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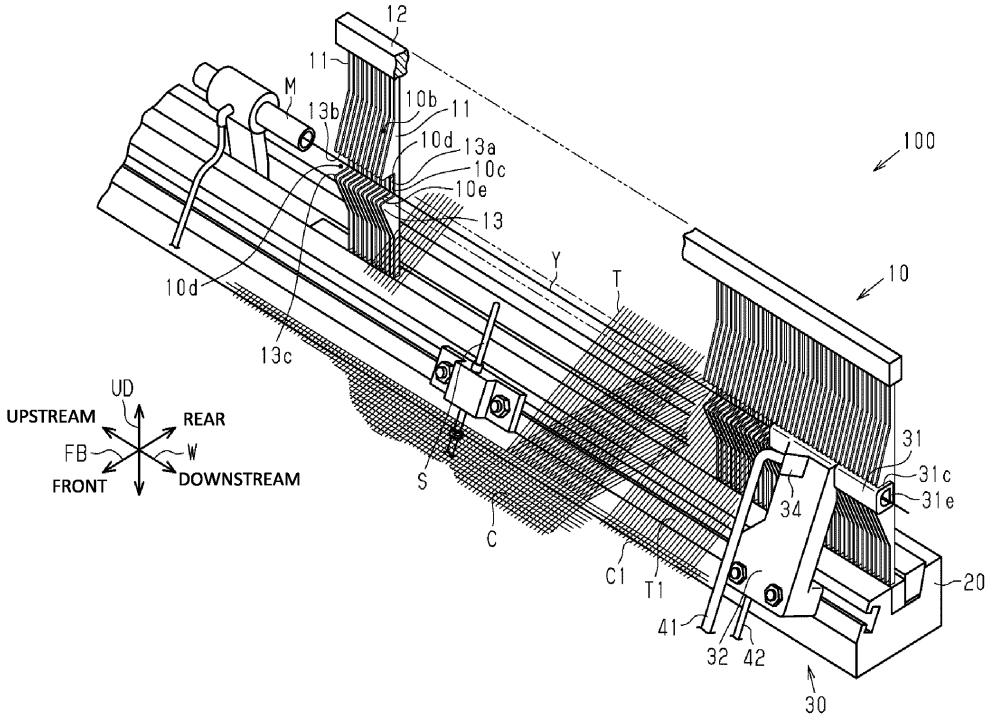
(54) **TENSIONING DEVICE FOR AIR JET LOOM**

(57) A tensioning device (30) for an air jet loom (100) that inserts a weft yarn (Y) along a weft yarn guide passage (10a) formed in a reed (10) formed of a plurality of reed dents (11) that are arranged with gaps (10b) in a weft insertion direction (W), includes a passage defining portion (31) that defines a weft yarn traveling passage (31a). The passage defining portion (31) has an upper surface (31c) and an air exhaust port (31d) facing at least one of the gaps (10b). The tensioning device (30) is configured to tension the weft yarn (Y). The passage defining portion (31) has a protrusion (50) that comes in contact with at least one of adjacent two of the reed dents (11) such that the protrusion (50) widens one of the gaps (10b) facing the air exhaust port (31d) and defining by the two adjacent reed dents.

FIG. 1



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Description

BACKGROUND ART

[0001] The present invention relates to a tensioning device for an air jet loom.

[0002] Conventionally, an air jet loom has a reed formed of a plurality of reed dents arranged in a weft insertion direction and inserts a weft yarn along a weft yarn guide passage provided in the reed. The reed dents are arranged at regular intervals in the weft insertion direction. A gap is formed between the reed dents arranged side by side. A warp yarn passes through each gap located within a weaving width.

[0003] The air jet loom has a tensioning device that tensions the inserted weft yarn. The tensioning device tensions the weft yarn traveling through the weft yarn guide passage to prevent the weft yarn from becoming loose. This contributes to weaving of high-quality fabric. For example, a weft yarn tensioning device described in Japanese Patent Application Publication No. 2022-014545 includes an upper stretch mechanism portion corresponding to a passage defining portion by which a weft yarn traveling passage is formed and a lower stretch mechanism portion in which a stretch air passage is formed. An air release hole is opened in an upper surface of the weft yarn traveling passage of the upper stretch mechanism portion, and serves as an air exhaust port.

[0004] In addition, the weft yarn tensioning device described in the Publication includes an air blow nozzle having an air blow injection port and a stretch air injection port from which air is injected in a direction different from a direction along the weft yarn traveling passage. The air blow nozzle injects air in the direction along the weft yarn traveling passage. The injected air introduces the weft yarn into the weft yarn traveling passage and tensions the weft yarn. Air supplied through the stretch air passage is injected from the stretch air injection port toward the weft yarn introduced into the weft yarn traveling passage. The air injected from the stretch air injection port tensions the weft yarn in the weft yarn traveling passage, and then, is exhausted outside the upper stretch mechanism portion through the air release hole. After the air is exhausted through the air release hole, the air passes through a gap located above the air release hole.

[0005] Fluff generated during the weaving may pass through the weft yarn traveling passage, and then, may be discharged outside the upper stretch mechanism portion together with the air exhausted through the air release hole. The fluff discharged outside the upper stretch mechanism portion may pile up in the gap located above the air release hole.

SUMMARY

[0006] In accordance with an aspect of the present invention, there is provided a tensioning device for an air jet loom that inserts a weft yarn along a weft yarn guide passage formed in a reed, the reed being formed of a plurality of reed dents that are arranged side by side with gaps in a weft insertion direction in which the weft yarn is inserted. The tensioning device includes a passage defining portion that defines a weft yarn traveling passage extending along the weft yarn guide passage. The passage defining portion has an upper surface facing an upper wall of the reed, the upper wall partially defining the weft yarn guide passage, and an air exhaust port being opened in the upper surface and communicating with the weft yarn traveling passage. The air exhaust port faces at least one of the gaps. The tensioning device is configured to tension the weft yarn by injecting air into the weft yarn traveling passage, the air being discharged through the air exhaust port. The passage defining portion has a protrusion that comes in contact with at least one of adjacent two of the reed dents such that the protrusion widens one of the gaps facing the air exhaust port and defined by the two adjacent reed dents.

[0007] Other aspects and advantages of the invention will become apparent from the following description, taken in conjunction with the accompanying drawings, illustrating by way of example the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The invention, 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 perspective view illustrating an air jet loom;
FIG. 2 is an enlarged view illustrating a tensioning device and a reed;
FIG. 3 is an enlarged view illustrating the tensioning device and reed dents;
FIG. 4 is a perspective view illustrating the tensioning device;
FIG. 5 is an enlarged view illustrating the tensioning device;
FIG. 6 is a view schematically illustrating an attachment of the tensioning device to the reed; and
FIG. 7 is an enlarged view illustrating a tensioning device and reed dents according to a modification.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0009] The following will describe an embodiment of a tensioning device for an air jet loom with reference to FIG. 1 to FIG. 6.

<Air jet loom>

[0010] As illustrated in FIG. 1, an air jet loom 100 includes a main nozzle M, a sub nozzle S, a reed 10, a

sley 20, and a tensioning device 30. A weft yarn guide passage 10a through which a weft yarn Y travels is formed in the reed 10. A direction in which the weft yarn guide passage 10a extends coincides with a longitudinal direction of the sley 20. The weft yarn Y is inserted from the main nozzle M into the weft yarn guide passage 10a. That is, the air jet loom 100 inserts the weft yarn Y along the weft yarn guide passage 10a formed in the reed 10. The weft yarn Y travels in the longitudinal direction of the sley 20. A direction in which the weft yarn Y travels is referred to as a weft insertion direction W. Hereinafter, a side in the weft insertion direction W on which the main nozzle M is located is referred to as an "upstream" side, and a side in the weft insertion direction W opposite to the upstream side is referred to as a "downstream" side.

[0011] In the air jet loom 100, the weft yarn Y is beaten by the reed 10 after being inserted. A direction in which the reed 10 moves during the beating is referred to as a front-rear direction FB. The front-rear direction FB is orthogonal to the weft insertion direction W. A direction orthogonal to each of the weft insertion direction W and the front-rear direction FB is referred to as an up-down direction UD. The up-down direction UD coincides with a vertical direction.

[0012] In the air jet loom 100, the reed 10 and the weft yarn Y are arranged in the front-rear direction FB. The air jet loom 100 weaves fabric C. Aside in the front-rear direction FB on which the woven fabric C is wound is referred to as a "front" side, and a side in the front-rear direction FB opposite to the front side is referred to as a "rear" side.

<Main nozzle and sub nozzle>

[0013] The main nozzle M is provided on the sley 20. The main nozzle M is fixed to the sley 20 and located on the upstream side in the weft insertion direction W. The weft yarn Y is inserted from the main nozzle M into the weft yarn guide passage 10a. The main nozzle M is attached to the sley 20 so that its position is adjustable in the weft insertion direction W.

[0014] The sub nozzle S is fixed to the sley 20. Air is injected from the sub nozzle S into the weft yarn guide passage 10a. A direction in which air is injected from the sub nozzle S is along the weft insertion direction W. Then, the weft yarn Y travels in the weft insertion direction W through the weft yarn guide passage 10a by the air injection from the main nozzle M and the sub nozzle S.

<Reed>

[0015] The reed 10 has a plurality of the reed dents 11 and a holding member 12.

[0016] The holding member 12 holds the plurality of the reed dents 11. The plurality of the reed dents 11 are arranged in a line in the weft insertion direction W of the weft yarn Y. That is, in the air jet loom 100, the plurality of the reed dents 11 are arranged side by side in the weft insertion direction W of the weft yarn Y. A gap 10b is defined by any adjacent two of the reed dents 11 in the weft insertion direction W therebetween. In other words, in the reed 10, the gaps 10b are defined by the reed dents 11 arranged side by side. In the reed 10, a plurality of the gaps 10b are formed. A warp yarn T passes through each of the gap 10b. However, the warp yarn T does not pass through each of the gaps 10b located at a position where the tensioning device 30, which will be described later, is provided. In the reed 10, the intervals of the gaps 10b are constant excluding the gap 10b into which a protrusion 50 illustrated in FIG. 2 is inserted.

[0017] As illustrated in FIG. 1 and FIG. 3, each of the reed dents 11 has a recess 13. The reed dents 11 are each recessed from its front surface toward its rear surface to form the recess 13. The reed dents 11 each have a rear side edge 13a, an upper side edge 13b, and a lower side edge 13c. The recess 13 is defined by the rear side edge 13a, the upper side edge 13b, and the lower side edge 13c. The rear side edge 13a is located at the most rearward position from the front surface of the reed dent 11, as viewed in the weft insertion direction W. The rear side edge 13a extends in the up-down direction UD of the reed dent 11. The upper side edge 13b extends from an upper end of the rear side edge 13a toward the front surface of the reed dent 11. The upper side edge 13b extends in the front-rear direction FB of the reed dent 11. The lower side edge 13c extends from a lower end of the rear side edge 13a toward the front surface of the reed dent 11. The lower side edge 13c extends in the front-rear direction FB of the reed dent 11. Note that the weft yarn guide passage 10a is formed of the recesses 13 of all of the reed dents 11, which are arranged side by side in the weft insertion direction W.

[0018] The reed 10 has a rear wall 10c, an upper wall 10d, and a lower wall 10e. The rear wall 10c is a portion of the reed 10 in which a plurality of the rear side edges 13a are arranged. Accordingly, the rear wall 10c is formed of the plurality of the rear side edges 13a arranged side by side in the weft insertion direction W. The upper wall 10d is a portion of the reed 10 in which a plurality of the upper side edges 13b are arranged. Accordingly, the upper wall 10d is formed of the plurality of the upper side edges 13b arranged side by side in the weft insertion direction W. The lower wall 10e is a portion of the reed 10 in which a plurality of the lower side edges 13c are arranged. Accordingly, the lower wall 10e is formed of the plurality of the lower side edges 13c arranged side by side in the weft insertion direction W. The weft yarn guide passage 10a is defined by the rear wall 10c, the upper wall 10d, and the lower wall 10e. That is, the reed 10 has the rear wall 10c that partially defines the weft yarn guide passage 10a.

[0019] As illustrated in FIG. 1, the warp yarn T passes through each of the gaps 10b. The warp yarn T extends in the front-rear direction FB. The air jet loom 100 weaves the fabric C by interlacing the weft yarns Y and the warp yarns T. The woven fabric C is spread in front of the air jet loom 100. A selvedge yarn T1 passes through each of the

gaps 10b upstream of the tensioning device 30. A plurality of the selvedge yarns T1 form a waste selvedge C1 together with some of the weft yarns Y.

<Tensioning device>

[0020] The tensioning device 30 captures an end portion of the weft yarn Y and tensions the weft yarn Y. In addition, the tensioning device 30 appropriately tensions the weft yarn Y to prevent the weft yarn Y from becoming loose.

[0021] The tensioning device 30 is disposed in front of the reed 10. The tensioning device 30 is located near the end portion of the weft yarn Y inserted into the weft yarn guide passage 10a and downstream of the selvedge yarns T1 of the waste selvedge C1 in the weft insertion direction W.

[0022] The tensioning device 30 has a passage defining portion 31 and a supply portion 32. The tensioning device 30 is fixed to the sley 20 by attaching a lower end portion of the supply portion 32 in the up-down direction UD to the sley 20.

[0023] The passage defining portion 31 is formed in a cylindrical shape. The passage defining portion 31 is provided at an upper end portion of the supply portion 32 in the up-down direction UD. The passage defining portion 31 is disposed in the weft yarn guide passage 10a. The passage defining portion 31 is accommodated in the weft yarn guide passage 10a. The passage defining portion 31 is disposed so as to extend over a plurality of the reed dents 11.

[0024] As illustrated in FIG. 2 to FIG. 4, the passage defining portion 31 has a passage portion rear surface 31e and a passage portion upper surface 31c as an upper surface of the passage defining portion 31. The passage portion rear surface 31e is one of outer surfaces of the passage defining portion 31, which extends along the plurality of the rear side edges 13a. The passage portion upper surface 31c is one of the outer surfaces of the passage defining portion 31, which extends along the plurality of the upper side edges 13b. In other words, the passage defining portion 31 has the passage portion upper surface 31c facing the upper wall 10d of the reed 10, which partially defines the weft yarn guide passage 10a.

[0025] Each of the passage portion rear surface 31e and the passage portion upper surface 31c of the passage defining portion 31 is in contact with the reed 10. That is, the tensioning device 30 is in contact with the plurality of the reed dents 11 on each of the passage portion rear surface 31e and the passage portion upper surface 31c of the passage defining portion 31.

[0026] The passage defining portion 31 defines a weft yarn traveling passage 31a. The weft yarn traveling passage 31a extends along the weft insertion direction W. That is, the passage defining portion 31 defines the weft yarn traveling passage 31a extending along the weft yarn guide passage 10a. A yarn inlet 30b of the weft yarn traveling passage 31a is opened in an upstream end of the passage defining portion 31 in the weft insertion direction W. The weft yarn Y is introduced into the weft yarn traveling passage 31a through the yarn inlet 30b. A yarn outlet 30c of the weft yarn traveling passage 31a is opened in a downstream end of the passage defining portion 31 in the weft insertion direction W.

[0027] As illustrated in FIG. 1 and FIG. 4, the passage defining portion 31 has an air injection portion 34. A first air injection port 34a is formed in the air injection portion 34. The first air injection port 34a is connected to a first air supply tube 41. Air supplied through the first air supply tube 41 is injected from the first air injection port 34a into the weft yarn traveling passage 31a.

[0028] The supply portion 32 is located in front of the passage defining portion 31 in the front-rear direction FB and below the passage defining portion 31 in the up-down direction UD. The upper end portion of the supply portion 32 is connected to the passage defining portion 31, and the lower end portion of the supply portion 32 is attached to the sley 20.

[0029] As illustrated in FIG. 4, a stretch air passage 32a is defined in the supply portion 32. The stretch air passage 32a extends in the up-down direction UD inside the supply portion 32. A lower end of the stretch air passage 32a is connected to a second air supply tube 42 illustrated in FIG. 1. The stretch air passage 32a has, at an upper end thereof, a second air injection port 32b. As illustrated in FIG. 2 and FIG. 4, the second air injection port 32b is opened toward an inside of the weft yarn traveling passage 31a. That is, the stretch air passage 32a communicates with the weft yarn traveling passage 31a through the second air injection port 32b. In addition, the stretch air passage 32a extends in a direction different from the direction in which the weft yarn traveling passage 31a extends, and the second air injection port 32b is opened toward a direction orthogonal to the direction in which the weft yarn traveling passage 31a extends.

[0030] As illustrated in FIGS. 2 to 4, the passage defining portion 31 has a passage defining inner surface 31b that defines the weft yarn traveling passage 31a. The passage defining portion 31 has a stretch air exhaust port 31d as an air exhaust port. The stretch air exhaust port 31d is opened in the passage defining inner surface 31b and the passage portion upper surface 31c. The stretch air exhaust port 31d is aligned with the second air injection port 32b in the front-rear direction FB and located above the stretch air exhaust port 31d in the up-down direction UD. Air injected from the second air injection port 32b into the weft yarn traveling passage 31a crosses the weft yarn traveling passage 31a, and then, is discharged from the stretch air exhaust port 31d to the outside of the tensioning device 30. That is, the passage defining portion 31 has the stretch air exhaust port 31d that is opened in the passage portion upper surface 31c and communicates with the weft yarn traveling passage 31a.

[0031] As illustrated in FIG. 1, the tensioning device 30

is provided in front of the reed 10. The tensioning device 30 is provided in the air jet loom 100 such that the weft yarn traveling passage 31a forms a part of the weft yarn guide passage 10a in the weft insertion direction W. The tensioning device 30 is provided in the air jet loom 100 such that the passage portion upper surface 31c faces the upper wall 10d and the passage portion rear surface 31e faces the rear wall 10c. The passage portion upper surface 31c is in contact with the upper wall 10d. In addition, the passage portion rear surface 31e is in contact with the rear wall 10c. That is, each of the passage portion upper surface 31c and the passage portion rear surface 31e of the passage defining portion 31 is in contact with the reed 10.

[0032] As illustrated in FIG. 2, the stretch air exhaust port 31d faces a part of the upper wall 10d. In other words, the stretch air exhaust port 31d faces the upper side edges 13b of a part of the plurality of the reed dents 11 that form the reed 10. The stretch air exhaust port 31d faces each of the gaps 10b defined by such a part of the reed dents 11. That is, the stretch air exhaust port 31d faces at least one of the plurality of the gaps 10b formed in the reed 10. The gaps 10b facing the stretch air exhaust port 31d communicate with the weft yarn traveling passage 31a through the stretch air exhaust port 31d.

<Protrusion>

[0033] As illustrated in FIGS. 2 to 4, the tensioning device 30 has the protrusion 50. The protrusion 50 is provided on the passage portion upper surface 31c. The protrusion 50 is formed integrally with the passage defining portion 31. Note that the protrusion 50 may be joined to the passage portion upper surface 31c after being formed separately from the passage defining portion 31.

[0034] As illustrated in FIG. 4 and FIG. 5, the protrusion 50 has a longitudinal side extending in the front-rear direction FB. A first end of the protrusion 50 in a longitudinal direction thereof corresponds to a front end of the protrusion 50 in the front-rear direction FB, and a second end of the protrusion 50 in the longitudinal direction thereof corresponds to a rear end of the protrusion 50 in the front-rear direction FB. The protrusion 50 has a shape in which a width of the protrusion 50 in the weft insertion direction W becomes smaller as the protrusion 50 extends from the first end toward the second end of the protrusion 50 in the longitudinal direction thereof. In other words, the width of the protrusion 50 in the weft insertion direction W becomes larger as the protrusion 50 extends from the second end toward the first end of the protrusion 50 in the longitudinal direction thereof. The protrusion 50 has a protrusion front surface 51 and a protrusion rear surface 52 as end surfaces in the longitudinal direction of the protrusion 50. The protrusion front surface 51 is a front end surface of the protrusion 50 in the front-rear direction FB, and the protrusion rear surface 52 is a rear end surface of the protrusion 50 in the front-rear direction FB. Each of the protrusion front surface 51 and the protrusion rear surface 52 is orthogonal to the passage portion upper surface 31c and continuous with the passage portion upper surface 31c.

[0035] The protrusion front surface 51 and the protrusion rear surface 52 are arranged in the front-rear direction FB. A width of the protrusion front surface 51 in the weft insertion direction W is larger than a width of the protrusion rear surface 52 in the weft insertion direction W. Regarding the front-rear direction FB, the protrusion 50 has a maximum width in the weft insertion direction W at the protrusion front surface 51 and a minimum width in the weft insertion direction W at the protrusion rear surface 52. The width of the protrusion front surface 51 in the weft insertion direction W is smaller than a hole diameter of the stretch air exhaust port 31d. In other words, the width of the protrusion 50 in the weft insertion direction W is equal to or smaller than a maximum length of the stretch air exhaust port 31d in the weft insertion direction W.

[0036] A first end of the protrusion 50 in the up-down direction UD corresponds to a lower end of the protrusion 50, and is coupled to the passage defining portion 31. A second end of the protrusion 50 in the up-down direction UD corresponds to an upper end of the protrusion 50. The protrusion 50 has a protrusion distal end surface 53 that is oriented in the same direction as a direction in which the passage portion upper surface 31c is oriented. The width of the protrusion 50 in the weft insertion direction W becomes smaller as the protrusion 50 extends from the first end to the second end of the protrusion 50 in the up-down direction UD. In other words, a width of the protrusion distal end surface 53 in the weft insertion direction W is smaller than the width of the protrusion 50 in the weft insertion direction W on a side of the first end of the protrusion 50 in the up-down direction UD. That is, the width of the protrusion 50 in the weft insertion direction W becomes smaller as the protrusion 50 extends away from the passage portion upper surface 31c in the up-down direction UD.

[0037] As illustrated in FIG. 5, the protrusion distal end surface 53 has edges 53a. Each of connecting surfaces 54 extends from the corresponding one of the edges 53a in the weft insertion direction W. The connecting surfaces 54 connect the protrusion distal end surface 53 to the passage portion upper surface 31c. The protrusion front surface 51 extends from one edge 53a located at a front end of the protrusion 50 in the front-rear direction FB. The protrusion rear surface 52 extends from one edge 53a located at a rear end of the protrusion 50 in the front-rear direction FB. The connecting surfaces 54 are surfaces located on both sides of the protrusion 50 in the weft insertion direction W, of outer surfaces of the protrusion 50. The connecting surfaces 54 are each curved so as to form a gentle arc as the connecting surface 54 extends from the second end toward the first end in the up-down direction UD. The connecting surfaces 54 are connected to each of the protrusion front surface 51 and the protrusion rear surface 52 in the front-rear direction FB. That is,

the outer surfaces of the protrusion 50 are formed of the protrusion front surface 51, the protrusion rear surface 52, the protrusion distal end surface 53, and the connecting surfaces 54.

[0038] As illustrated in FIG. 3, on the passage portion upper surface 31c, the protrusion 50 and the stretch air exhaust port 31d are arranged in the front-rear direction FB. The protrusion 50 is located closer to the rear wall 10c of the reed 10 than the stretch air exhaust port 31d. That is, the protrusion 50 is located between the stretch air exhaust port 31d and the rear wall 10c in the front-rear direction FB. As illustrated in FIG. 5, the protrusion 50 is located at a position such that on the passage portion upper surface 31c, the protrusion front surface 51 and an opening edge of the stretch air exhaust port 31d on a side of the passage portion upper surface 31c are arranged in the front-rear direction FB through the passage portion upper surface 31c. The protrusion front surface 51 is connected to an inner peripheral surface that defines the stretch air exhaust port 31d through the passage portion upper surface 31c in the front-rear direction FB.

[0039] As illustrated in FIG. 6, the width of the protrusion front surface 51 in the weft insertion direction W is larger than a width of each of the gaps 10b. Furthermore, the width of the protrusion rear surface 52 in the weft insertion direction W is smaller than the width of each of the gaps 10b. That is, the width of the protrusion 50 in the weft insertion direction W at the protrusion front surface 51 is larger than the width of each of the gaps 10b, and the width of the protrusion 50 in the weft insertion direction W at the protrusion rear surface 52 is smaller than the width of each of the gaps 10b. In other words, the width of the protrusion 50 in the weft insertion direction W becomes smaller as the protrusion 50 extends away from the stretch air exhaust port 31d in the front-rear direction FB.

[0040] As illustrated in FIG. 2, each of the connecting surfaces 54 of the protrusion 50 on a side near the passage portion upper surface 31c comes in contact with the corresponding one of the two reed dents 11, so that the protrusion 50 widens the gap 10b in the weft insertion direction W, which is defined by the two reed dents 11. The width of the gap 10b of the plurality of the gaps 10b formed in the reed 10, which is defined by the two reed dents 11 in contact with the protrusion 50, is larger than that of each of the other gaps 10b in the weft insertion direction W. The width of the widening gap 10b is determined by the width of the protrusion front surface 51 in the weft insertion direction W. That is, the passage defining portion 31 has the protrusion 50 that comes in contact with the two reed dents 11 such that the protrusion 50 widens the gap 10b facing the stretch air exhaust port 31d.

<Insertion of tensioning device into weft yarn guide passage>

[0041] The tensioning device 30 is provided in the air jet loom 100 by inserting the passage defining portion 31 into the weft yarn guide passage 10a from a front of the reed 10. In FIG. 6, the tensioning device 30 before being attached to the reed 10 is illustrated by a long dashed double short dashed line, and the tensioning device 30 after being attached to the reed 10 is illustrated by a solid line. In the process of attaching the tensioning device 30 to the air jet loom 100, the protrusion 50 moves from a position where the protrusion rear surface 52 faces the gap 10b in the front-rear direction FB to a position where the protrusion 50 is in contact with the reed dents 11 that defines the gap 10b. In the process of this movement, the connecting surfaces 54 of the protrusion 50 are brought into contact with the reed dents 11 after the protrusion rear surface 52 is inserted into the gap 10b. The width of the protrusion 50 in the weft insertion direction W becomes larger as the protrusion 50 extends from the protrusion rear surface 52 to the protrusion front surface 51. That is, in the process of inserting the protrusion 50 into the gap 10b, the gap 10b, which is defined by the reed dents 11 in contact with the protrusion 50, widens as the protrusion 50 widens in the weft insertion direction W. When the protrusion 50 is inserted in the gap 10b, the width of the gap 10b is larger near the protrusion front surface 51 than that near the protrusion rear surface 52.

[0042] As illustrated in FIG. 3 and FIG. 6, the tensioning device 30 is inserted into the reed 10 until the tensioning device 30 reaches a position where the stretch air exhaust port 31d faces the gap 10b widened by the protrusion 50 and the passage portion rear surface 31e is in contact with the rear wall 10c. The stretch air exhaust port 31d is located near the protrusion front surface 51 of the protrusion 50 in the front-rear direction FB, and the stretch air exhaust port 31d and the reed dents 11 are arranged in the up-down direction UD. In the tensioning device 30, while the passage portion upper surface 31c is kept in contact with the upper wall 10d in the up-down direction UD, the passage defining portion 31 is inserted into the weft yarn guide passage 10a.

<Tensioning weft yarn by tensioning device>

[0043] As illustrated in FIG. 1, in the weft insertion of the weft yarn Y, the air jet loom 100 causes the weft yarn Y to travel through the weft yarn guide passage 10a by injecting air from the main nozzle M and the sub nozzle S. The weft yarn Y travels in the weft insertion direction W from the upstream side to the downstream side of the weft yarn guide passage with the air flow from the main nozzle M. After the weft yarn Y reaches a position of the selvedge yarns T1, the weft yarn Y is introduced into the weft yarn traveling passage 31a defined by the passage defining portion 31 through the yarn inlet 30b.

[0044] When the weft yarn Y is introduced into the yarn inlet 30b, air is supplied from an air supply source, which is not illustrated, to the air injection portion 34 from the first air supply tube 41. In the air injection portion 34, the air is injected into the weft yarn traveling passage 31a through the first air injection port 34a. The weft yarn Y is captured

and tensioned in the weft yarn traveling passage 31a by the air injection into the weft yarn traveling passage 31a from the air injection portion 34. That is, the tensioning device 30 for the air jet loom 100 injects air into the weft yarn traveling passage 31a in order to tension the weft yarn Y and discharges the air from the stretch air exhaust port 31d.

[0045] The weft yarn Y passes through the weft yarn traveling passage 31a, and then, the weft yarn Y comes out of the tensioning device 30 through the yarn outlet 30c. After the weft yarn Y is introduced into the yarn outlet 30c, air is supplied from an air supply source, which is not illustrated, to the stretch air passage 32a through the second air supply tube 42. That is, air is supplied to the supply portion 32 through the second air supply tube 42. In the supply portion 32, air supplied through the second air supply tube 42 passes through the stretch air passage 32a and is injected into the weft yarn traveling passage 31a from the second air injection port 32b. The air is injected from the second air injection port 32b, crosses the weft yarn traveling passage 31a through which the weft yarn Y travels, and is discharged to the outside of the weft yarn traveling passage 31a through the stretch air exhaust port 31d. That is, the air injected from the second air injection port 32b crosses the weft yarn Y, and then, is discharged through the stretch air exhaust port 31d.

[0046] When the air is discharged through the stretch air exhaust port 31d, air in a vicinity of the stretch air exhaust port 31d inside the weft yarn traveling passage 31a flows into the stretch air exhaust port 31d. A direction of this flow of the air coincides with the up-down direction UD, and is orthogonal to the direction in which the weft yarn traveling passage 31a extends. That is, the weft yarn Y traveling through the weft yarn traveling passage 31a is pressed against an opening edge of the stretch air exhaust port 31d on a side of the weft yarn traveling passage 31a by the air discharged through the stretch air exhaust port 31d. The weft yarn Y is tensioned in the weft insertion direction W by this pressing.

[0047] The air discharged through the stretch air exhaust port 31d flows into the gap 10b facing the stretch air exhaust port 31d.

[Operation of present embodiment]

[0048] The following will describe an operation of the present embodiment.

[0049] In the process of the weaving by the air jet loom 100, fluff is generated from the weft yarn Y. The fluff generated from the weft yarn Y is discharged together with the air toward the reed 10 through the stretch air exhaust port 31d. The air discharged through the stretch air exhaust port 31d flows into the gap 10b facing the stretch air exhaust port 31d. The gap 10b into which this air flows is defined by the reed dents 11 in contact with the protrusion 50. That is, the air discharged from the stretch air exhaust port 31d flows into the gap 10b that is widened in the weft insertion direction W by the protrusion 50.

[Advantageous effects of present embodiment]

[0050] The following will describe advantageous effects of the present embodiment.

(1) The air discharged to the outside of the passage defining portion 31 through the stretch air exhaust port 31d flows into the gap 10b facing the stretch air exhaust port 31d. The protrusion 50 provided on the passage portion upper surface 31c widens the gap 10b in the weft insertion direction W. This makes it possible to suppress that the fluff discharged together with the air flowing through the stretch air exhaust port 31d piles up in the gap 10b facing the stretch air exhaust port 31d. As a result, the tensioning device 30 for the air jet loom 100 suppresses that the fluff piles up in the gap 10b.

(2) An amount of the widening of the gap 10b by the protrusion 50 is largest at a point of the gap 10b where the reed dents 11 are in contact with the protrusion 50 since the reed dents 11 are elastically deformed. Then, the amount of the widening of the gap 10b by the protrusion 50 decreases at a point of the gap 10b as a distance between the point and the protrusion 50 increases in the front-rear direction FB and the up-down direction UD. That is, the width of the gap 10b at the point away from the protrusion 50 becomes easily smaller than a desired width of the gap 10b directly above the stretch air exhaust port 31d as a distance between the stretch air exhaust port 31d and the protrusion 50 in the front-rear direction FB and the up-down direction UD increases. Accordingly, in the tensioning device 30 for the air jet loom 100, both the protrusion 50 and the stretch air exhaust port 31d are provided on the passage portion upper surface 31c, so that the gap 10b directly above the stretch air exhaust port 31d may be widened to the desired width.

(3) The protrusion 50 is provided on the passage portion upper surface 31c and located closer to the rear wall 10c than the stretch air exhaust port 31d in the front-rear direction FB. In this case, the width of the gap 10b widened by the protrusion 50 becomes larger at a point closer to the stretch air exhaust port 31d than the protrusion 50, and becomes smaller at a point closer to the rear wall 10c than the protrusion 50. For example, as compared with a case where the protrusion 50 is provided in front of the stretch air exhaust port 31d, the gap 10b directly above the stretch air exhaust port 31d may be made wider. As a result, the tensioning device 30 for the air jet loom 100 may widen the gap 10b directly above the stretch air exhaust port 31d by the protrusion 50.

(4) When the passage defining portion 31 is inserted into the weft yarn guide passage 10a, the width of the

gap 10b into which the protrusion 50 is inserted becomes larger as the width of the protrusion 50 increases in the weft insertion direction W. Accordingly, in the tensioning device 30 for the air jet loom 100, as compared with a case where the protrusion 50 has a cross-sectional shape with a constant width when viewed in the up-down direction UD, the passage defining portion 31 is easily inserted into the weft yarn guide passage 10a.

[0051] In addition, since the protrusion 50 has the above-described configuration, in the tensioning device 30, the passage defining portion 31 may be inserted into the weft yarn guide passage 10a while the gap 10b is widened step by step. As a result, in the tensioning device 30 for the air jet loom 100, the gap 10b may be widened by the protrusion 50 while load applied to the reed dents 11 is reduced.

[0052] (5) The width of the protrusion 50 in the weft insertion direction W becomes smaller as the protrusion 50 extends away from the passage portion upper surface 31c in the up-down direction UD. With this shape, the width of the protrusion 50 in the weft insertion direction W is largest at the portion of the protrusion 50 in the up-down direction UD, which is connected to the passage portion upper surface 31c, and the gap 10b between the reed dents 11 is widened at the portion of the protrusion 50. That is, in the tensioning device 30, as compared with the protrusion 50 has a cross-sectional shape with the constant width when viewed in the front-rear direction FB, a contact area of the protrusion 50 and each of the reed dents 11 is small. As a result, in the tensioning device 30 for the air jet loom 100, load applied to the reed dents 11 by the protrusion 50 may be reduced.

[0053] (6) The width of the gap 10b that may be widened by the protrusion 50 is equal to or smaller than the maximum length of the stretch air exhaust port 31d in the weft insertion direction W. The fluff that may affect the air exhaust through the stretch air exhaust port 31d piles up in the gap 10b located directly above the stretch air exhaust port 31d. That is, the width of the gap 10b that is desired to be ensured by the protrusion 50 corresponds to the maximum length of the stretch air exhaust port 31d in the weft insertion direction W. In addition, widening the gap 10b by the protrusion 50 beyond the maximum length of the stretch air exhaust port 31d applies load to the reed dents 11 that form the gap widened by the protrusion 50. Thus, in the tensioning device 30 for the air jet loom 100, the width of the gap 10b that may be widened by the protrusion 50 is set to be equal to or smaller than the maximum length of the stretch air exhaust port 31d, so that the fluff that piles up in the gap 10b is reduced while the load applied to the reed dents 11 defining the gap 10b is suppressed.

[Modifications]

[0054] The above-described present embodiment may be modified as follows. The present embodiment and the following modifications may be combined with each other as long as they do not technically contradict each other.

[0055] The width of the protrusion 50 in the weft insertion direction W need not be equal to or smaller than the maximum length of the stretch air exhaust port 31d in the weft insertion direction W.

[0056] The width of the protrusion 50 in the weft insertion direction W need not become smaller as the protrusion 50 extends away from the passage portion upper surface 31c in the up-down direction UD. For example, the connecting surfaces 54 of the protrusion 50 may be surfaces orthogonal to the passage portion upper surface 31c and the protrusion distal end surface 53.

[0057] The width of the protrusion 50 in the weft insertion direction W need not become smaller as the protrusion 50 extends away from the stretch air exhaust port 31d in the front-rear direction FB. In this case, the protrusion 50 has the protrusion rear surface 52 that has the same width as that of the protrusion front surface 51 in the weft insertion direction W. That is, the protrusion 50 is formed in a columnar shape whose axial direction coincides with the front-rear direction FB and that has the protrusion front surface 51 and the protrusion rear surface 52 as the end surfaces.

[0058] The protrusion 50 need not be provided between the stretch air exhaust port 31d and the rear wall 10c in the front-to-rear direction FB on the passage portion upper surface 31c. For example, the protrusion 50 may be provided in front of the stretch air exhaust port 31d in the front-rear direction FB on the passage portion upper surface 31c.

[0059] The protrusion 50 need not be provided on the passage portion upper surface 31c. For example, as illustrated in FIG. 7, the protrusion 50 may be provided on the passage portion rear surface 31e. In this case, the protrusion 50 is provided at a position where the protrusion 50 is in contact with the reed dents 11 that define the gap 10b facing the stretch air exhaust port 31d, of the reed dents 11 that form the rear wall 10c.

[0060] The tensioning device 30 is inserted from the front of the reed 10 and provided at a position where the passage portion rear surface 31e is in contact with the rear wall 10c. When the tensioning device 30 is provided, in the protrusion 50, after the protrusion distal end surface 53 is inserted into the gap 10b, the connecting surfaces 54 are brought into contact with the reed dents 11 that define the gap 10b. That is, when the protrusion 50 is provided on the passage portion rear surface 31e, the protrusion 50 preferably has the connecting surfaces 54 such that the width of the protrusion 50 in the weft insertion direction W becomes smaller as the protrusion 50 extends from the passage portion rear surface 31e toward the protrusion distal end surface 53. In the protrusion 50 having the above-described configuration, when the tensioning device 30 is inserted into the reed 10, the load applied to the reed dents 11 in contact with the protrusion 50 is reduced.

[0061] The stretch air exhaust port 31d may face a plurality of the gaps 10b.

[0062] The protrusion 50 may be in contact with one of the two reed dents 11 that define the gap 10b facing the stretch air exhaust port 31d to widen the gap 10b. In this case, the width of the protrusion front surface 51 in the weft insertion direction W may be smaller than the width of the gap 10b in the weft insertion direction W.

Claims

1. A tensioning device (30) for an air jet loom (100) that inserts a weft yarn (Y) along a weft yarn guide passage (10a) formed in a reed (10), the reed (10) being formed of a plurality of reed dents (11) that are arranged side by side with gaps (10b) in a weft insertion direction (W) in which the weft yarn (Y) is inserted,

the tensioning device (30) comprising a passage defining portion (31) that defines a weft yarn traveling passage (31a) extending along the weft yarn guide passage (10a),
the passage defining portion (31) having:

an upper surface (31c) facing an upper wall (10d) of the reed (10), the upper wall (10d) partially defining the weft yarn guide passage (10a); and
an air exhaust port (31d) being opened in the upper surface (31c) and communicating with the weft yarn traveling passage (31a),

the air exhaust port (31d) facing at least one of the gaps (10b), and
the tensioning device (30) being configured to tension the weft yarn (Y) by injecting air into the weft yarn traveling passage (31a), the air being discharged through the air exhaust port (31d), **characterized in that**
the passage defining portion (31) has a protrusion (50) that comes in contact with at least one of adjacent two of the reed dents (11) such that the protrusion (50) widens one of the gaps (10b) facing the air exhaust port (31d) and defined by the adjacent two reed dents (11).

2. The tensioning device (30) for the air jet loom (100) according to claim 1, **characterized in that**
the protrusion (50) is provided on the upper surface (31c).

3. The tensioning device (30) for the air jet loom (100) according to claim 2, **characterized in that**

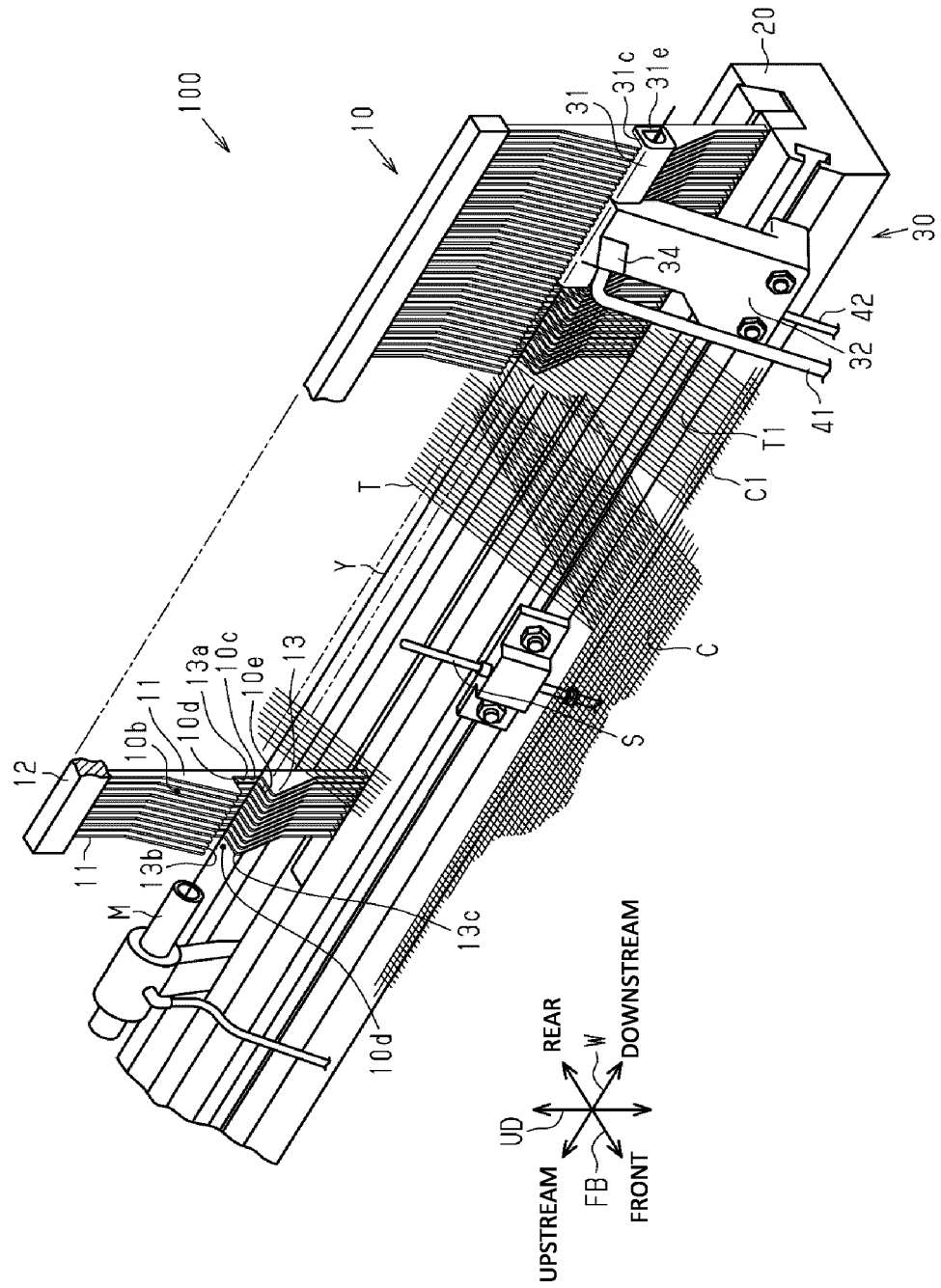
the reed (10) has a rear wall (10c) that partially defines the weft yarn guide passage (10a) in a front-rear direction (FB) orthogonal to each of the weft insertion direction (W) and an up-down direction (UD), and
the protrusion (50) is located between the air exhaust port (31d) and the rear wall (10c).

4. The tensioning device (30) for the air jet loom (100) according to claim 3, **characterized in that**
a width of the protrusion (50) in the weft yarn direction (W) becomes smaller as the protrusion (50) extends away from the air exhaust port (31d) in the front-rear direction (FB) orthogonal to each of the weft insertion direction (W) and the up-down direction (UD).

5. The tensioning device (30) for the air jet loom (100) according to claim 2, **characterized in that**
a width of the protrusion (50) in the weft yarn direction (W) becomes smaller as the protrusion (50) extends away from the upper surface (31c) in the up-down direction (UD).

6. The tensioning device (30) for the air jet loom (100) according to claim 5, **characterized in that**
the width of the protrusion (50) in the weft insertion direction (W) is equal to or smaller than a maximum length of the air exhaust port (31d) in the weft insertion direction (W).

FIG. 1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10b
10d
13a
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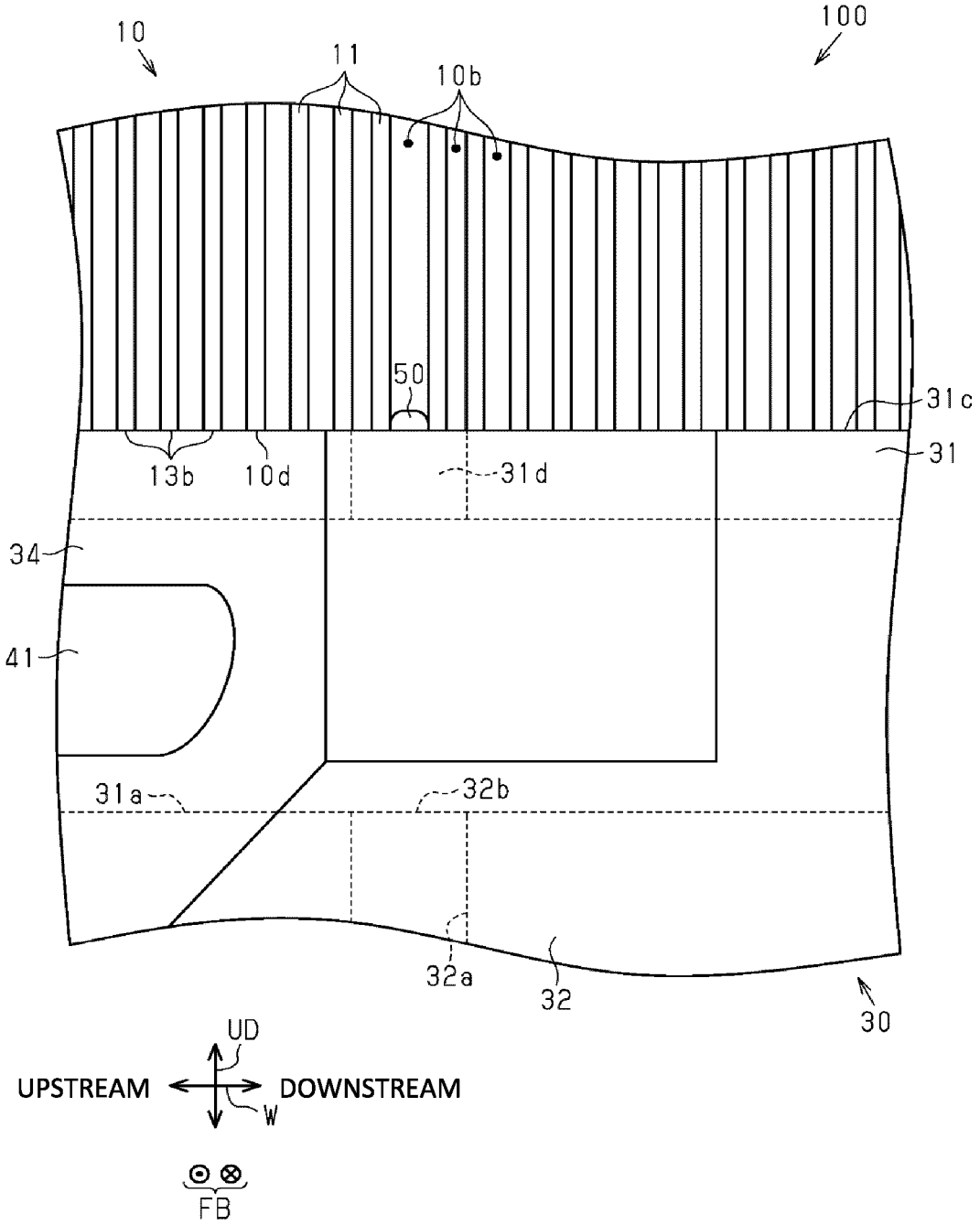
M
13c
10d
UD
REAR
W
DOWNSTREAM
FB
FRONT
UPSTREAM

FIG. 2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32
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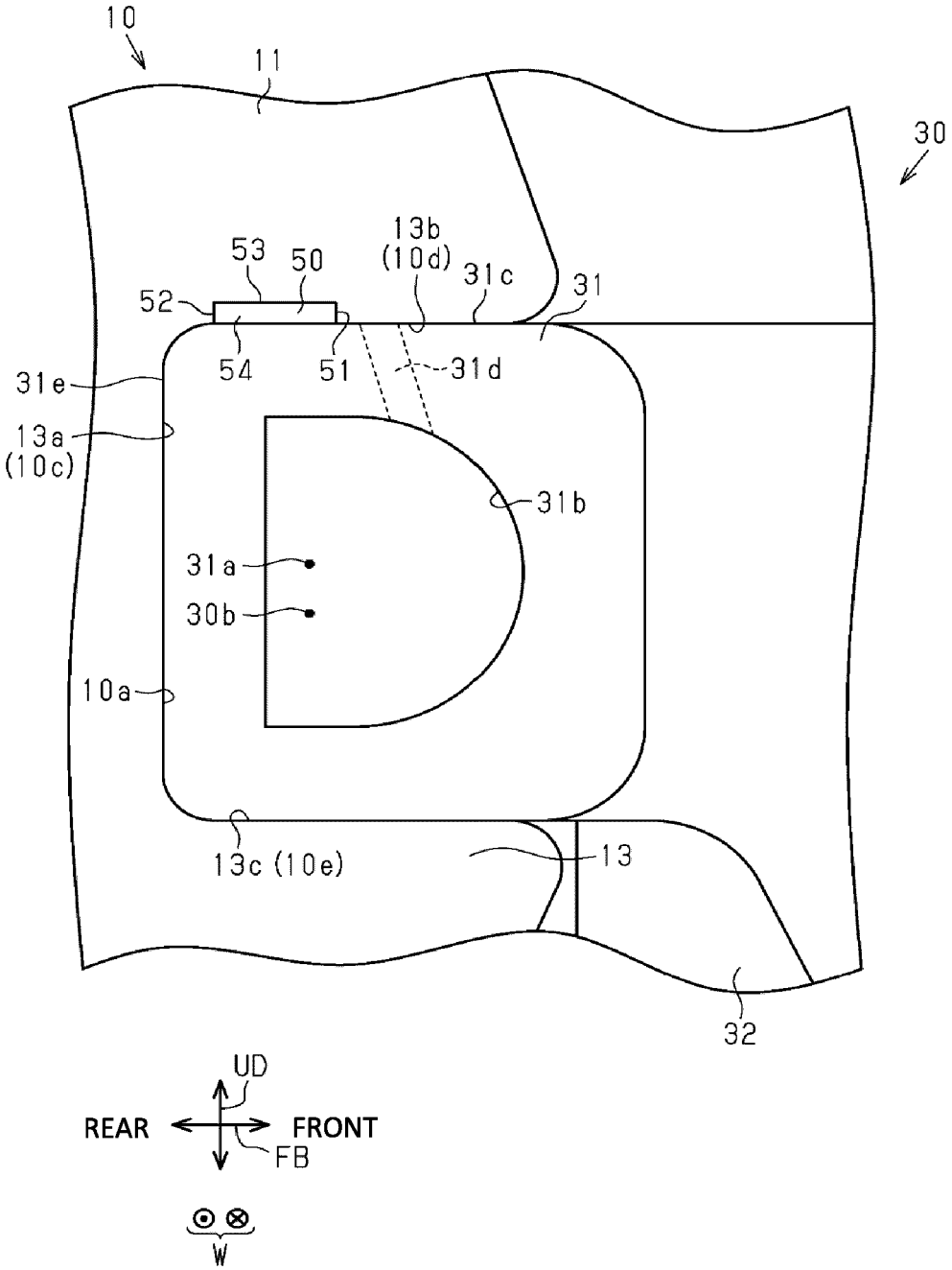
UD
UPSTREAM
DOWNSTREAM
W
FB

FIG. 3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31d
31e
13a
(10c)
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31a
30b
10a
13c (10e)
13
32
UD
REAR
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FB
W

FIG. 4

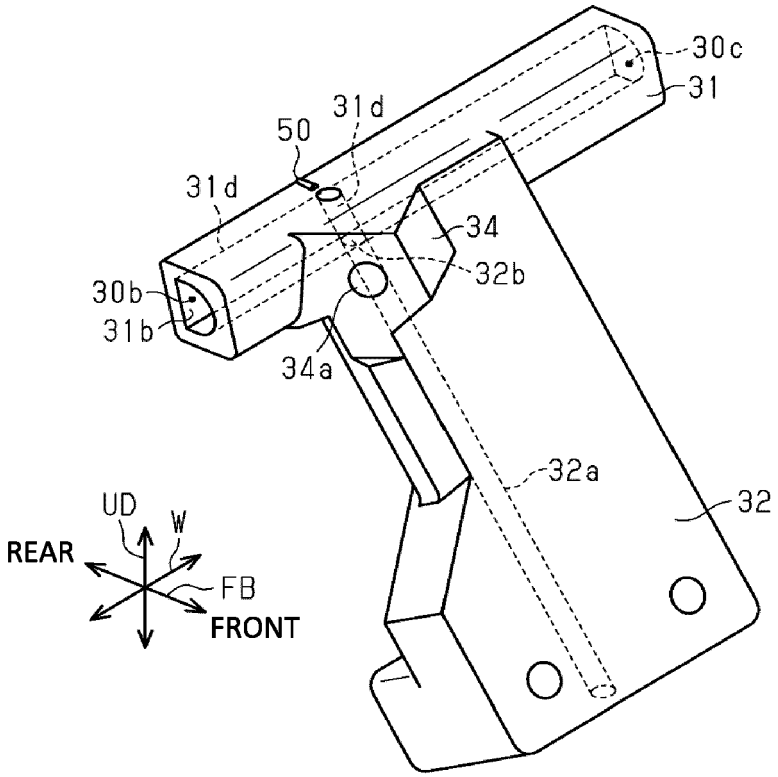
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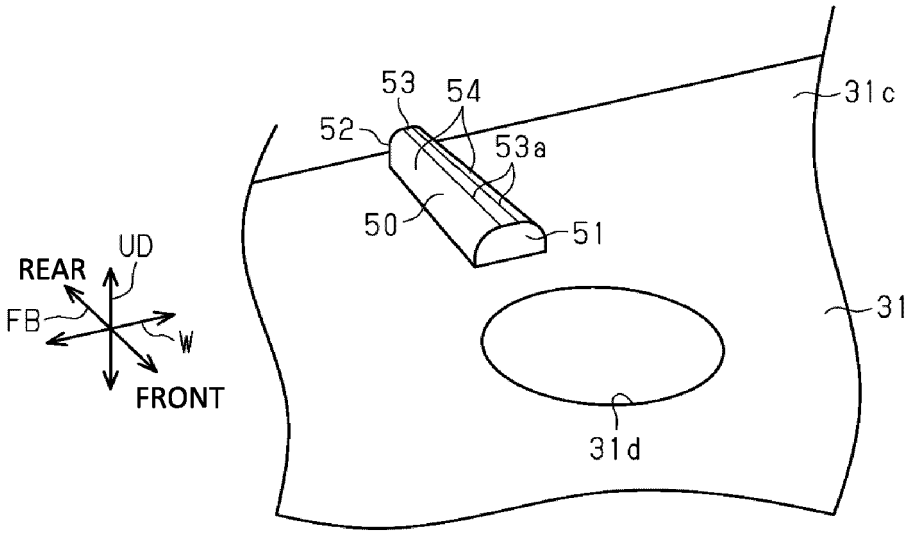
FIG. 5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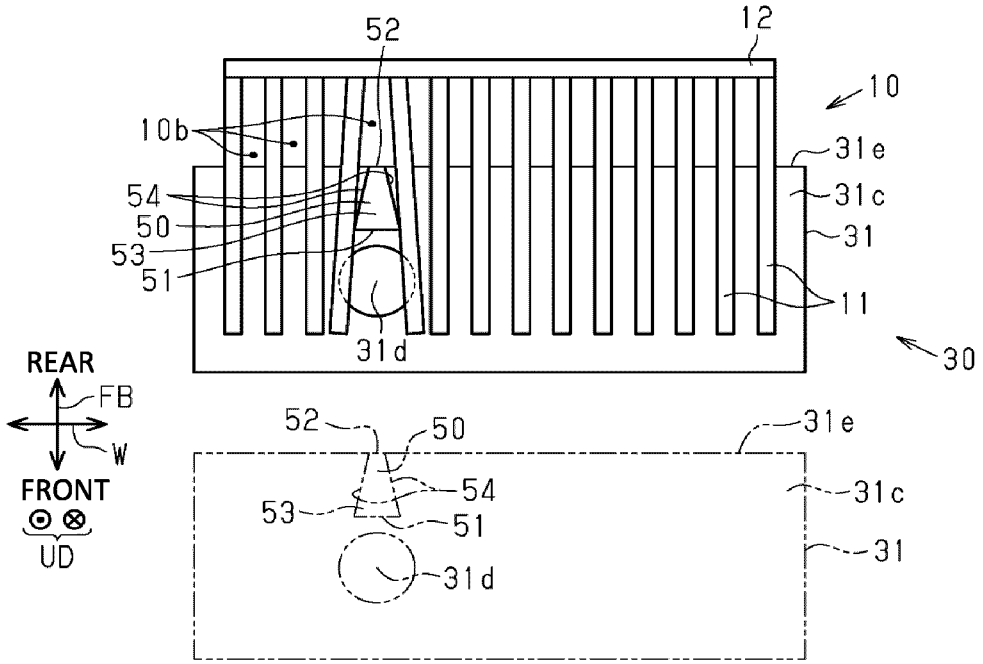
31d

FIG. 6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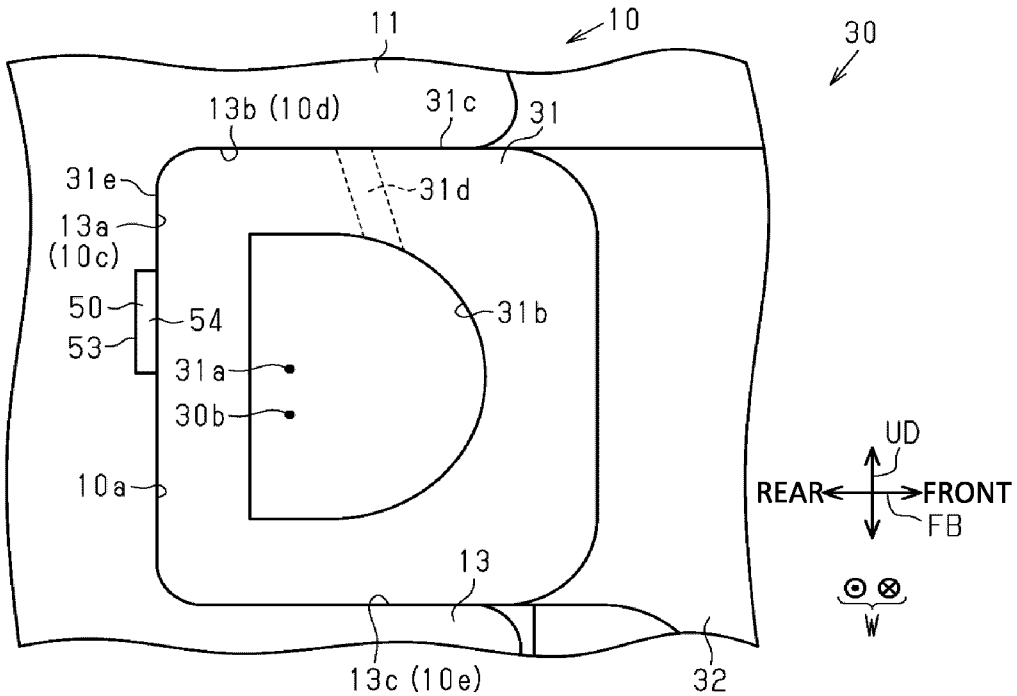
31d

FIG. 7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(10c)
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30b
10a
UD
REAR
FRONT
FB
13
W
13c (10e)
32

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Application Number
EP 24 21 2901

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 2022 014545 A (TOYOTA IND CORP) 20 January 2022 (2022-01-20) * abstract * * claim 1 * * figures 1-6 * * paragraph [0001] - paragraph [0016] * * paragraph [0018] * * paragraph [0020] * * paragraph [0021] * * paragraph [0039] *	1-6	INV. D03D47/30 D03D47/27
A	JP 2016 084557 A (TOYOTA IND CORP) 19 May 2016 (2016-05-19) * abstract * * claims 1, 2 * * figures 1-4 * * paragraph [0001] - paragraph [0003] * * paragraph [0006] - paragraph [0008] * * paragraph [0016] * * paragraph [0021] - paragraph [0021] * * paragraph [0026] * * paragraph [0031] * * paragraph [0032] * * paragraph [0043] *	1-6	TECHNICAL FIELDS SEARCHED (IPC) D03D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	28 November 2024	Heinzelmann, Eric

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28-11-2024

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2022014545 A	20-01-2022	CN 113913999 A	11-01-2022
		EP 3936649 A1	12-01-2022
		JP 2022014545 A	20-01-2022
JP 2016084557 A	19-05-2016	BE 1023208 A1	21-12-2016
		CN 105544070 A	04-05-2016
		JP 6119715 B2	26-04-2017
		JP 2016084557 A	19-05-2016

EPO FORM P0459

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Patent documents cited in the description

- JP 2022014545 A **[0003]**