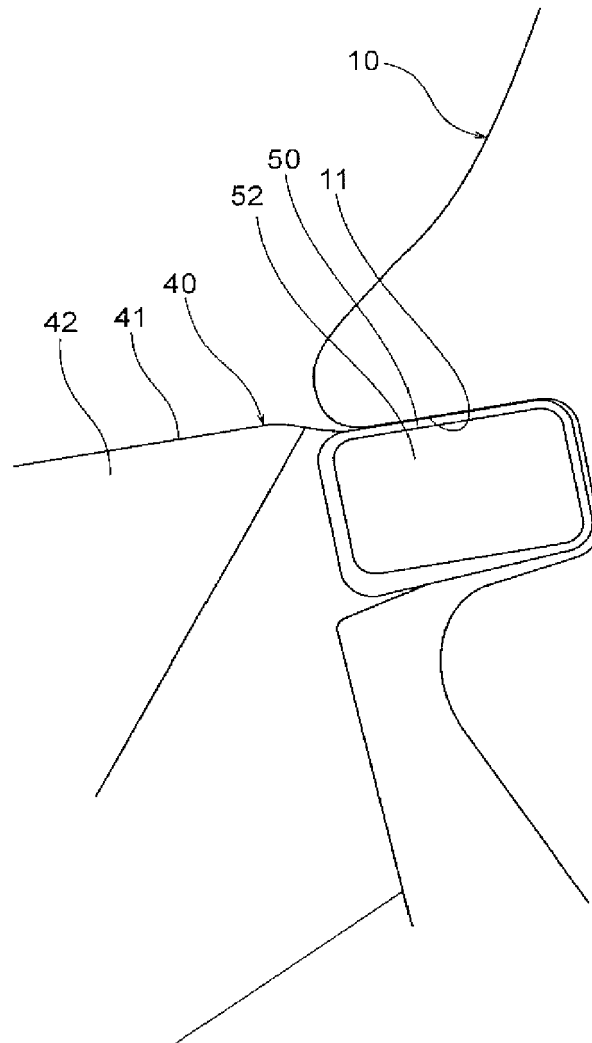


FIG. 3

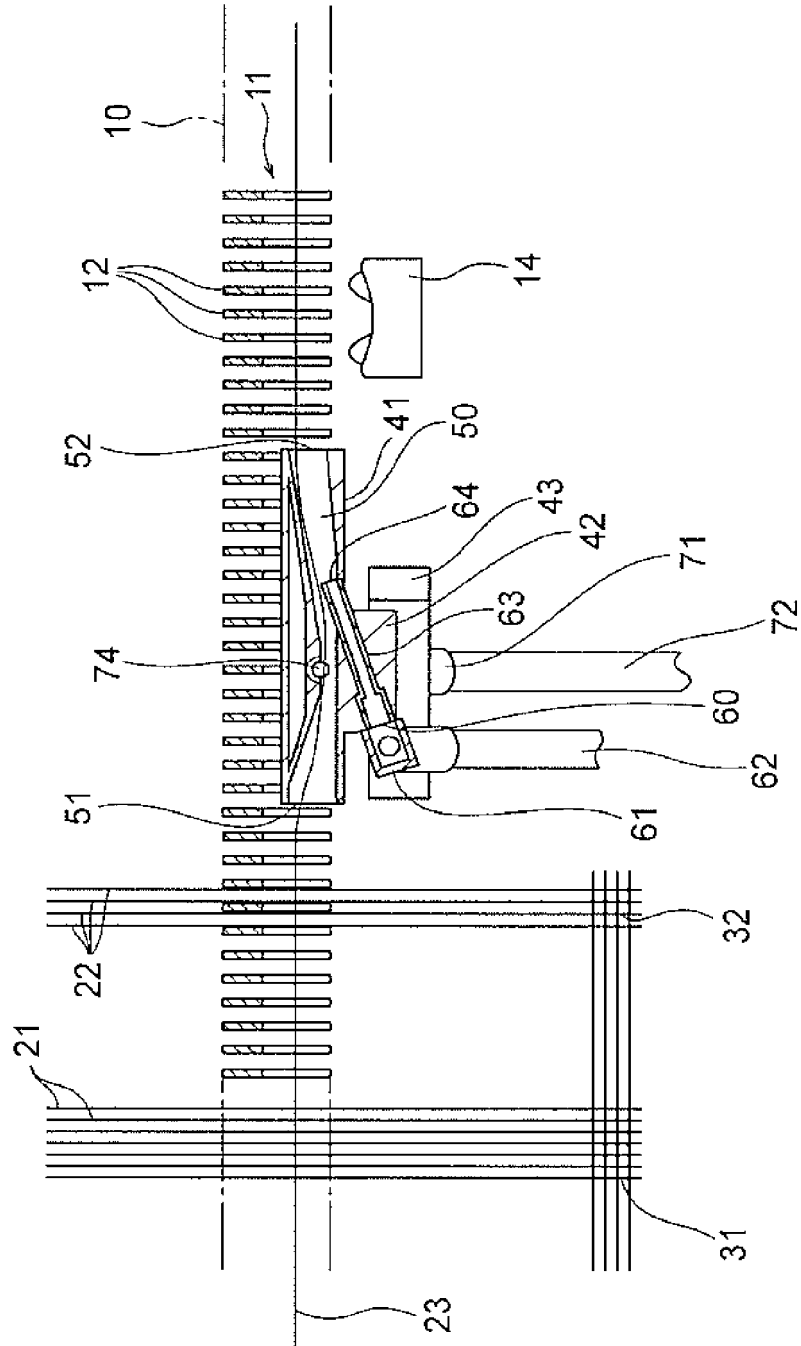


FIG. 4

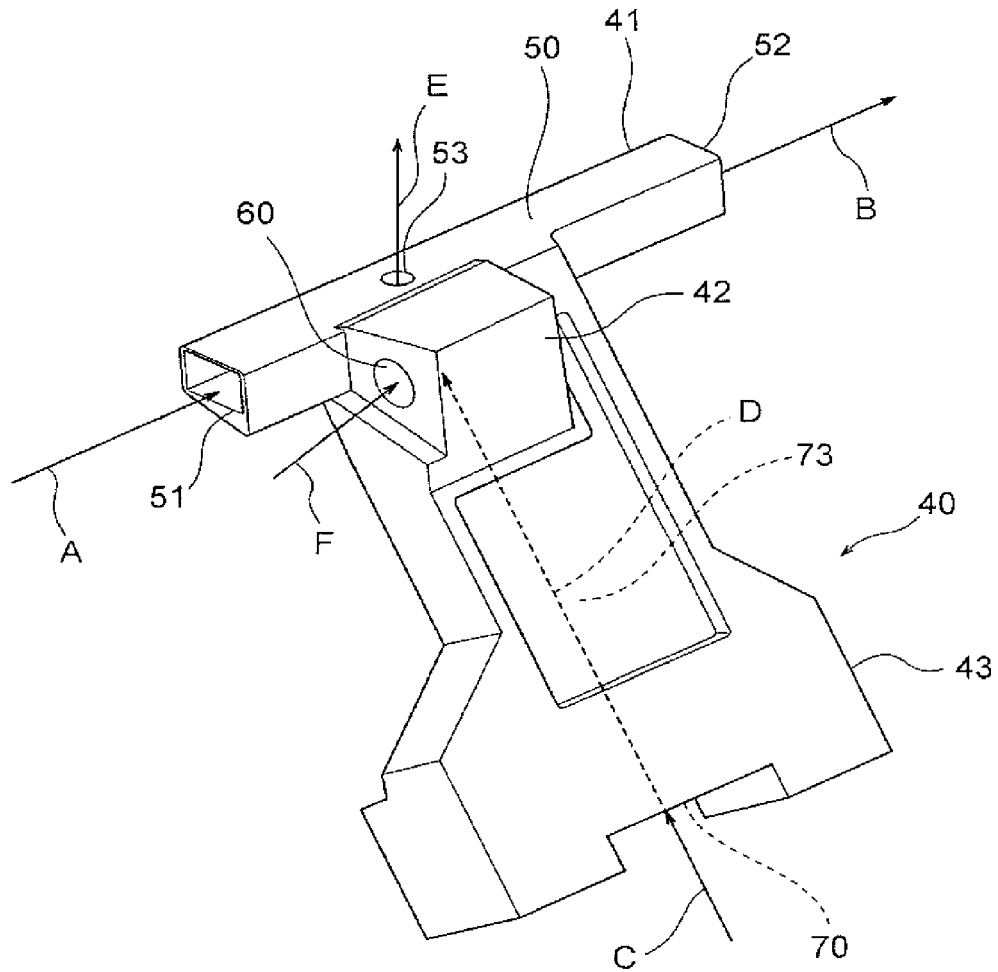


FIG. 5

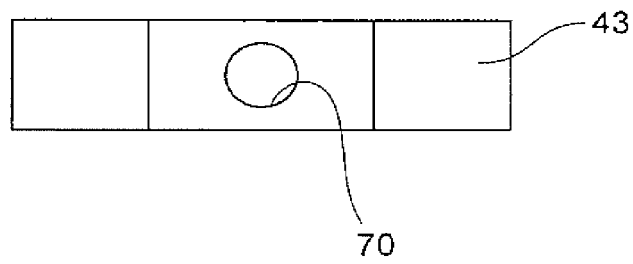


FIG. 6

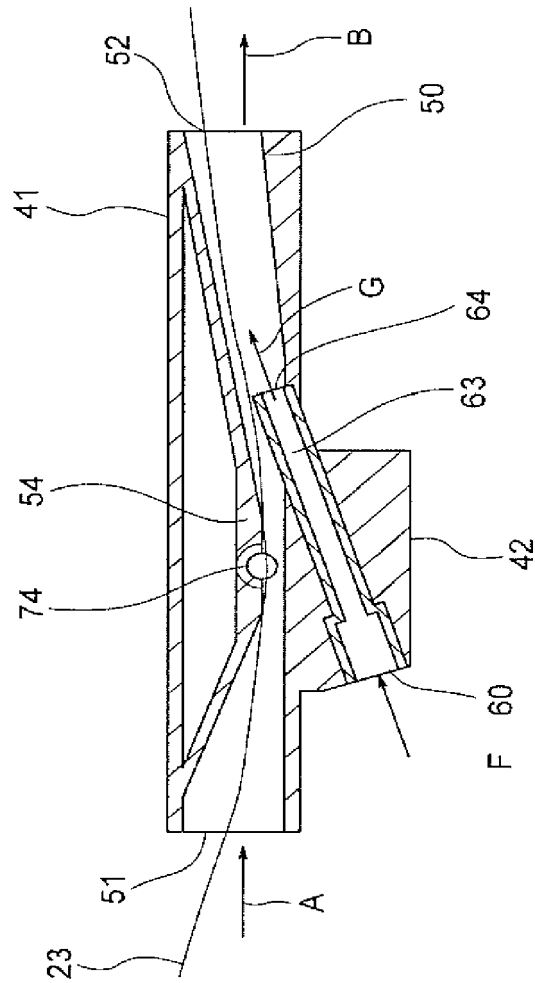
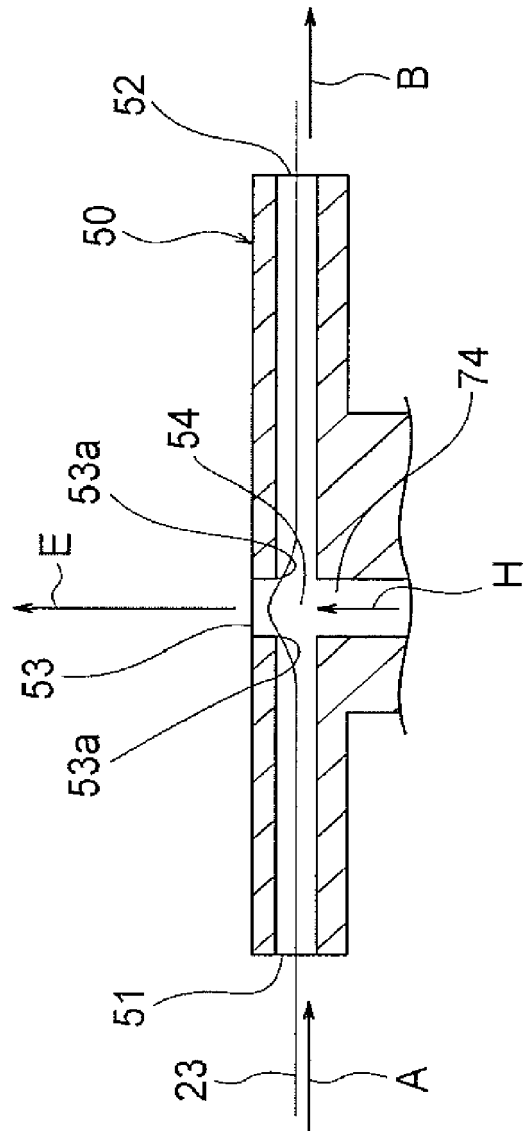


FIG. 7





## EUROPEAN SEARCH REPORT

Application Number  
EP 21 18 1047

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| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                    |                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                       |                                         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| Category                                                                                                                                                                                                                                               | Citation of document with indication, where appropriate, of relevant passages                                                                                                                                        | Relevant to claim                                                                                                                                                                                                                                                                     | CLASSIFICATION OF THE APPLICATION (IPC) |
| A,D                                                                                                                                                                                                                                                    | JP 2010 285713 A (TOYOTA IND CORP)<br>24 December 2010 (2010-12-24)<br>* paragraphs [0022] - [0036]; figures 1-10<br>*                                                                                               | 1-5                                                                                                                                                                                                                                                                                   | INV.<br>D03D47/30                       |
| A                                                                                                                                                                                                                                                      | BE 1 017 893 A5 (TE STRAKE TEXTILE BV<br>[NL]) 6 October 2009 (2009-10-06)<br>* page 5, lines 25,26 *<br>* page 12, line 22 - page 13, line 25 *<br>* page 17, line 11 - page 19, line 18;<br>figures 1-9 *<br>----- | 1-5                                                                                                                                                                                                                                                                                   |                                         |
|                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                       | TECHNICAL FIELDS<br>SEARCHED (IPC)      |
|                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                       | D03D                                    |
| The present search report has been drawn up for all claims                                                                                                                                                                                             |                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                       |                                         |
| Place of search<br><b>Munich</b>                                                                                                                                                                                                                       |                                                                                                                                                                                                                      | Date of completion of the search<br><b>24 November 2021</b>                                                                                                                                                                                                                           | Examiner<br><b>Louter, Petrus</b>       |
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