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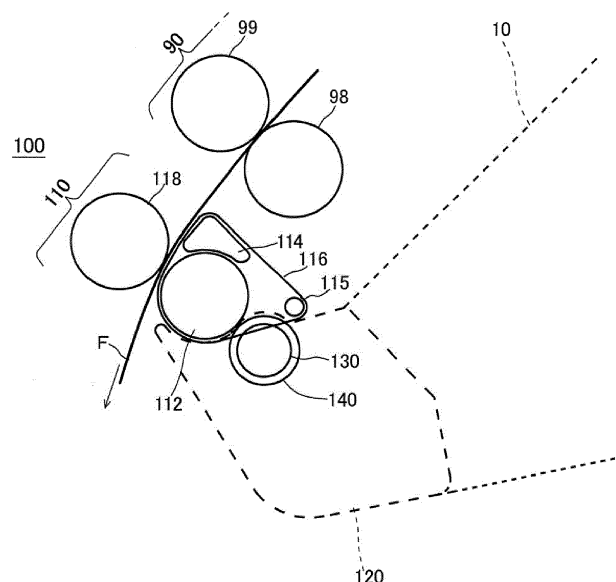
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(54) **FIBER BUNDLE CONDENSING DEVICE FOR SPINNING MACHINE**

(57) A fiber bundle condensing device (100) for a spinning machine includes a condensing device (110) that includes a delivery roller pair comprising a delivery top roller (118) and a delivery bottom roller (112) transporting a fiber bundle (F), a suction portion (114) that exerts suction on the fiber bundle (F), and an air-permeable apron (116) that is rotated along the suction portion (114). The fiber bundle condensing device (100) further

includes a support plate (120) fixed to a roller stand (10) and supports the condensing device (110), and a countershaft (130) that rotates the delivery bottom roller (112). The support plate 120 has an opening (122) through which the countershaft (130) is inserted. The opening (122) is smaller than the outer diameter of a bearing (140), and the edge portion of the opening (122) restricts the position of the bearing (140) in the axial direction.

FIG. 1



Description

BACKGROUND ART

[0001] The present invention relates to a fiber bundle condensing device for a spinning machine.

[0002] Various types of fiber bundle condensing devices have been proposed for condensing fiber bundles, which are drafted by a draft device, in advance prior to twisting, to improve yarn quality, for example, by reducing fluff or adjusting yarn strength.

[0003] Such fiber bundle condensing devices include a countershaft for rotating a delivery roller pair that delivers fiber bundles. In the fiber bundle condensing devices, it is important to precisely arrange a bearing that rotatably supports the countershaft.

[0004] European Patent Application Publication No. 1473388 discloses that a bearing rotatably supporting the countershaft is fixed with a set screw having a threaded portion in a radially inward direction.

[0005] In the spinning machine, fiber bundle condensing devices are disposed at predetermined intervals in a longitudinal direction of the machine frame so as to correspond to a plurality of spindles. Each of the fiber bundle condensing devices is configured to be rotated through a common countershaft.

[0006] Thus, a load in an axial direction (hereinafter referred to as a thrust load) may be generated in the bearing that rotatably supports the countershaft. When the bearing is fixed only with the set screw disclosed in the above-cited Publication, the bearing may be dislocated in a case where a thrust load greater than a frictional force between the set screw and the bearing is generated.

[0007] The present invention, which has been made in light of the above-described problem, is directed to providing a fiber bundle condensing device for a spinning machine in which a bearing, which rotatably supports a countershaft that rotates a delivery roller transporting fiber bundles, may be positioned precisely in an axial direction.

SUMMARY

[0008] In accordance with an aspect of the present invention, there is provided a fiber bundle condensing device for a spinning machine including a condensing device configured to condense a fiber bundle having been drafted, and including a delivery roller pair that comprises a delivery top roller and a delivery bottom roller and transports the fiber bundle, a suction portion that exerts suction on the fiber bundle, and an air-permeable apron that is rotated along the suction portion, a support plate fixed to a roller stand, and configured to support the condensing device, and a countershaft configured to rotate the delivery bottom roller. The support plate has an opening through which the countershaft is inserted. The opening is smaller than an outer diameter of a bearing, and an

edge portion of the opening restricts a position of the bearing in an axial direction of the countershaft.

[0009] 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

[0010] 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:

FIGS. 1 is a configuration view of a fiber bundle condensing device for a spinning machine, illustrating the fiber bundle condensing device together with a part of a draft device according to an embodiment; FIGS 2A and 2B are views, illustrating positioning of a countershaft in the fiber bundle condensing device for the spinning machine according to the embodiment; and

FIG. 3A and 3B are views, illustrating positioning of a countershaft in the fiber bundle condensing device for the spinning machine according to a modified example.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0011] The following will describe a fiber bundle condensing device for a spinning machine according to an embodiment of the present invention with reference to the accompanying drawings. It is noted that same reference numerals are used for the same components in the drawings.

Embodiment

[0012] Firstly, a basic configuration of a fiber bundle condensing device 100 for a spinning machine according to the present embodiment will be described with reference to FIG. 1. FIG. 1 is a configuration view, illustrating the fiber bundle condensing device 100 and a part of a draft device 90 according to the embodiment.

[0013] The fiber bundle condensing device 100 is disposed downstream of final delivery rollers 98, 99 of a draft device 90, and is configured to condense a fiber bundle drafted by the draft device in advance for reducing fluff or the like prior to twisting.

[0014] The fiber bundle condensing device 100 includes a condensing device 110, a support plate 120, and a countershaft 130 as main components.

[0015] The condensing device 110 includes a delivery bottom roller 112, a suction portion 114, a guide portion 115, an air-permeable apron 116, and a delivery top roller 118.

[0016] The delivery bottom roller 112 includes a gear (not illustrated) corresponding to a gear mounted on the

countershaft 130. The delivery bottom roller 112 is rotated by the gear of the countershaft 130, thereby rotating the air-permeable apron 116 and transporting a fiber bundle F.

[0017] The suction portion 114 includes a plurality of suction holes. The suction portion 114 exerts suction on the fiber bundle F transported by the air-permeable apron 116.

[0018] The air-permeable apron 116 is made of air-permeable woven cloth having no end. The air-permeable apron 116 is wound on the delivery bottom roller 112, the suction portion 114, and the guide portion 115. The delivery top roller 118 is pressed against and in contact with the delivery bottom roller 112 with the air-permeable apron 116 interposed therebetween, and rotates together with the delivery bottom roller 112. The delivery top roller 118 and the delivery bottom roller cooperate to form a delivery roller pair.

[0019] The above-described components of the condensing device 110 are supported directly or through an additional support member, by the support plate 120. The support plate 120 is fixed to a roller stand 10 at a predetermined position.

[0020] With rotation of the delivery bottom roller 112 driven by the countershaft 130, the fiber bundle F is transported while being held between the delivery bottom roller 112 and the delivery top roller 118 and drawn by the suction portion 114 through the air-permeable apron 116.

[0021] The countershaft 130 is rotatably supported by a bearing 140 accommodated in the roller stand 10.

[0022] The following will describe positioning of the countershaft 130 in the fiber bundle condensing device 100 with reference to FIGS. 2A and 2B. FIGS. 2A and 2B are views, illustrating the positioning of the countershaft 130 in the fiber bundle condensing device 100 for the spinning machine according to the embodiment.

[0023] FIG. 2A illustrates a relationship between the support plate 120 and the countershaft 130 in which an axial direction of the countershaft 130 coincides with a direction vertical to the illustration. FIG. 2B illustrates a positional relationship among the support plate 120, the countershaft 130, and the bearing 140, taken along line IIB-IIB of FIG. 2A.

[0024] The support plate 120 is fixed to a roller stand 10 at a predetermined position with a plurality of bolts 160.

[0025] The roller stand 10 is supported by a draft rod supported by a machine frame of the spinning machine, and supports the above-mentioned draft device 90. The roller stand 10 has an accommodation portion 12 to accommodate the bearing 140.

[0026] The bearing 140 is accommodated in the accommodation portion 12 formed in the roller stand 10, and supports the countershaft 130 rotatably.

[0027] As illustrated in FIG. 2B, the support plate 120 is fixed so that the roller stand 10 is sandwiched in a width direction of the roller stand 10. That is, the support plate 120 includes a pair of support plates 120a, 120b fixed to

the roller stand 10 on opposite sides thereof. A movement of the bearing 140 in the axial direction thereof is restricted by the pair of support plates 120a, 120b such that the movement of the bearing 140 in the axial direction does not exceed a predetermined amount. That is, the pair of support plates 120a, 120b restricts a position of the bearing 140 in the axial direction from the opposite sides of the bearing 140 in the axial direction of the countershaft 130.

[0028] Although the support plate 120 restricts the position of the bearing 140 in the axial direction from the opposite side with the pair of support plates 120a, 120b in the present embodiment, when it is known that the thrust load is applied to the countershaft 130 only in one direction, the support plate 120 may be configured to restrict the position of the bearing 140 only in the direction in which the thrust load is applied.

[0029] In the present embodiment, "restricting the position in the axial position" may be achieved by the configuration in which the support plate 120 and the bearing 140 are in contact from the start, or the configuration in which the bearing 140 is placed in contact with the support plate 120 when axial displacement of the bearing 140 exceeding a gap occurs, as illustrated in FIG. 2B.

[0030] In a case where a plurality of roller stands 10 is provided for the countershaft 130, the bearing 140 may be provided in at least one of the plurality of roller stands 10. In this case, in the roller stands 10 having no bearing 140, the support plate 120 is provided for supporting the condensing device 110.

[0031] Each of the pair of support plates 120a, 120b has an opening 122 having a circular shape and an inner diameter greater than an outer diameter of the countershaft 130 for insertion of the countershaft 130. The inner diameter of the opening 122 is smaller than an outer diameter of the bearing 140, and an edge portion of the opening 122 restricts the position of the bearing 140 in the axial direction.

[0032] Thus, in the support plate 120, the edge portion of the opening 122 is placed in contact with a casing or an outer race of the bearing 140, which restricts the position of the bearing 140 in the axial direction. Since the edge portion of the opening 122 is placed in contact with the casing or the outer race of the bearing 140, the edge portion does not prevent the rotation of the countershaft 130.

[0033] The opening 122 may be formed in any shape as long as the opening 122 allows the countershaft 130 to be inserted therethrough and restricts the axial position of the bearing 140. That is, the opening 122 may have a shape other than a circular shape. For example, the opening 122 have a triangle shape, a square shape, a pentagon shape, or a hexagon shape.

[0034] The following will describe a modified example of the positioning of the countershaft 130 in the fiber bundle condensing device 100 with reference to FIGS. 3A and 3B.

[0035] FIG. 3A and 3B are views, illustrating the mod-

ified example of the positioning of the countershaft 130 in the fiber bundle condensing device 100 for the spinning machine according to the above-described embodiment.

[0036] FIG. 3A illustrates a relationship between the support plate 120 and the countershaft 130 in a state where an axial direction of the countershaft 130 coincides with a direction vertical to the illustration. FIG. 3B illustrates a positional relationship among the support plate 120, the countershaft 130, and the bearing 140, taken along the line IIIB-IIIB of FIG. 3A.

[0037] In FIGS. 3A and 3B, the same reference numerals are used for the same components illustrated in FIGS. 2A and 2B. In the following description with reference to FIGS. 3A and 3B, the description the same as that in FIGS. 2A and 2B is omitted and a part different from FIGS. 2A and 2B will be described.

[0038] Each of the pair of support plates 120a, 120b has an opening 122a having a U-shape and an opening width greater than the outer diameter of the countershaft 130 for insertion of the countershaft 130.

[0039] The opening width of the opening 122a is smaller than the outer diameter of the bearing 140, and one end of the opening 122a is opened.

[0040] Thus, in the support plate 120, the edge portion of the opening 122a having a U-shape is placed in contact with the casing or the outer race of the bearing 140, which restricts the position of the bearing 140 in the axial direction. Since the edge portion of the opening 122a is placed in contact with the casing or the outer race of the bearing 140, the edge portion does not prevent the rotation of the countershaft 130.

[0041] The opening 122a may be formed in any shape as long as the opening 122a allows the countershaft 130 to be inserted therethrough and restricts the position of the bearing 140 in the axial direction. Thus, the opening 122a may have a shape other than a U-shape. For example, the opening 122a may have a V-shape having one end that is opened, or a polygonal shape having one end that is opened.

[0042] In this way, in the spinning machine having a configuration in which the plurality of fiber bundle condensing devices 100 corresponding to a plurality of spindles arranged in the longitudinal direction of the machine frame is rotated by the common countershaft 130, even when the thrust load is applied to the bearing 140 that supports the countershaft 130 rotatably, the support plate 120 restricts the position of the bearing 140 in the axial direction. As a result, the displacement of the bearing 140 due to the thrust load may be prevented and the bearing 140 may be positioned precisely.

[0043] Further, the configuration of the present embodiment can receive a greater thrust load as compared to a configuration in which a set screw or simple fitting of parts, or the like is used. In addition, the fiber bundle condensing device of the present embodiment does not require an additional part and additional processing for the additional part such as a set screw and machining a screw hole for the set screw, and a retaining ring and

joggling for the retaining ring.

[0044] The bearing 140 is accommodated in the accommodation portion 12 of the roller stand 10. As a result, the precision of the original alignment may be secured.

[0045] The support plate 120 supports the components of the condensing device 110 and restricts the position of the bearing 140 in the axial direction. As a result, the precision of the position of the countershaft 130 relative to each of the components of the condensing device 110 is secured.

[0046] As has been described, according to the fiber bundle condensing device for the spinning machine of the present invention, the bearing 140, which rotatably supports the countershaft 130 that rotates the delivery bottom roller 112 transporting fiber bundles, may be positioned precisely in the axial direction

Advantageous effects offered by embodiment

[0047] As described above, the present embodiment offers the following effects.

[0048] The fiber bundle condensing device 100 for the spinning machine of the present invention includes the condensing device 110 that is configured to condense the fiber bundle F having been drafted on the downstream side of the draft device 90 of the spinning machine, and includes the delivery roller pair comprising the delivery top roller 118 and the delivery bottom roller 112 and transporting the fiber bundle F, the suction portion 114 that exerts suction on the fiber bundle F, and the air-permeable apron 116 that is rotated along the suction portion 114. The fiber bundle condensing device further includes the support plate 120 that is fixed to the roller stand 10 and supports the condensing device 110, and the countershaft 130 that rotates the delivery bottom roller 112. The support plate 120 has the opening 122 through which the countershaft 130 is inserted. The opening 122 is smaller than the outer diameter of the bearing 140 that supports the countershaft 130 rotatably, and the edge portion of the opening 122 restricts the position of the bearing 140 in the axial direction.

[0049] According to this configuration, the bearing 140, which rotatably supports the countershaft 130 that rotates the delivery bottom roller 112 transporting the fiber bundle F, may be positioned precisely in the axial direction in the fiber bundle condensing device 100.

[0050] In the fiber bundle condensing device 100 for the spinning machine according to the present invention, the support plate 120 restricts the position of the bearing 140 in the axial direction from the opposite sides thereof in the axial direction of the countershaft 130. It is to be noted that the support plate 120 may be configured to restrict the position of the bearing 140 only in the direction in which the thrust load is applied when it is known that the thrust load is applied to the countershaft 130 only in one direction. As a result, the bearing 140 rotatably supporting the countershaft 130 may be reliably positioned in the axial direction with precision.

[0051] In the fiber bundle condensing device 100 for the spinning machine according to the present invention, the support plate 120 has the opening 122 through which the countershaft 130 is inserted, and the edge portion of the opening 122 is placed in contact with the casing or the outer race of the bearing 140, which restricts the position of the bearing 140 in the axial direction. As a result, the bearing 140 rotatably supporting the countershaft 130 may be reliably positioned in the axial direction with precision.

[0052] A fiber bundle condensing device (100) for a spinning machine includes a condensing device (110) that includes a delivery roller pair comprising a delivery top roller (118) and a delivery bottom roller (112) transporting a fiber bundle (F), a suction portion (114) that exerts suction on the fiber bundle (F), and an air-permeable apron (116) that is rotated along the suction portion (114). The fiber bundle condensing device (100) further includes a support plate (120) fixed to a roller stand (10) and supports the condensing device (110), and a countershaft (130) that rotates the delivery bottom roller (112). The support plate 120 has an opening (122) through which the countershaft (130) is inserted. The opening (122) is smaller than the outer diameter of a bearing (140), and the edge portion of the opening (122) restricts the position of the bearing (140) in the axial direction.

Claims

1. A fiber bundle condensing device (100) for a spinning machine comprising:

a condensing device (110) configured to condense a fiber bundle (F) having been drafted, and including a delivery roller pair that comprises a delivery top roller (118) and a delivery bottom roller (112) and transports the fiber bundle (F), a suction portion (114) that exerts suction on the fiber bundle (F), and an air-permeable apron (116) that is rotated along the suction portion (114);

a support plate (120) fixed to a roller stand (10), and configured to support the condensing device (110); and

a countershaft (130) configured to rotate the delivery bottom roller (112), **characterized in that** the support plate (120) has an opening (122) through which the countershaft (130) is inserted, the opening (122) is smaller than an outer diameter of a bearing (140), and an edge portion of the opening (122) restricts a position of the bearing (140) in an axial direction of the countershaft (130).

2. The fiber bundle condensing device (100) for the spinning machine according to claim 1, **characterized in that**

the support plate (120) includes a pair of support plates (120a, 120b) fixed to the roller stand (10) on opposite sides of the roller stand (10), the pair of support plates (120a, 120b) restricts the position of the bearing (140) in the axial direction from opposite sides of the bearing (140).

3. The fiber bundle condensing device (100) for the spinning machine according to claim 1, **characterized in that** the opening (122a) has a U-shape and an opening width greater than an outer diameter of the countershaft (130) for insertion of the countershaft (130).

FIG. 1

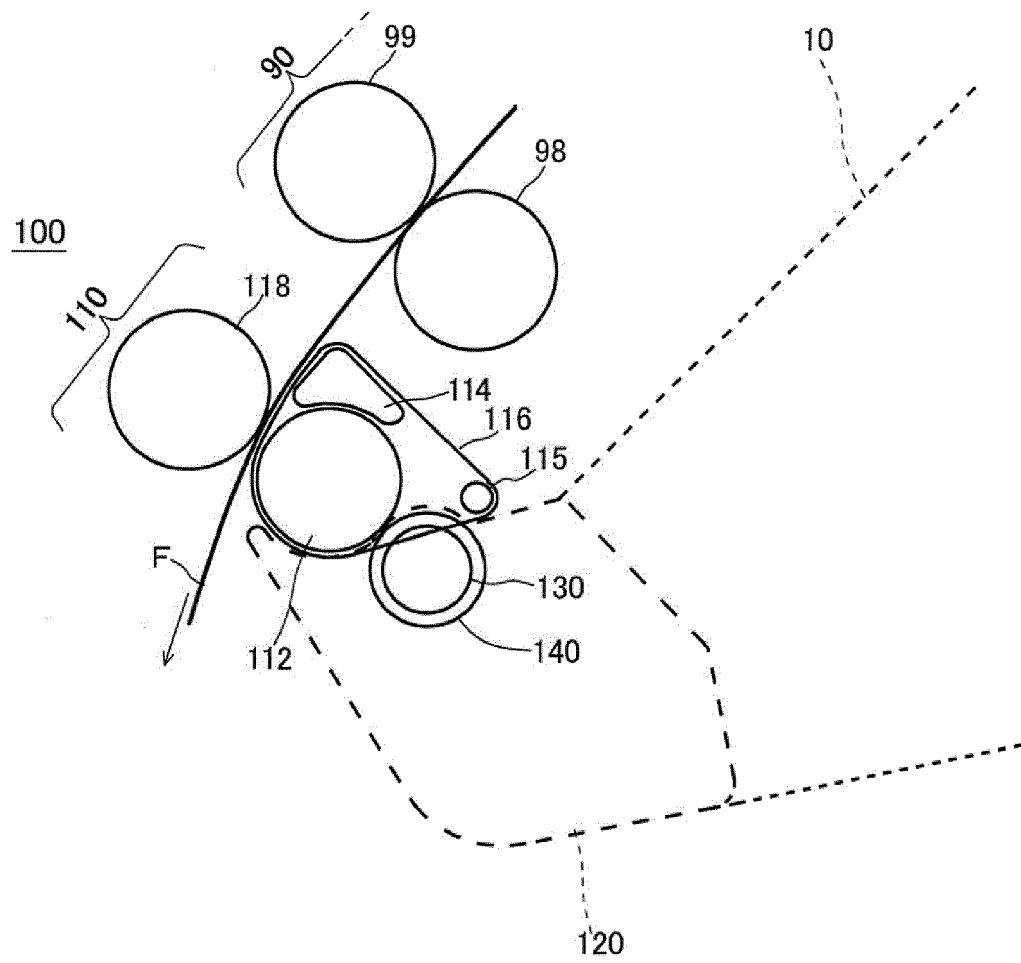


FIG. 2A

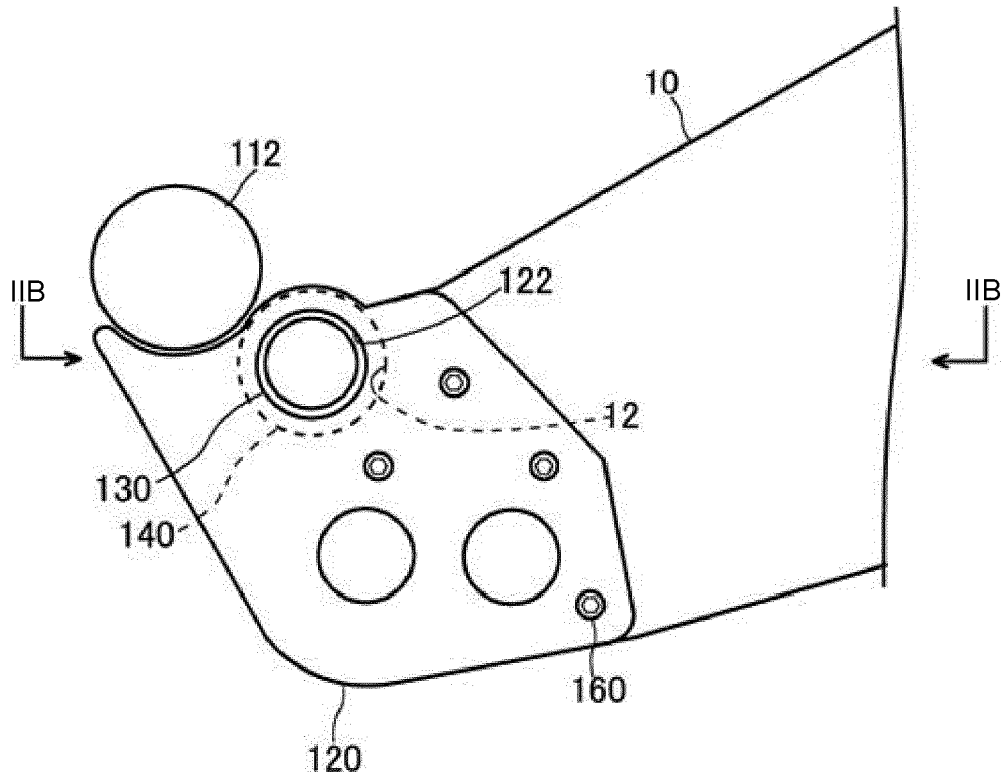


FIG. 2B

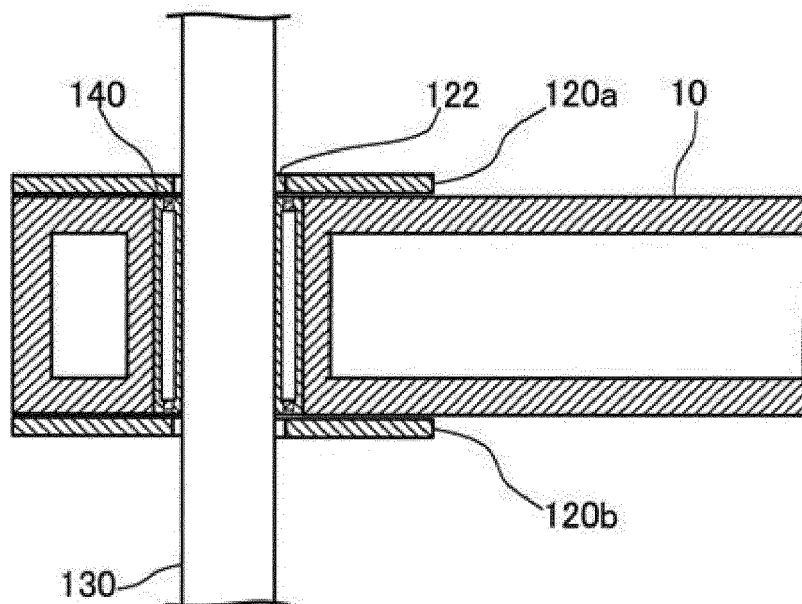


FIG. 3A

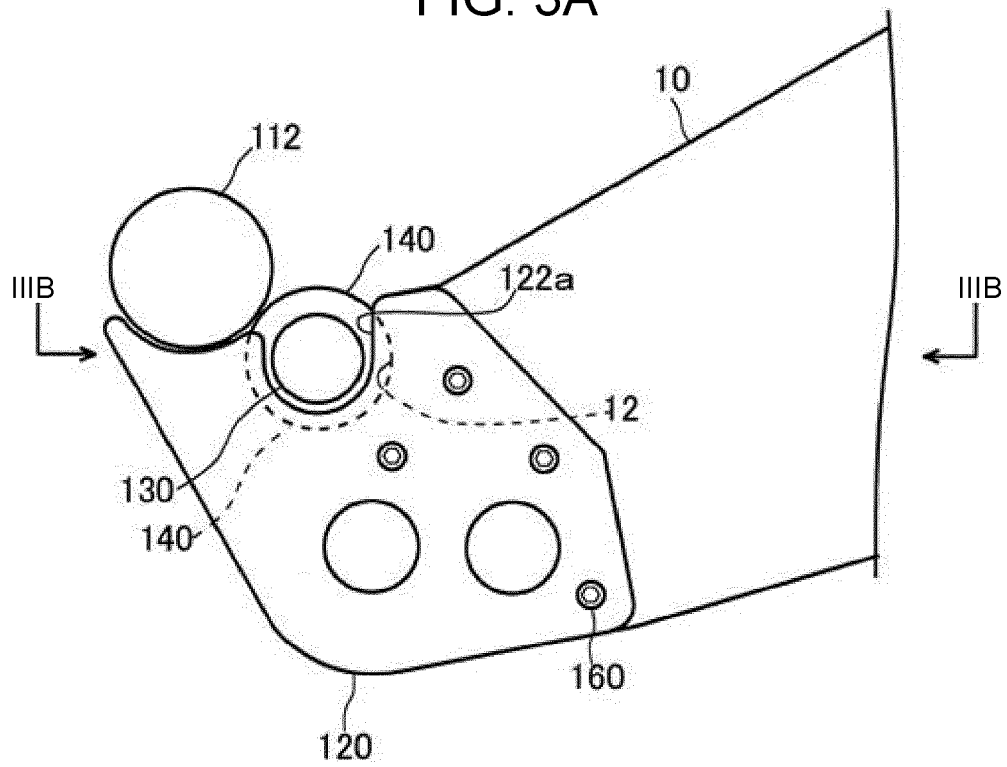
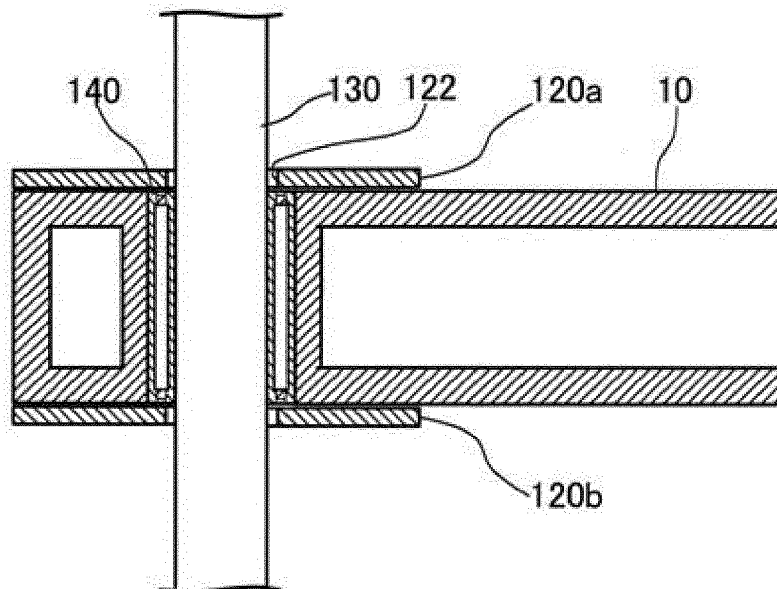


FIG. 3B





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Application Number

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Place of search Munich		Date of completion of the search 11 May 2023	Examiner Todarello, Giovanni
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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ON EUROPEAN PATENT APPLICATION NO.**

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