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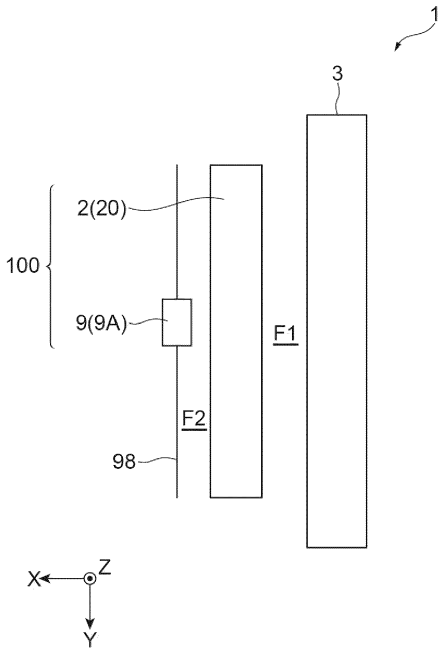
(54) HOLDING METHOD, YARN SUPPLY DEVICE AND YARN SUPPLY STAND

(57) In a yarn supply stand (20), when a line passing through a first mounting portion (25A) and a second mounting portion (25B) is virtually set as a mounting portion line (L1) in the front view, one of a first holding portion (28) and a second holding portion (29) is disposed in an area on one side divided by a mounting portion line (L1) as a boundary and the other of the first holding portion (28) and the second holding portion (29) is disposed in an area on the other side divided by the mounting portion line (L1) as a boundary, and when a line passing through the first holding portion (28) and the second holding portion (29) is virtually set as a holding portion line (L2), one of the first mounting portion (25A) and the second mounting portion (25B) is disposed in an area on one side divided by the holding portion line (L2) as a boundary and the other of the first mounting portion (25A) and the second mounting portion (25B) is disposed in an area on the other side divided by the holding portion line (L2) as a boundary.

Fig.1



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Description

TECHNICAL FIELD

[0001] The present invention relates to a holding method, a yarn supply device, and a yarn supply stand.

BACKGROUND

[0002] There is known a false-twist texturing device including a yarn supply stand which rotatably supports a plurality of yarn supply packages and a false-twist texturing device which falsely twists yarns supplied from the yarn supply packages. For example, Patent Literature 1 (Japanese Unexamined Patent Publication No. 2021-24744) discloses a yarn supply stand provided with a pair of mounting portions (pegs) respectively supporting a plurality of yarn supply packages. In such a yarn supply stand, since a yarn splicing process (tail connecting process) of connecting a yarn end (foremost yarn) of a yarn of a yarn supply package (hereinafter, referred to as a first yarn supply package) supported by one of the pair of mounting portion and a yarn end (rearmost yarn) of a yarn of a yarn supply package (hereinafter, referred to as a second yarn supply package) supported by the other of the pair of mounting portions is performed, the yarn can be supplied from the second yarn supply package provided as a spare to the false-twist texturing device even when the yarn of the first yarn supply package runs out. That is, the yarn supply stand of Patent Literature 1 can continuously supply the yarn to the false-twist texturing device by automatically switching the yarn supply package to be supplied to the false-twist texturing device.

[0003] In the yarn splicing process, yarns are respectively pulled out from the first yarn supply package and the second yarn supply package and these yarns are connected using the yarn splicing device. At the time when this connection is completed, the yarn connected between the first yarn supply package and the second yarn supply package (hereinafter, the yarn between both yarn supply packages) is in a slack state. When the yarn is unwound from one yarn supply package while the yarn between both yarn supply packages is in a slack state, the slack yarn may get entangled in the unwound yarn and may cause problems such as yarn breakage. Further, when the yarn supply package to be supplied to the false-twist texturing device while the yarn between both yarn supply packages is in a slack state is switched, a local load is applied to the yarn between both yarn supply packages or the yarn between both yarn supply packages contacts the peripheral parts. As a result, problems such as yarn damage and yarn breakage may occur.

[0004] In the yarn supply stand, one holding portion (clip) for avoiding the above-described problems when unwinding or switching the yarn supply package (see Japanese Unexamined Patent Publication No. H9-67064) is provided at a lower portion between the first yarn supply package and the second yarn supply package and a worker removes the slack of the yarn between both yarn supply packages and holds the yarn between both yarn supply packages by the holding portion.

SUMMARY

[0005] However, the holding state of the yarn between both yarn supply packages by the holding portion changes depending on the situation when the yarn is unwound from the yarn supply package, such as the unwound state of the yarn from any one of the first yarn supply package and the second yarn supply package and the winding direction (clockwise or counterclockwise winding) of the yarn unwound from the first yarn supply package or the second yarn supply package on the yarn supply bobbin. Therefore, when the yarn is held only by one holding portion between the first yarn supply package and the second yarn supply package, for example, a difference in height between the yarn pull-out position of the yarn supply package and the arrangement position of the holding portion may increase depending on the state of the yarn between the yarn supply packages. As a result, unnecessary resistance may occur in the yarn between the yarn supply packages. Then, if such unnecessary resistance occurs, problems such as cutting of the yarn or damage of the yarn occur when switching the yarn supply package to be unwound.

[0006] Here, an object of the present invention is to provide a holding method, a yarn supply device and a yarn supply stand capable of suppressing problems from occurring when unwinding or switching yarn supply packages and a yarn supply device including the same.

[0007] A holding method according to one aspect of the present invention holds connected yarn between a first yarn supply package and a second yarn supply package by a first holding portion or a second holding portion in a yarn supply stand, the yarn supply stand comprising a first mounting portion on which the first yarn supply package obtained by winding a yarn on a bobbin is mounted, a second mounting portion on which the second yarn supply package obtained by winding a yarn on a bobbin is mounted, a guide portion which guides the yarn unwound from an outer layer side of the first yarn supply package while a yarn end on an outer layer side of the second yarn supply package is connected to a yarn end on an inner layer side of the first yarn supply package or the yarn unwound from the outer layer side of the second yarn supply package while a yarn end on the outer layer side of the first yarn supply package is connected

to a yarn end on an inner layer side of the second yarn supply package to a yarn processing device, the first holding portion which holds a part of the yarn between both yarn supply packages while the yarn end on the inner layer side of the first yarn supply package is connected to the yarn end on the outer layer side of the second yarn supply package, and the second holding portion which holds a part of the yarn between both yarn supply packages while the yarn end on the inner layer side of the second yarn supply package is connected to the yarn end on the outer layer side of the first yarn supply package, wherein when a line passing through the first mounting portion and the second mounting portion is virtually set as a mounting portion line in a front view in which the guide portion is located between the first mounting portion and the second mounting portion and the yarn processing device is located behind the guide portion, one of the first holding portion and the second holding portion is disposed in an area on one side divided by the mounting portion line as a boundary in the front view and another of the first holding portion and the second holding portion is disposed in an area on another side divided by the mounting portion line as a boundary, wherein when a line passing through the first holding portion and the second holding portion is virtually set as a holding portion line in the front view, one of the first mounting portion and the second mounting portion is disposed in an area on one side divided by the holding portion line as a boundary in the front view and another of the first mounting portion and the second mounting portion is disposed in an area on another side divided by the holding portion line as a boundary, and wherein the first mounting portion is disposed on a left side of the guide portion, the second mounting portion is disposed on a right side of the guide portion, the first holding portion is disposed on an upper side of the guide portion, and the second holding portion is disposed on a lower side of the guide portion in the front view, the holding method comprising: holding the connected yarn by the first holding portion when the yarn of the first yarn supply package is wound clockwise, the yarn of the second yarn supply package is wound clockwise, and the yarn wound on the first yarn supply package is unwound in the front view; holding the connected yarn by the second holding portion when the yarn of the first yarn supply package is wound clockwise, the yarn of the second yarn supply package is wound clockwise, and the yarn wound on the second yarn supply package is unwound in the front view; holding the connected yarn by the second holding portion when the yarn of the first yarn supply package is wound counterclockwise, the yarn of the second yarn supply package is wound counterclockwise, and the yarn wound on the first yarn supply package is unwound in the front view; and holding the connected yarn by the first holding portion when the yarn of the first yarn supply package is wound counterclockwise, the yarn of the second yarn supply package is wound counterclockwise, and the yarn wound on the second yarn supply package is unwound in the front view.

[0008] In this holding method, in the yarn supply device in which the first holding portion is disposed above the first mounting portion in the vertical direction and above the second mounting portion in the vertical direction and the second holding portion is disposed below the first mounting portion in the vertical direction and below the second mounting portion in the vertical direction, the yarn between both yarn supply packages is held by an appropriate holding portion (the first holding portion or the second holding portion) that prevents a local load from being applied to the yarn between both yarn supply packages or prevents the yarn between both yarn supply packages from contacting the peripheral parts according to the yarn winding direction in the yarn supply package supported by both mounting portions and the attachment position of the yarn supply package to be unwound. As a result, it is possible to suppress problems from occurring when unwinding or switching the yarn supply package.

[0009] In this holding method according to one aspect of the present invention, the first holding portion may include a first holding portion for a first mounting portion disposed at a position closer to the first mounting portion than the second mounting portion and a first holding portion for a second mounting portion disposed at a position closer to the second mounting portion than the first mounting portion, and the second holding portion may include a second holding portion for a first mounting portion disposed at a position closer to the first mounting portion than the second mounting portion and a second holding portion for a second mounting portion disposed at a position closer to the second mounting portion than the first mounting portion.

[0010] In the holding method of this configuration, it is possible to hold the yarn between both yarn supply packages in a more appropriate state depending on the yarn pulled out from the first yarn supply package or the yarn pulled out from the second yarn supply package. Accordingly, it is possible to more reliably suppress problems from occurring when unwinding or switching the yarn supply package.

[0011] A yarn supply device according to one aspect of the present invention comprises: a yarn supply stand; and a yarn splicing processing device, wherein the yarn supply stand comprises a first mounting portion on which a first yarn supply package obtained by winding a yarn on a bobbin is mounted, a second mounting portion on which a second yarn supply package obtained by winding a yarn on a bobbin is mounted, a guide portion which guides the yarn unwound from an outer layer side of the first yarn supply package while a yarn end on an outer layer side of the second yarn supply package is connected to a yarn end on an inner layer side of the first yarn supply package or the yarn unwound from the outer layer side of the second yarn supply package while a yarn end on the outer layer side of the first yarn supply package is connected to a yarn end on an inner layer side of the second yarn supply package to a yarn processing device, a first holding portion which holds a part of the yarn between both yarn supply packages while the yarn end on the inner layer side of the first yarn supply package is connected to the yarn end on the outer layer side of the second

yarn supply package, and a second holding portion which holds a part of the yarn between both yarn supply packages while the yarn end on the inner layer side of the second yarn supply package is connected to the yarn end on the outer layer side of the first yarn supply package, wherein when a line passing through the first mounting portion and the second mounting portion is virtually set as a mounting portion line in a front view in which the guide portion is located between the first mounting portion and the second mounting portion and the yarn processing device is located behind the guide portion, one of the first holding portion and the second holding portion is disposed in an area on one side divided by the mounting portion line as a boundary in the front view and another of the first holding portion and the second holding portion is disposed in an area on another side divided by the mounting portion line as a boundary, wherein when a line passing through the first holding portion and the second holding portion is virtually set as a holding portion line in the front view, one of the first mounting portion and the second mounting portion is disposed in an area on one side divided by the holding portion line as a boundary in the front view and another of the first mounting portion and the second mounting portion is disposed in an area on another side divided by the holding portion line as a boundary, and wherein when a line passing through the guide portion, the first holding portion and the second holding portion is virtually set as a guide portion/mounting portion line in a side view in which the first mounting portion and the second mounting portion overlap each other, the first holding portion and the second holding portion are arranged line-symmetrically with respect to the guide portion/mounting portion line, wherein the yarn splicing processing device comprises a yarn splicing device which connects the yarn end of the first yarn supply package mounted on the first mounting portion to the yarn end of the second yarn supply package mounted on the second mounting portion and holds a part of the connected yarn by the first holding portion or the second holding portion, and a control unit that controls the yarn splicing device, wherein the first mounting portion is disposed on a left side of the guide portion, the second mounting portion is disposed on a right side of the guide portion, the first holding portion is disposed on an upper side of the guide portion, and the second holding portion is disposed on a lower side of the guide portion in the front view, wherein the control unit causes the connected yarn to be held by the first holding portion when the yarn of the first yarn supply package is wound clockwise, the yarn of the second yarn supply package is wound clockwise, and the yarn wound on the first yarn supply package is unwound in the front view, the connected yarn to be held by the second holding portion when the yarn of the first yarn supply package is wound clockwise, the yarn of the second yarn supply package is wound clockwise, and the yarn wound on the second yarn supply package is unwound in the front view, the connected yarn to be held by the second holding portion when the yarn of the first yarn supply package is wound counterclockwise, the yarn of the second yarn supply package is wound counterclockwise, and the yarn wound on the first yarn supply package is unwound in the front view, and the connected yarn to be held by the first holding portion when the yarn of the first yarn supply package is wound counterclockwise, the yarn of the second yarn supply package is wound counterclockwise, and the yarn wound on the second yarn supply package is unwound in the front view.

[0012] In this configuration, in the yarn supply device in which the first holding portion is disposed above the first mounting portion in the vertical direction and above the second mounting portion in the vertical direction and the second holding portion is disposed below the first mounting portion in the vertical direction and below the second mounting portion in the vertical direction, the yarn between both yarn supply packages is held by an appropriate holding portion (the first holding portion or the second holding portion) that prevents a local load from being applied to the yarn between both yarn supply packages or prevents the yarn between both yarn supply packages from contacting the peripheral parts according to the yarn winding direction in the yarn supply package supported by both mounting portions and the attachment position of the yarn supply package to be unwound. As a result, it is possible to suppress problems from occurring when unwinding or switching the yarn supply package. Furthermore, in this configuration, it is possible to align the holding states of the yarn pulled out from the first yarn supply package and the yarn pulled out from the second yarn supply package by the first holding portion and the second holding portion.

[0013] In the yarn supply device according to this aspect of the present invention, the first holding portion may include a first holding portion for a first mounting portion disposed at a position closer to the first mounting portion than the second mounting portion and a first holding portion for a second mounting portion disposed at a position closer to the second mounting portion than the first mounting portion, and the second holding portion may include a second holding portion for a first mounting portion disposed at a position closer to the first mounting portion than the second mounting portion and a second holding portion for a second mounting portion disposed at a position closer to the second mounting portion than the first mounting portion, wherein the control unit causes the connected yarn to be held by both the first holding portion for the first mounting portion and the first holding portion for the second mounting portion when the yarn of the first yarn supply package is wound clockwise, the yarn of the second yarn supply package is wound clockwise, and the yarn wound on the first yarn supply package is unwound in the front view, the connected yarn to be held by both the second holding portion for the first mounting portion and the second holding portion for the second mounting portion when the yarn of the first yarn supply package is wound clockwise, the yarn of the second yarn supply package is wound clockwise, and the yarn wound on the second yarn supply package is unwound in the front view, the connected yarn to be held by both the second holding portion for the first mounting portion and the second holding portion for the second mounting portion when the yarn of the first yarn supply package is wound counterclockwise, the yarn of the second yarn

supply package is wound counterclockwise, and the yarn wound on the first yarn supply package is unwound in the front view, and the connected yarn to be held by both the first holding portion for the first mounting portion and the first holding portion for the second mounting portion when the yarn of the first yarn supply package is wound counterclockwise, the yarn of the second yarn supply package is wound counterclockwise, and the yarn wound on the second yarn supply package is unwound in the front view.

[0014] In this configuration, it is possible to hold the yarn between both yarn supply packages in a more appropriate state depending on the yarn pulled out from the first yarn supply package or the yarn pulled out from the second yarn supply package. Accordingly, it is possible to more reliably suppress problems from occurring when unwinding or switching the yarn supply package.

[0015] A yarn supply device according to one aspect of the present invention comprises: a yarn supply stand; a yarn splicing processing device; and a yarn supply package rotation device, wherein the yarn supply stand comprises a first mounting portion on which a first yarn supply package obtained by winding a yarn on a bobbin is mounted, a second mounting portion on which a second yarn supply package obtained by winding a yarn on a bobbin is mounted, a guide portion which guides the yarn unwound from an outer layer side of the first yarn supply package while a yarn end on an outer layer side of the second yarn supply package is connected to a yarn end on an inner layer side of the first yarn supply package or the yarn unwound from the outer layer side of the second yarn supply package while a yarn end on the outer layer side of the first yarn supply package is connected to a yarn end on an inner layer side of the second yarn supply package to a yarn processing device, first holding portion which holds a part of the yarn between both yarn supply packages while the yarn end on the inner layer side of the first yarn supply package is connected to the yarn end on the outer layer side of the second yarn supply package, and

a second holding portion which holds a part of the yarn between both yarn supply packages while the yarn end on the inner layer side of the second yarn supply package is connected to the yarn end on the outer layer side of the first yarn supply package, wherein when a line passing through the first mounting portion and the second mounting portion is virtually set as a mounting portion line in a front view in which the guide portion is located between the first mounting portion and the second mounting portion and the yarn processing device is located behind the guide portion, one of the first holding portion and the second holding portion is disposed in an area on one side divided by the mounting portion line as a boundary in the front view and another of the first holding portion and the second holding portion is disposed in an area on another side divided by the mounting portion line as a boundary, wherein when a line passing through the first holding portion and the second holding portion is virtually set as a holding portion line in the front view, one of the first mounting portion and the second mounting portion is disposed in an area on one side divided by the holding portion line as a boundary in the front view and another of the first mounting portion and the second mounting portion is disposed in an area on another side divided by the holding portion line as a boundary, wherein the yarn splicing processing device connects the yarn end of the first yarn supply package mounted on the first mounting portion to the yarn end of the second yarn supply package mounted on the second mounting portion and holds a part of the connected yarn by the first holding portion or the second holding portion, and wherein the yarn supply package rotation device rotates the first yarn supply package mounted on the first mounting portion around an extension direction of the first mounting portion as a rotation axis and rotates the second yarn supply package mounted on the second mounting portion around an extension direction of the second mounting portion as a rotation axis, and the yarn supply package rotation device rotates at least one of the first yarn supply package and the second yarn supply package to remove the slack of the yarn held by the first holding portion or the yarn held by the second holding portion.

[0016] In this configuration, in the yarn supply device in which the first holding portion is disposed above the first mounting portion in the vertical direction and above the second mounting portion in the vertical direction and the second holding portion is disposed below the first mounting portion in the vertical direction and below the second mounting portion in the vertical direction, the yarn between both yarn supply packages is held by an appropriate holding portion (the first holding portion or the second holding portion) that prevents a local load from being applied to the yarn between both yarn supply packages or prevents the yarn between both yarn supply packages from contacting the peripheral parts according to the yarn winding direction in the yarn supply package supported by both mounting portions and the attachment position of the yarn supply package to be unwound. As a result, it is possible to suppress problems from occurring when unwinding or switching the yarn supply package. Furthermore, in this configuration, it is possible to align the holding states of the yarn pulled out from the first yarn supply package and the yarn pulled out from the second yarn supply package by the first holding portion and the second holding portion. Moreover, in this configuration, it is possible to perform the process of connecting the yarn end of the first yarn supply package and the yarn end of the second yarn supply package and the yarn hooking process of holding a part of the yarn in which the yarn supply packages are connected to each other by the first holding portion and the second holding portion without requiring the hand of the worker. Accordingly, it is possible to reduce the burden of the worker who requires the yarn splicing process and the yarn hooking process.

[0017] A yarn supply device according to one aspect of the present invention comprises: a yarn supply stand; a yarn splicing processing device; and a slack adjustment mechanism, wherein the yarn supply stand comprises a first mounting

portion on which a first yarn supply package obtained by winding a yarn on a bobbin is mounted, a second mounting portion on which a second yarn supply package obtained by winding a yarn on a bobbin is mounted, a guide portion which guides the yarn unwound from an outer layer side of the first yarn supply package while a yarn end on an outer layer side of the second yarn supply package is connected to a yarn end on an inner layer side of the first yarn supply package or the yarn unwound from the outer layer side of the second yarn supply package while a yarn end on the outer layer side of the first yarn supply package is connected to a yarn end on an inner layer side of the second yarn supply package to a yarn processing device, a first holding portion which holds a part of the yarn between both yarn supply packages while the yarn end on the inner layer side of the first yarn supply package is connected to the yarn end on the outer layer side of the second yarn supply package, and a second holding portion which holds a part of the yarn between both yarn supply packages while the yarn end on the inner layer side of the second yarn supply package is connected to the yarn end on the outer layer side of the first yarn supply package, wherein when a line passing through the first mounting portion and the second mounting portion is virtually set as a mounting portion line in a front view in which the guide portion is located between the first mounting portion and the second mounting portion and the yarn processing device is located behind the guide portion, one of the first holding portion and the second holding portion is disposed in an area on one side divided by the mounting portion line as a boundary in the front view and another of the first holding portion and the second holding portion is disposed in an area on another side divided by the mounting portion line as a boundary, wherein when a line passing through the first holding portion and the second holding portion is virtually set as a holding portion line in the front view, one of the first mounting portion and the second mounting portion is disposed in an area on one side divided by the holding portion line as a boundary in the front view and another of the first mounting portion and the second mounting portion is disposed in an area on another side divided by the holding portion line as a boundary, wherein the first holding portion includes a first holding portion for a first mounting portion disposed at a position closer to the first mounting portion than the second mounting portion and a first holding portion for a second mounting portion disposed at a position closer to the second mounting portion than the first mounting portion, and wherein the second holding portion includes a second holding portion for a first mounting portion disposed at a position closer to the first mounting portion than the second mounting portion and a second holding portion for a second mounting portion disposed at a position closer to the second mounting portion than the first mounting portion, wherein the yarn splicing processing device connects the yarn end of the first yarn supply package mounted on the first mounting portion and the yarn end of the second yarn supply package mounted on the second mounting portion and holds a part of the connected yarn by both the first holding portion for the first mounting portion and the first holding portion for the second mounting portion or both the second holding portion for the first mounting portion and the second holding portion for the second mounting portion, and wherein the slack adjustment mechanism adjusts the length of the yarn between the first holding portion for the first mounting portion and the first holding portion for the second mounting portion to remove the slack of at least one of the yarn between the first holding portion for the first mounting portion and the first yarn supply package and the yarn between the first holding portion for the second mounting portion and the second yarn supply package or adjusts the length of the yarn between the second holding portion for the first mounting portion and the second holding portion for the second mounting portion to remove the slack of at least one of the yarn between the second holding portion for the first mounting portion and the first yarn supply package and the yarn between the second holding portion for the second mounting portion and the second yarn supply package.

[0018] In this configuration, in the yarn supply device in which the first holding portion is disposed above the first mounting portion in the vertical direction and above the second mounting portion in the vertical direction and the second holding portion is disposed below the first mounting portion in the vertical direction and below the second mounting portion in the vertical direction, the yarn between both yarn supply packages is held by an appropriate holding portion (the first holding portion or the second holding portion) that prevents a local load from being applied to the yarn between both yarn supply packages or prevents the yarn between both yarn supply packages from contacting the peripheral parts according to the yarn winding direction in the yarn supply package supported by both mounting portions and the attachment position of the yarn supply package to be unwound. As a result, it is possible to suppress problems from occurring when unwinding or switching the yarn supply package. In this configuration, it is possible to hold the yarn between both yarn supply packages in a more appropriate state depending on the yarn pulled out from the first yarn supply package or the yarn pulled out from the second yarn supply package. Accordingly, it is possible to more reliably suppress problems from occurring when unwinding or switching the yarn supply package. Furthermore, in this configuration, it is possible to perform the process of connecting the yarn end of the first yarn supply package and the yarn end of the second yarn supply package and the yarn hooking process of holding a part of the yarn in which the yarn supply packages are connected to each other by each holding portion provided as the first holding portion and each holding portion provided as the second holding portion without requiring the hand of the worker. Accordingly, it is possible to reduce the burden of the worker who requires the yarn splicing process and the yarn hooking process.

[0019] The yarn supply device according to one aspect of the present invention may further comprise: a yarn supply package rotation device which rotates the first yarn supply package mounted on the first mounting portion around an extension direction of the first mounting portion as a rotation axis and rotates the second yarn supply package mounted

on the second mounting portion around an extension direction of the second mounting portion as a rotation axis, wherein the yarn supply package rotation device rotates at least one of the first yarn supply package and the second yarn supply package to remove the slack of the yarn held by the first holding portion or the yarn held by the second holding portion.

[0020] In the yarn supply stand of this configuration, it is possible to perform the process of connecting the yarn end of the first yarn supply package and the yarn end of the second yarn supply package and the yarn hooking process of holding a part of the yarn in which the yarn supply packages are connected to each other by the first holding portion and the second holding portion without requiring the hand of the worker. Accordingly, it is possible to reduce the burden of the worker who requires the yarn splicing process and the yarn hooking process.

[0021] The yarn supply device according to one aspect of the present invention may further comprise: a slack adjustment mechanism which adjusts the length of the yarn between the first holding portion for the first mounting portion and the first holding portion for the second mounting portion to remove the slack of at least one of the yarn between the first holding portion for the first mounting portion and the first yarn supply package and the yarn between the first holding portion for the second mounting portion and the second yarn supply package or adjusts the length of the yarn between the second holding portion for the first mounting portion and the second holding portion for the second mounting portion to remove the slack of at least one of the yarn between the second holding portion for the first mounting portion and the first yarn supply package and the yarn between the second holding portion for the second mounting portion and the second yarn supply package.

[0022] In this configuration, it is possible to perform the process of connecting the yarn end of the first yarn supply package and the yarn end of the second yarn supply package and the yarn hooking process of holding a part of the yarn in which the yarn supply packages are connected to each other by each holding portion provided as the first holding portion and each holding portion provided as the second holding portion without requiring the hand of the worker. Accordingly, it is possible to reduce the burden of the worker who requires the yarn splicing process and the yarn hooking process.

[0023] A yarn supply stand according to one aspect of the present invention comprises: a first mounting portion on which the first yarn supply package obtained by winding a yarn on a bobbin is mounted; a second mounting portion on which the second yarn supply package obtained by winding a yarn on a bobbin is mounted; a guide portion which guides the yarn unwound from an outer layer side of the first yarn supply package while a yarn end on an outer layer side of the second yarn supply package is connected to a yarn end on an inner layer side of the first yarn supply package or the yarn unwound from the outer layer side of the second yarn supply package while a yarn end on the outer layer side of the first yarn supply package is connected to a yarn end on an inner layer side of the second yarn supply package to a yarn processing device; the first holding portion which holds a part of the yarn between both yarn supply packages while the yarn end on the inner layer side of the first yarn supply package is connected to the yarn end on the outer layer side of the second yarn supply package; and the second holding portion which holds a part of the yarn between both yarn supply packages while the yarn end on the inner layer side of the second yarn supply package is connected to the yarn end on the outer layer side of the first yarn supply package, wherein when a line passing through the first mounting portion and the second mounting portion is virtually set as a mounting portion line in a front view in which the guide portion is located between the first mounting portion and the second mounting portion and the yarn processing device is located behind the guide portion, one of the first holding portion and the second holding portion is disposed in an area on one side divided by the mounting portion line as a boundary in the front view and another of the first holding portion and the second holding portion is disposed in an area on another side divided by the mounting portion line as a boundary, wherein when a line passing through the first holding portion and the second holding portion is virtually set as a holding portion line in the front view, one of the first mounting portion and the second mounting portion is disposed in an area on one side divided by the holding portion line as a boundary in the front view and another of the first mounting portion and the second mounting portion is disposed in an area on another side divided by the holding portion line as a boundary, wherein the first holding portion includes a first holding portion for a first mounting portion disposed at a position closer to the first mounting portion than the second mounting portion and a first holding portion for a second mounting portion disposed at a position closer to the second mounting portion than the first mounting portion, and wherein the second holding portion includes a second holding portion for a first mounting portion disposed at a position closer to the first mounting portion than the second mounting portion and a second holding portion for a second mounting portion disposed at a position closer to the second mounting portion than the first mounting portion.

[0024] In this configuration, the first holding portion and the second holding portion are arranged on one side and the other side of the area divided by the mounting portion line as a boundary in the front view. Accordingly, since it is possible to select the holding portion (the first holding portion or the second holding portion) holding the yarn between both yarn supply packages according to the position of the yarn pulled out from the (spare) yarn supply package after switching, it is possible to hold the yarn between both yarn supply packages in an appropriate state for each situation. As a result, it is possible to suppress problems from occurring when unwinding or switching the yarn supply package. Furthermore, in this configuration, it is possible to hold the yarn between both yarn supply packages in a more appropriate state depending on the yarn pulled out from the first yarn supply package or the yarn pulled out from the second yarn supply

package. Accordingly, it is possible to more reliably suppress problems from occurring when unwinding or switching the yarn supply package.

[0025] In the yarn supply stand according to one aspect of the present invention, when a line passing through the guide portion, the first holding portion and the second holding portion may be virtually set as a guide portion/holding portion line in a plan view in which the first holding portion and the second holding portion overlap each other, the first mounting portion and the second mounting portion are arranged line-symmetrically with respect to the guide portion/holding portion line. In the yarn supply stand of this configuration, it is possible to align the holding states of the yarn pulled out from the first yarn supply package and the yarn pulled out from the second yarn supply package by the first holding portion and the second holding portion.

[0026] In the yarn supply stand according to one aspect of the present invention, the mounting portion line may be a direction along a horizontal direction, and the holding portion line may be a direction along a vertical direction. In this configuration, one of the first holding portion and the second holding portion is disposed above the first mounting portion in the vertical direction and above the second mounting portion in the vertical direction and another of the first holding portion and the second holding portion is disposed below the first mounting portion in the vertical direction and below the second mounting portion in the vertical direction. Accordingly, since it is possible to select the holding portion (the first holding portion or the second holding portion) holding the yarn between both yarn supply packages according to the position of the yarn pulled out from the (spare) yarn supply package after switching, it is possible to hold the yarn between both yarn supply packages in an appropriate state for each situation. As a result, it is possible to suppress problems from occurring when unwinding or switching the yarn supply package.

[0027] According to one aspect of the present invention, it is possible to suppress problems from occurring when unwinding or switching the yarn supply package.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028]

FIG. 1 is a diagram showing a configuration of a false-twist texturing device and a package exchanging device according to an embodiment.
FIG. 2 is a perspective view showing a yarn supply package mounted with an adapter.
FIG. 3 is a perspective view showing a creel stand.
FIG. 4 is an enlarged perspective view showing a pair of pegs in the creel stand.
FIG. 5 is a front view showing a clip.
FIG. 6A is a diagram illustrating a front view of the creel stand. FIG. 6B is a diagram illustrating a plan view of the creel stand. FIG. 6C is a diagram illustrating a side view of the creel stand.
FIG. 7 is a perspective view showing a peg.
FIG. 8 is a perspective view showing the package exchanging device.
FIG. 9 is a diagram showing a schematic configuration of an exchanging unit.
FIG. 10 is a perspective view showing a yarn splicing device.
FIG. 11 is a perspective view showing the yarn splicing device.
FIG. 12 is a block diagram showing a functional configuration of the package exchanging device including a yarn splicing processing device.
FIGS. 13A and 13B are perspective views showing a series of operations of the yarn splicing processing device.
FIGS. 14A and 14B are perspective views showing a series of operations of the yarn splicing processing device.
FIGS. 15A and 15B are perspective views showing a series of operations of the yarn splicing processing device.
FIG. 16 is an enlarged perspective view showing a pair of pegs in a creel stand according to a modified example.
FIGS. 17A and 17B are perspective views showing a series of operations of the yarn splicing processing device according to the modified example.
FIGS. 18A and 18B are perspective views showing a series of operations of the yarn splicing processing device according to the modified example.
FIG. 19 is a perspective view showing a series of operations of the yarn splicing processing device according to the modified example.

DETAILED DESCRIPTION

[0029] Hereinafter, preferred embodiments of the present invention will be described in detail with reference to the accompanying drawings. In the description of the drawings, the same is designated by the same reference numerals, and duplicate description will be omitted.

[0030] A yarn feeding device 100 of an embodiment includes, as shown in FIG. 1, a creel stand (yarn feeding stand)

20 and a yarn joining processing device 9A. The creel stand 20 is provided in a false-twist texturing device 1. The yarn joining processing device 9A of an embodiment is mounted on a package exchange device 9. The yarn joining processing device 9A includes a yarn joining device 60 and a control unit 94 which will be described in detail in the rear stage (see FIGS. 1 and 11). In the following description, the "Z direction" shown in the drawing is the vertical direction (up and down direction), the "X direction" is the horizontal direction, and the "Y direction" is the horizontal direction orthogonal to the "X direction" and is also the direction orthogonal to both the X direction and the Z direction.

[0031] The false-twist texturing device 1 shown in FIG. 1 manufactures a winding package P by processing a yarn (synthetic yarn) Y supplied from a plurality of yarn feeding packages P. The yarn Y is, for example, a synthetic yarn made of thermoplastic synthetic fibers such as polyester and polyamide. The yarn feeding package P is formed by winding a partially oriented yarn (POY) on a yarn feeding bobbin B. The winding package is formed by winding a draw textured yarn (DTY) on a winding bobbin. That is, the false-twist texturing device 1 processes the yarn Y which is the partially oriented yarn to generate the draw textured yarn.

[0032] As shown in FIG. 2, an adapter 8 is attached to the yarn supply package P. The adapter 8 is attached to an end portion of a yarn supply bobbin B of the yarn supply package P to be synchronously rotatable. The adapter 8 is formed in a cylindrical shape. The adapter 8 is provided with a holding hole portion 81 into which the yarn end of the yarn Y on the outer layer side (foremost yarn side) of the yarn supply package P (hereinafter, the yarn end of the yarn Y on the outer layer side is also referred to as a "first yarn end YI") enters and is held. Additionally, the yarn end of the yarn Y on the inner layer side (rearmost yarn side) of the yarn supply package P is also referred to as a "second yarn end Y2" in the following description.

[0033] As shown in FIG. 1, the false-twist texturing device 1 includes a yarn supply section 2 and a processing section (yarn texturing device) 3. A plurality of configurations of the yarn supply section 2 and the processing section 3 to be described later are arranged in the Y direction (machine base longitudinal direction) orthogonal to a traveling surface of the yarn Y in which a yarn path from the yarn supply section 2 to the processing section 3 is disposed (paper surface of FIG. 1).

[0034] The yarn feeding portion 2 feeds the yarn Y to the processing portion 3. The yarn feeding portion 2 includes a creel stand 20 which holds a plurality of the yarn feeding packages P. As shown in FIGS. 1 and 3, the creel stand 20 includes a creel base portion 21, a first support column 22, a second support column 23, a partition dish plate 24, a peg (first mounting portion/second mounting portion) 25, a guide portion 26, and a pair of clips (locking portion) 27 and 27. The creel base portion 21 is installed on a floor surface or the like and supports the first support column 22 and the second support column 23. The first support column 22 and the second support column 23 are erected on the creel base portion 21.

[0035] The first support column 22 extends along the Z direction (vertical direction). The first support columns 22 are arranged at equal intervals in the Y direction. The first support column 22 is disposed at the rear side F1 of the creel stand 20 in the X direction. The rear side F1 of the X direction is a side in which the processing portion 3 to be described later in detail in the rear stage is disposed and a side in which the yarn Y is sent to the processing portion 3 for performing false-twist texturing.

[0036] The second support column 23 extends along the Z direction. The second support columns 23 are arranged in pairs in the Y direction and a plurality of pairs of second support columns 23 and 23 are arranged in the Y direction. The second support column 23 is disposed at the front side F2 of the creel stand 20 in the X direction. The front side F2 of the X direction is a side in which the package exchange device 9 to be described later in detail in the rear stage travels and a side in which the operator performs a yarn joining processing work. A group of the first support columns 22 including the plurality of first support columns 22 and a group of the second support columns 23 including the plurality of second support columns 23 are arranged in the X direction to face each other.

[0037] The partition dish plate 24 is provided to straddle the first support column 22 and the second support column 23. The partition dish plate 24 is a dish plate-shaped member and is arranged at a predetermined interval in the Z direction. The partition dish plate 24 prevents the yarn feeding package P from falling from the peg 25.

[0038] The peg 25 supports the yarn feeding package P. The peg 25 is provided in the second support column 23. A plurality of (for example, four) pegs 25 are arranged at predetermined intervals in the Z direction of the second support column 23. The peg 25 is disposed between two partition dish plates 24 in the Z direction. Further, the pegs 25 are arranged in pairs corresponding to the second support columns 23 and 23 and a plurality of sets (pairs) of the pegs 25 and 25 are arranged in the Y direction.

[0039] In the peg 25 with this configuration, the yarn Y of the yarn feeding package P supported by one peg 25 of the pair of pegs can be connected to the yarn Y of the yarn feeding package P supported by the other peg 25 of the pair of pegs. Specifically, the first yarn end Y1 of the yarn feeding package P supported by one peg 25 of the pair of pegs is connected to the second yarn end Y2 of the yarn feeding package P supported by the other peg 25 of the pair of pegs or the second yarn end Y2 of the yarn feeding package P supported by one peg 25 of the pair of pegs is connected to the first yarn end Y1 of the yarn feeding package P supported by the other peg 25 of the pair of pegs. Accordingly, one yarn Y is fed from two yarn feeding packages P and P respectively supported by the pair of pegs 25 and 25. That is, the

yarn Y can be continuously supplied to the processing portion 3.

[0040] Hereinafter, for convenience of description, one of the pair of pegs 25 and 25 is referred to as a first peg (first mounting portion) 25A and the other of the pair of pegs 25 and 25 is referred to as a second peg (second mounting portion) 25B. Further, the yarn supply package P mounted on the first peg 25A is referred to as a first yarn supply package PA and the yarn supply package P mounted on the second peg 25B is referred to as a second yarn supply package PB.

[0041] The guide portion 26 guides the yarn Y unwound from the outer layer side of the first yarn supply package PA in a state in which the first yarn end Y1 of the second yarn supply package PB is connected to the second yarn end Y2 of the first yarn supply package PA (a state shown in FIG. 4) or the yarn Y unwound from the outer layer side of the second yarn supply package PB in a state in which the first yarn end Y1 of the first yarn supply package PA is connected to the second yarn end Y2 of the second yarn supply package PB to the processing section 3. The guide portion 26 is formed by an elongated hole 26B formed in a plate-shaped member 26A that is fixed to a part of the rear side F1 in the X direction of the partition plate 24 and extends in the Z-axis direction. Additionally, in FIGS. 4 and 16, the yarn Y which is guided to the processing section 3 while the yarn Y unwound from the outer layer side of the first yarn supply package PA passes through the guide portion 26 is omitted.

[0042] The pair of clips 27 and 27 holds a part of the yarn Y in which the second yarn end Y2 of the first yarn supply package PA is connected to the first yarn end Y1 of the second yarn supply package PB or a part of the yarn Y in which the second yarn end Y2 of the second yarn supply package PB is connected to the first yarn end Y1 of the first yarn supply package PA. In the pair of clips 27 and 27, hereinafter, one of the pair of clips 27 and 27 is referred to as a first clip (first holding portion) 28 and the other of the pair of clips 27 and 27 is referred to as a second clip (second holding portion) 29.

[0043] Here, as shown in FIG. 6A, a front view is defined as viewing the creel stand 20 so that the guide portion 26 is located between the first peg 25A and the second peg 25B and the processing section 3 is located behind the guide portion 26. In the front view of the creel stand 20, the first peg 25A is disposed on the left side of the guide portion 26, the second peg 25B is disposed on the right side of the guide portion 26, the first clip 28 is disposed on the upper side of the guide portion 26, and the second clip 29 is disposed on the lower side of the guide portion 26.

[0044] As shown in FIGS. 4 and 5, the first clip 28 and the second clip 29 are fixed to the partition plate 24 through a second mounting bracket 24B attached to a first mounting bracket 24A fixed to the partition plate 24. The first clip 28 and the second clip 29 include a pair of disk plates 281 (291) and 282 (292), an elastic member 283 (293), and a shaft portion 284 (294). The pair of disk plates 281 (291) and 282 (292) is provided to be movable within a predetermined range in the extension direction of the shaft portion 284 (294) and is biased toward the second mounting bracket 24B by the elastic member 283 (293). When the yarn Y is disposed between the pair of disk plates 281 (291) and 282 (292), the yarn Y is locked by being clamped by the pair of disk plates 281 (291) and 282 (292). Additionally, the elastic force of the elastic member 283 (293) is appropriately selected or adjusted so that the locking by the pair of disk plates 281 (291) and 282 (292) is released when the worker pulls the yarn Y.

[0045] The configuration of the first clip 28 and the second clip 29 is not limited to the configuration described above, and any configuration that can hold the yarn Y may be used. For example, the elastic member 283 (293) that biases the pair of disk plates 281 (291) and 282 (292) is not essentially required and the yarn Y may be held by the own weight of the disk plates 281 (291) and 282 (292).

[0046] As shown in FIGS. 4 and 6A, when the creel stand 20 is viewed from the front side, the first clip 28 and the second clip 29 are arranged between the first peg 25A and the second peg 25B in the horizontal direction and are arranged to sandwich both the first peg 25A and the second peg 25B in the vertical direction. When it is assumed that the fully wound first yarn supply package PA is mounted on the first peg 25A and the fully wound second yarn supply package PB is mounted on the second peg 25B, the first clip 28 and the second clip 29 are arranged to sandwich the fully wound first yarn supply package PA and the fully wound second yarn supply package PB in the vertical direction. That is, the first clip 28 is disposed above the outer edge of the fully wound first yarn supply package PA in the vertical direction and the second clip 29 is disposed below the outer edge of the fully wound second yarn supply package PB.

[0047] Hereinafter, the arrangement positions of the first clip 28 and the second clip 29 will be described in more detail. In the front view shown in FIG. 6A, the line passing through the first peg 25A and the second peg 25B is virtually set as a mounting portion line L1. At this time, one of the first clip 28 and the second clip 29 is disposed in an area on one side divided by the mounting portion line L1 as a boundary in the front view and the other of the first clip 28 and the second clip 29 is disposed in an area on the other side divided by the mounting portion line L1 as a boundary. In this embodiment, the mounting portion line L1 extends in a direction along the horizontal direction, the first clip 28 is disposed in an upper area A1 divided by the mounting portion line L1 in the front view, and the second clip 29 is disposed in a lower area A2 divided by the mounting portion line L1.

[0048] Further, here, the line passing through the first clip 28 and the second clip 29 is virtually set as a holding portion line L2 in the front view. At this time, one of the first peg 25A and the second peg 25B is disposed in an area on one side divided by the holding portion line L2 as a boundary in the front view and the other of the first peg 25A and the

second peg 25B is disposed in an area on the other side divided by the holding portion line L2 as a boundary. In this embodiment, the holding portion line L2 extends in a direction along the vertical direction, the first peg 25A is disposed in a left area A3 divided by the holding portion line L2 as a boundary in the front view, and the second peg 25B is disposed in a right area A4 divided by the holding portion line L2 as a boundary.

[0049] Additionally, the line passing through the first peg 25A and the second peg 25B mentioned herein is the line passing through a point in which the first peg 25A supports the first yarn supply package PA and a point in which the second peg 25B supports the second yarn supply package PB in the front view. The point in which the first peg 25A supports the first yarn supply package PA is a portion of the first peg 25A and can be, for example, a portion between two yarn supply package support portions 251 and 251 to be described later in detail. Further, the point in which the second peg 25B supports the second yarn supply package PB is a portion of the second peg 25B and can be, for example, a portion between two yarn supply package support portions 251 and 251 to be described later in detail. Further, the line passing through the first clip 28 and the second clip 29 is the line passing through a portion of the first clip 28 and a portion of the second clip 29. A portion of the first clip 28 is, for example, the position of the shaft portion 284. A portion of the second clip 29 is, for example, the position of the shaft portion 294.

[0050] In this embodiment, in the front view, the first clip 28 is disposed at a position farther from the mounting portion line L1 than the outer edge of the fully wound first yarn supply package PA mounted on the first peg 25A and is disposed at a position farther from the mounting portion line L1 than the outer edge of the fully wound second yarn supply package PB mounted on the second peg 25B. The second clip 29 is disposed at a position farther from the mounting portion line L1 than the outer edge of the fully wound first yarn supply package PA mounted on the first peg 25A and is disposed at a position farther from the mounting portion line L1 than the outer edge of the fully wound second yarn supply package PB mounted on the second peg 25B.

[0051] As shown in FIG. 6B, the first clip 28 and the second clip 29 are arranged to overlap each other in a plan view when viewed from the vertical direction (the upper side in the Z direction). In such a plan view, the line passing through the guide portion 26, the first clip 28, and the second clip 29 is virtually set as a guide portion/holding portion line L3. In this embodiment, the first peg 25A and the second peg 25B are arranged line-symmetrically with respect to the guide portion/holding portion line L3.

[0052] As shown in FIG. 6C, the first peg 25A and the second peg 25B are arranged to overlap each other in a side view when viewed from the left side in the Y direction. In such a side view, the line passing through the guide portion 26, the first peg 25A, and the second peg 25B is virtually set as a guide portion/mounting portion line L4. In this embodiment, the first clip 28 and the second clip 29 are arranged line-symmetrically with respect to the guide portion/mounting portion line L4.

[0053] The first clip 28 and the second clip 29 which are in the above-described arrangement relationship hold a part of the yarn Y in which the second yarn end Y2 of the first yarn supply package PA is connected to the first yarn end Y1 of the second yarn supply package PB or a part of the yarn Y in which the second yarn end Y2 of the second yarn supply package PB is connected to the first yarn end Y1 of the first yarn supply package PA.

[0054] One feature of the creel stand 20 of this embodiment is that the pair of clips 27 and 27 (that is, the first clip 28 and the second clip 29 described above) is provided with respect to the pair of pegs 25 (that is, the first peg 25A and the second peg 25B). Specifically, one feature of the creel stand 20 of this embodiment is that the first clip 28 and the second clip 29 are provided to hold the yarn Y which is determined according to the winding direction of the yarn Y in the first yarn supply package PA and the second yarn supply package PB (that is, clockwise or counterclockwise direction) and the connection state between the yarn Y of the first yarn supply package PA and the yarn Y of the second yarn supply package PB (that is, a part of the yarn Y in which the second yarn end Y2 of the first yarn supply package PA is connected to the first yarn end Y1 of the second yarn supply package PB or a part of the yarn Y in which the second yarn end Y2 of the second yarn supply package PB is connected to the first yarn end Y1 of the first yarn supply package PA) . Hereinafter, this will be described in detail with reference to FIG. 4.

(A) Case of winding the yarn Y of the yarn supply package P counterclockwise in the front view

[0055] The first clip 28 holds a part of the yarn Y in which the second yarn end Y2 of the second yarn supply package PB is connected to the first yarn end Y1 of the first yarn supply package PA (the dashed yarn Y shown in FIG. 4) when the yarn Y wound on the second yarn supply package PB is unwound. The second clip 29 holds a part of the yarn Y in which the second yarn end Y2 of the first yarn supply package PA is connected to the first yarn end Y1 of the second yarn supply package PB (the solid yarn Y shown in FIG. 4) when the yarn Y wound on the first yarn supply package PA is unwound.

(B) Case of winding the yarn Y of the first yarn supply package P clockwise in the front view

[0056] The first clip 28 holds a part of the yarn Y (not shown) in which the second yarn end Y2 of the first yarn supply

package PA is connected to the first yarn end Y1 of the second yarn supply package PB when the yarn Y wound on the first yarn supply package PA is unwound. The second clip 29 holds a part of the yarn Y (not shown) in which the second yarn end Y2 of the second yarn supply package PB is connected to the first yarn end Y1 of the first yarn supply package PA when the yarn Y wound on the second yarn supply package PB is unwound.

[0057] Table 1 below is a table showing the clip 27 (the first clip 28 or the second clip 29) holding the yarn Y in a connected state which is determined according to the winding direction and the connection state.

[Table 1]

Connection state	Winding direction of Yarn supply package P	
	Counterclockwise	Clockwise
State in which second yarn end Y2 of first yarn supply package PA is connected to first yarn end Y1 of second yarn supply package PB when yarn Y wound on the first yarn supply package PA is unwound	Second clip 29	First clip 28
State in which second yarn end Y2 of second yarn supply package PB is connected to first yarn end Y1 of first yarn supply package PA when yarn Y wound on second yarn supply package PB is unwound	First clip 28	Second clip 29

[0058] As indicated by the dashed yarn Y in FIG. 4, the first clip 28 is disposed so that an angle $\theta 1$ formed by the yarn Y between the outer edge of the fully wound first yarn supply package PA and the second clip 29 does not become equal to or larger than 30° with respect to the line parallel to the mounting portion line L1 (that is, the horizontal direction) when the yarn Y is unwound from the second yarn supply package PB. As indicated by the solid yarn Y in FIG. 4, the second clip 29 is disposed so that an angle $\theta 2$ formed by the yarn Y between the outer edge of the fully wound second yarn supply package PB and the second clip 29 does not become equal to or larger than 30° with respect to the line parallel to the mounting portion line L1 (that is, the horizontal direction) when the yarn Y is unwound from the first yarn supply package PA. Accordingly, since it is possible to suppress a change in the holding state by the first clip 28 and the second clip 29, the first clip 28 and the second clip 29 can stably hold the yarn Y.

[0059] As shown in FIG. 7, the peg 25 includes a yarn feeding package support portion 251, a peg body portion 252, a first rotating mechanism 253, a body support portion 254, and a second rotating mechanism 255.

[0060] The yarn feeding package support portion 251 locks the yarn feeding package P. The yarn feeding package support portion 251 includes package support members 251A and 251B. The package support members 251A and 251B are bar-shaped members. The package support members 251A is rotatably supported by the peg body portion 252 around the extension direction of as a rotation axis. The package support members 251B is rotatably supported by the peg body portion 252 around the extension direction of as a rotation axis. The package support members 251A and 251B are arranged at predetermined intervals to extend in one direction and to be parallel to each other. The peg 25 supports the yarn feeding package 1 at two points by the package support members 251A and 251B.

[0061] One end portion of the package support member 251A in the extension direction is provided with a covering portion 251D. One end portion of the package support member 251B in the extension direction is provided with a covering portion 251E. The covering portions 251D and 251E are formed of, for example, rubber (resin) having a large friction coefficient. The covering portions 251D and 251E come into contact with the inner peripheral surface of the yarn feeding bobbin B of the yarn feeding package P. One end of the package support member 251A and one end of the package support member 251B are connected by a connection member 251F.

[0062] The peg body 252 supports the package support member 251A to be rotatable around the extension direction of the package support member 251A as a rotation axis and supports the package support member 251B to be rotatable around the extension direction of the package support member 251B as a rotation axis. The peg body portion 252 is provided with a regulation member 252A. The regulation member 252A is formed, for example, in a disk shape. The regulation member 252A is disposed on one side surface of the peg body portion 252. The regulation member 252A is attached by inserting the package support member 251A and the package support member 251B therethrough. The regulation member 252A faces the end surface of the yarn feeding package P and regulates the movement of the yarn feeding package P in the extension direction of the package support member 251A and the package support member 251B. An insertion hole 252B is formed in the peg body portion 252. The second support column 23 (see FIG. 3) of the creel stand 20 is inserted through the insertion hole 252B.

[0063] The first rotating mechanism 253 includes a driven pulley 253A, a drive pulley 253B, a power transmission belt 253C, and a first wheel 253D. The driven pulley 253A is provided at the other end of the package support member 251A. The drive pulley 253B is provided at the other end of the package support member 251B. The power transmission belt

253C is hung on the driven pulley 253A and the drive pulley 253B. The first wheel 253D is provided in the drive pulley 253B (the package support member 251B). In this embodiment, the first wheel 253D is a Geneva wheel that constitutes a Geneva mechanism. The first wheel 253D rotates in accordance with the rotational driving of the first yarn joining processing driver 621 or the second yarn joining processing driver 631 of the yarn joining device 60 to be described later. The first wheel 253D rotates around the extension direction of the package support member 251B as a rotation axis by the rotational driving of the first yarn splicing driver 621 or the second yarn splicing driver 631 of the yarn splicing device 60 to be described later.

[0064] The body support portion 254 is formed in a tubular shape. One end of the body support portion 254 is connected to the peg body portion 252 and the body support portion 254 and the peg body portion 252 are integrally formed with each other. The hollow portion of the body support portion 254 communicates with the insertion hole 252B of the peg body portion 252. The second support column 23 (see FIG. 3) of the creel stand 20 is inserted into the body support portion 254.

[0065] The second rotating mechanism 255 is a Geneva wheel that constitutes the Geneva mechanism. The second rotating mechanism 255 is connected to the other end of the body support portion 254 and the second rotating mechanism 255 and the body support portion 254 are integrally formed with each other. The second rotating mechanism 255 rotates by the driving of a rotation driver 932A of a rotation device 932 to be described later. The peg body 252 rotates around the second support column 23 as the second rotation mechanism 255 rotates. Accordingly, the package support members 251A and 251B rotate around the second support column 23 as a rotation axis.

[0066] The processing section 3 performs a false-twist texturing process on the yarn Y supplied from the plurality of yarn supply packages P and winds the processed yarn onto a winding bobbin to form a winding package.

[0067] The package exchange device 9 collects the yarn feeding bobbin B from the peg 25 and attaches the yarn feeding package P to the peg 25. As shown in FIG. 6, the package exchange device 9 travels along a rail 98. The rail 98 is laid on a floor and extends in the Y direction. That is, the package exchange device 9 is provided to be able to travel along the Y direction. The package exchange device 9 includes a traveling unit 90, an elevating unit 91, a holding unit 92, an exchange unit 93, the yarn joining device 60, and a control unit 94 (see FIG. 12) which controls the operations of the units 90, 91, 92, and 93 and the yarn joining device 60.

[0068] The traveling unit 90 is provided with a vehicle wheel traveling on the rail 98, a drive mechanism, and the like. The traveling unit 90 supports the elevating unit 91, the holding unit 92, and the exchange unit 93. The elevating unit 91 is elevated while the operator gets thereon. The elevating unit 91 is used for the maintenance or the like. The elevating unit 91 includes a work table 911 on which the operator gets, a guide portion 912 which supports the work table 911 to be movable in the Z direction, and a drive mechanism (not shown) which drives the work table.

[0069] The holding unit 92 holds the plurality of (for example, four) yarn feeding packages P. The holding unit 92 receives the yarn feeding package P supplied from a package replenishing device (not shown), temporarily stores the yarn feeding package P, and supplies the yarn feeding package P to the exchange unit 93. The holding unit 92 is provided to be rotatable in the range of about 90. More specifically, the holding unit 92 is provided to be rotatable between a replenishment position in which the yarn feeding package P is supplied from the package replenishing device and a supply position (a position shown in FIG. 6) in which the yarn feeding package P is supplied to the exchange unit 93.

[0070] The exchange unit 93 exchanges the yarn feeding bobbin B and the yarn feeding package P in the peg 25. Specifically, the exchange unit 93 collects the yarn feeding bobbin B from the peg 25 and attaches the yarn feeding package P to the peg 25. The exchange unit 93 is provided adjacent to the holding unit 92. As shown in FIG. 9, the exchange unit 93 includes a base 931, a rotation device 932, a collection device 933, a supply device 934, and a rotary table 936. Additionally, in FIG. 8, the description of the rotation device 932, the collection device 933, the supply device 934, the rotary table 936, and the yarn joining device 60 described in detail in the rear stage is omitted.

[0071] The base 931 includes the rotation device 932, the collection device 933, the supply device 934, and the rotary table 936 supporting the yarn joining device 60. The base 931 is provided to be elevatable along the Z direction. The rotation device 932 rotates the peg 25 around the second support column 23 as a rotation axis (see FIG. 3). The rotation device 932 includes a rotation driver 932A and a rotation arm 932B.

[0072] The rotation driver 932A rotates the second rotation mechanism 255 (see FIG. 7) of the peg 25 around the second support column 23 as a rotation axis. The rotation driver 932A is a Geneva driver that constitutes the Geneva mechanism. The rotation driver 932A is rotated by the rotational driving of the motor (not shown) . The rotation arm 932B supports the rotation driver 932A. The rotation arm 932B is provided to be swingable in the horizontal direction. The rotation arm 932B is driven by, for example, a motor or an air cylinder (not shown). The rotation device 932 is provided to correspond to one peg 25 and the other peg 25 provided in pairs in the creel stand 20.

[0073] The rotation device 932 changes the direction of the peg 25 by rotating the peg 25 when attaching the yarn feeding package P to the peg 25. More specifically, the rotation device 932 swings the rotation arm 932B so that the rotation driver 932A engages with the second rotating mechanism 255 of the peg 25. The rotation device 932 rotates the rotation driver 932A in one direction by engaging the rotation driver 932A and the second rotation mechanism 255 with each other. In the peg 25, when the second rotation mechanism 255 rotates around the second support column 23

as a rotation axis, the body support portion 254 rotates around the second support column 23 as a rotation axis. Accordingly, the peg 25 rotates around the second support column 23 as a rotation axis and the tip of the yarn supply package support portion 251 faces the exchanging unit 93.

[0074] The collection device 933 is provided in the rotary table 936 rotatably supported by the base 931. The collection device 933 collects the yarn feeding bobbin B from the peg 25. The collection device 933 includes a yarn feeding bobbin support portion 933A which supports the yarn feeding bobbin B. The collection device 933 supports the yarn feeding bobbin B by advancing the yarn feeding bobbin support portion 933A while the yarn feeding bobbin B is not supported by the peg 25 and collects the yarn feeding bobbin B from the peg 25 by retracting the yarn feeding bobbin support portion 933A while the yarn feeding bobbin B is supported by the peg 25.

[0075] The supply device 934 is provided in the rotary table 936 rotatably supported by the base 931. The supply device 934 supplies the yarn feeding package P to the peg 25. The supply device 934 includes a yarn feeding package supply unit 934A supporting the yarn feeding package P. The supply device 934 attaches the yarn feeding package P to the peg 25 by advancing the yarn feeding package supply unit 934A while the yarn feeding package P is supported by the peg 25 and supplies the yarn feeding package P to the peg 25 by retracting the yarn feeding package supply unit 934A while the yarn feeding package P is not supported by the peg 25.

[0076] The package exchange device 9 connects the yarn ends of the pair of yarn feeding packages P and P attached to the pair of pegs 25 and 25 of the creel stand 20 (yarn joining process) and locks the connected yarn to at least one clip 29 provided in the creel stand 20 (the yarn hooking process) in addition to the collection of the yarn feeding bobbin B from the peg 25 and the attachment of the yarn feeding package P to the peg 25. The yarn joining process and the yarn hooking process are performed by the yarn joining processing device 9A. The yarn joining processing device 9A includes the yarn joining device 60 and the control unit 94.

[0077] The yarn splicing device 60 is provided in the turntable 936 rotatably supported by the base 931. The yarn splicing device 60 splices the first yarn end Y1 of the first yarn supply package PA supported by the first peg 25A and the second yarn end Y2 of the second yarn supply package PB supported by the second peg 25B or splices the second yarn end Y2 of the first yarn supply package PA supported by the first peg 25A and the first yarn end Y1 of the second yarn supply package PB supported by the second peg 25B. As shown in FIGS. 10, 11, and 12, the yarn joining device 60 includes a yarn hooking mechanism 61, a first rotation mechanism 62, a second rotation mechanism 63, and a yarn joining processing mechanism 64.

[0078] The yarn hooking mechanism 61 captures the yarn Y of the yarn feeding package P and guides the yarn Y to the yarn joining processing mechanism 64. The yarn hooking mechanism 61 captures the first yarn end Y1 of the first yarn feeding package PA and the second yarn end Y2 of the second yarn feeding package PB and guides them to the yarn joining processing mechanism 64 or captures the second yarn end Y2 of the first yarn feeding package PA and the first yarn end Y1 of the second yarn feeding package PB and guides them to the yarn joining processing mechanism 64. The yarn hooking mechanism 61 includes a suction gun 611, and an arm portion 612.

[0079] The suction gun 611 sucks and captures the yarn Y. The suction gun 611 includes a suction pipe 613 and a suction nozzle (suction holding portion) 614. The suction nozzle 614 is provided at the tip of the suction pipe 613. The suction nozzle 614 sucks the yarn Y. A negative pressure source (not shown) is connected to the suction pipe 613. Accordingly, a suction flow is generated in the suction nozzle 614. The base end side of the suction pipe 613 is connected to the arm portion 612. The suction gun 611 moves the yarn Y entangled (spliced) by the yarn splicing device 60 while sucking and holding the yarn. The arm portion 612 moves the suction gun 611. The arm portion 612 moves the suction gun 611. The arm portion 612 includes a link mechanism and a plurality of motors. The arm portion 612 is supported by the bracket 616.

[0080] The first rotation mechanism 62 operates the first peg 25A to rotate the first yarn supply package PA around the extension direction of the yarn supply package support portion 251 as a rotation axis. The first rotation mechanism 62 rotates the first yarn supply package PA to deliver the yarn Y from the first yarn supply package PA when guiding the yarn Y to the yarn splicing mechanism 64 by the yarn hooking mechanism 61. The first rotation mechanism 62 winds the yarn Y on the first yarn supply package PA by rotating the first yarn supply package PA in order to remove slack in the yarn Y spliced by the yarn splicing mechanism 64 and held by the first clip 28 or the second clip 29.

[0081] The first rotation mechanism 62 includes a first yarn joining processing driver 621, a first motor 622, and a first arm portion 623. The first yarn joining processing driver 621 is rotatably journaled to the first arm portion 623. The first yarn joining processing driver 621 is provided with a first driven pulley 624. The first motor 622 is fixed to the first arm portion 623. The first drive pulley 625 is connected to the output shaft of the first motor 622. The first motor 622 rotationally drives the first drive pulley 625 about an axis. A first power transmission belt 626 is hung on the first driven pulley 624 and the first drive pulley 625. Accordingly, the first yarn joining processing driver 621 is rotated by the rotational driving of the first motor 622.

[0082] The second rotation mechanism 63 operates the second peg 25B to rotate the second yarn supply package PB around the extension direction of the yarn supply package support portion 251 as a rotation axis. The second rotation mechanism 63 rotates the second yarn supply package PB to deliver the yarn Y from the second yarn supply package

PB when guiding the yarn Y to the yarn splicing mechanism 64 by the yarn hooking mechanism 61. The second rotation mechanism 63 winds the yarn Y on the second yarn supply package PB by rotating the second yarn supply package PB in order to remove slack in the yarn Y spliced by the yarn splicing mechanism 64 and held by the first clip 28 or the second clip 29.

[0083] The second rotation mechanism 63 includes a second yarn joining processing driver 631, a second motor 632, and a second arm portion 633. The second yarn joining processing driver 631 is rotatably journaled to the second arm portion 633. The second yarn joining processing driver 631 is provided with a second driven pulley 634. The second motor 632 is fixed to the second arm portion 633. A second drive pulley 635 is connected to the output shaft of the second motor 632. The second motor 632 rotationally drives the second drive pulley 635 about an axis. A second power transmission belt 636 is hung on the second driven pulley 634 and the second drive pulley 635. Accordingly, the second yarn joining processing driver 631 is rotated by the rotational driving of the second motor 632.

[0084] The yarn joining processing mechanism 64 performs yarn joining processing. The yarn joining processing mechanism 64 includes a splicer 66, a first guide mechanism 67, and a second guide mechanism 68.

[0085] The splicer 66 includes a yarn joining processing portion 661, a pair of sandwiching portions 662 and 663, a cutter 664 provided in the sandwiching portion 662, and a cutter 665 provided in the sandwiching portion 663. The yarn joining processing portion 661 entangles (connects) the first yarn end Y1 of the first yarn feeding package PA and the second yarn end Y2 of the second yarn feeding package PB or entangles (connects) the second yarn end Y2 of the first yarn feeding package PA and the first yarn end Y1 of the second yarn feeding package PB. The pair of sandwiching portions 662 and 663 is provided at positions sandwiching the yarn joining processing portion 661. The pair of sandwiching portions 662 and 663 sandwich the yarn Y (the first yarn end Y1 and the second yarn end Y2) inserted through a chamber of the yarn joining processing portion 661. The cutters 664 and 665 cut, for example, an extra portion including a portion sucked and held by the suction nozzle 614 from the yarn joining processed portion of the yarn Y joined by the yarn joining processing portion 661.

[0086] The first guide mechanism 67 locks and guides the yarn Y. The first guide mechanism 67 is provided to be swingable. The first guide mechanism 67 is provided with a potentiometer (not shown) for detecting the tension of the yarn Y. The yarn joining device 60 controls the operation of the first motor 622 of the first rotation mechanism (a yarn supply package rotation device) 62 on the basis of the detection result of the potentiometer. That is, the yarn joining device 60 adjusts the rotation amount (feeding amount) of the first yarn feeding package PA on the basis of the detection result of the potentiometer and draws out the yarn Y from the first yarn feeding package PA at a predetermined tension.

[0087] The second guide mechanism 68 locks and guides the yarn Y. The second guide mechanism 68 is provided to be swingable. The second guide mechanism 68 is provided with a potentiometer (not shown) for detecting the tension of the yarn Y. The yarn joining device 60 controls the operation of the second motor 632 of the second rotation mechanism (a yarn supply package rotation device) 63 on the basis of the detection result of the potentiometer. That is, the yarn joining device 60 adjusts the rotation amount (feeding amount) of the second yarn feeding package PB on the basis of the detection result of the potentiometer and draws out the yarn Y from the second yarn feeding package PB at a predetermined tension.

[0088] As shown in FIG. 9, the rotary table 936 is rotatably supported by the base 931. The rotary table 936 is rotated so that the yarn feeding bobbin support portion 933A is located in front of the target peg 25 when the yarn feeding bobbin B is collected. Further, the rotary table 936 is rotated so that the yarn feeding package supply unit 934A is located in front of the target peg 25 when the yarn feeding package P is supplied. Further, the rotary table 936 is rotated to be located in front of the target peg 25 when joining the yarn Y by the yarn joining device 60.

[0089] As shown in FIG. 11, the control unit 94 is an electronic control unit including a central processing unit (CPU), a read only memory (ROM), a random access memory (RAM), an I/O port, a communication port, and the like. The ROM stores a program for controlling each of the traveling unit 90, the elevating unit 91, the holding unit 92, and the exchange unit 93. Further, each function in the control unit 94 is executed under the control of the CPU by loading predetermined computer software on the hardware such as the CPU and the main storage unit. The control unit 94 of this embodiment mainly controls the suction nozzle 614, the arm portion 612, the splicer 66, the first rotation mechanism 62, and the second rotation mechanism 63 to perform the yarn splicing process and the clip holding process.

[0090] The control unit 94 controls the arm portion 612, the suction nozzle 614, and the splicer 66 to perform a yarn splicing operation of splicing the second yarn end Y2 and the first yarn end Y1 after setting the second yarn end Y2 of the first yarn supply package PA and the first yarn end Y1 of the second yarn supply package PB to the splicer 66 when the yarn Y wound on the first yarn supply package PA is unwound. The control unit 94 controls the arm portion 612 and the suction nozzle 614 to perform a yarn hooking operation of holding a part of the yarn Y between the second yarn end Y2 of the first yarn supply package PA and the inner edge of the first yarn supply package PA or a part of the yarn Y between the first yarn end Y1 of the second yarn supply package PB and the outer edge of the second yarn supply package PB to the clip 27 before performing such a yarn splicing operation. Additionally, whether the clip 27 holding the yarn Y is the first clip 28 or the second clip 29 will be described later.

[0091] The control unit 94 controls the arm portion 612, the suction nozzle 614, and the splicer 66 to perform a yarn

splicing operation of splicing the second yarn end Y2 and the first yarn end Y1 after setting the second yarn end Y2 of the second yarn supply package PB and the first yarn end Y1 of the first yarn supply package PA to the splicer 66 when the yarn Y wound on the second yarn supply package PB is unwound. The control unit 94 controls the arm portion 612 and the suction nozzle 614 to perform a yarn hooking operation of holding a part of the yarn Y between the second yarn end Y2 of the second yarn supply package PB and the inner edge of the second yarn supply package PB or a part of the yarn Y between the first yarn end Y1 of the first yarn supply package PA and the outer edge of the first yarn supply package PA to the clip 27 before performing such a yarn splicing operation. Additionally, whether the clip 27 holding the yarn Y is the first clip 28 or the second clip 29 will be described later.

[0092] Additionally, such a yarn hooking operation may be used to hold a part of the yarn Y in which the second yarn end Y2 is connected to the first yarn end Y1 by the yarn splicing operation to the clip 27 after the yarn splicing operation.

[0093] Next, a holding method (control method) of holding the yarn Y connected between the first yarn supply package PA and the second yarn supply package PB to the first clip 28 or the second clip 29 in the creel stand 20 will be described. The holding method (control method) of this embodiment has one feature that the clip 27 (the first clip 28 or the second clip 29) holding the yarn Y is determined (different) for each of (1) a first scene to (4) a fourth scene in the configuration of the creel stand 20 in which the first peg 25A is disposed on the left side of the guide portion 26, the second peg 25B is disposed on the right side of the guide portion 26, the first clip 28 is disposed on the upper side of the guide portion 26, and the second clip 29 is disposed on the lower side of the guide portion 26 in the front view.

(1) The first clip 28 holds the yarn Y connected between the first yarn supply package PA and the second yarn supply package PB in the first scene in which the yarn Y of the first yarn supply package PA is wound counterclockwise, the yarn Y of the second yarn supply package PB is wound counterclockwise, and the yarn Y wound on the second yarn supply package PB is unwound.

(2) The first clip 28 holds the yarn Y connected between the first yarn supply package PA and the second yarn supply package PB in the second scene in which the yarn Y of the first yarn supply package PA is wound clockwise, the yarn Y of the second yarn supply package PB is wound clockwise, and the yarn Y wound on the first yarn supply package PA is unwound.

(3) The second clip 29 holds the yarn Y connected between the first yarn supply package PA and the second yarn supply package PB in the third scene in which the yarn Y of the first yarn supply package PA is wound counterclockwise, the yarn Y of the second yarn supply package PB is wound counterclockwise, and the yarn Y wound on the first yarn supply package PA is unwound.

(4) The second clip 29 holds the yarn Y connected between the first yarn supply package PA and the second yarn supply package PB in the fourth scene in which the yarn Y of the first yarn supply package PA is wound clockwise, the yarn Y of the second yarn supply package PB is wound clockwise, and the yarn Y wound on the second yarn supply package PB is unwound.

[0094] Hereinafter, a series of operations of the yarn splicing processing device 9A performing a yarn splicing process and a clip holding process based on the holding method will be described in detail with reference to FIGS. 10 to 15. Here, a case will be described in which the yarn splicing device 60 splices the second yarn end Y2 of the first yarn supply package PA supported by the first peg 25A and the first yarn end Y1 of the second yarn supply package PB supported by the second peg 25B when the yarn Y is unwound from the outer layer side of the first yarn supply package PA (third scene).

[0095] The control unit 94 drives the first motor 622 to rotate the first yarn splicing driver 621 engaging with the first wheel 253D of the first peg 25A. When the first yarn splicing driver 621 rotates, the first yarn supply package PA rotates around the extension direction of the yarn supply package support portion 251 as a rotation axis. The control unit 94 drives the second motor 632 to rotate the second yarn splicing driver 631 engaging with the first wheel 253D of the second peg 25B. When the second yarn splicing driver 631 rotates, the second yarn supply package PB rotates around the extension direction of the yarn supply package support portion 251 as a rotation axis. For example, the control unit 94 rotates the first yarn supply package PA and the second yarn supply package PB to a predetermined position by controlling the first motor 622 and the second motor 632 based on the detection result of a sensor (not shown) detecting a detection object (not shown) provided in the adapter 8.

[0096] The control unit 94 activates the suction gun 611. Accordingly, the suction gun 611 can suck and hold the yarn Y in the suction nozzle 614. The control unit 94 controls the arm portion 612 so that the second yarn end Y2 of the first yarn feeding package PA is captured (held) to the suction nozzle 614. Next, the control unit 94 controls the arm portion 612 so that the suction nozzle 614 is moved to the second clip 29 and the yarn Y of the first yarn feeding package PA is hooked (holed) to the second clip 29 as shown in FIG. 13 (A). More specifically, the yarn Y of the first yarn feeding package PA is locked by being sandwiched between the pair of dish plates 291 and 292 of the second clip 29.

[0097] Next, the control unit 94 controls the arm portion 612 while the yarn Y of the first yarn feeding package PA is hooked to the second clip 29 and moves the suction nozzle 614 holding the second yarn end Y2 of the first yarn feeding

package PA to the first guide mechanism 67 to hook the yarn Y of the first yarn feeding package PA to the first guide mechanism 67 as shown in FIG. 13(B). The control unit 94 adjusts the rotation amount (feeding amount) of the first yarn feeding package PA on the basis of the detection result of the potentiometer provided in the first guide mechanism 67 and draws out the yarn Y from the first yarn feeding package PA at a predetermined tension. Further, the control unit 94 controls the arm portion 612 while the yarn Y of the first yarn feeding package PA is hooked to the first guide mechanism 67 and moves the suction nozzle 614 to the yarn joining processing mechanism 64 so that the second yarn end Y2 of the first yarn feeding package PA is set (guided) to the yarn joining processing mechanism 64.

[0098] Next, the control unit 94 causes the suction nozzle 614 to catch (hold) the first yarn end Y1 of the second yarn supply package PB. Next, the control unit 94 controls the arm portion 612 so that the suction nozzle 614 holding the first yarn end Y1 of the second yarn supply package PB is moved to the second guide mechanism 68 and the yarn Y of the second yarn supply package PB is hooked on the second guide mechanism 68 as shown in FIG. 14A. Next, the control unit 94 controls the arm portion 612 so that the suction nozzle 614 holding the first yarn end Y1 of the second yarn supply package PB is moved to the yarn splicing mechanism 64 and the first yarn end Y1 of the second yarn supply package PB is set (guided) to the yarn splicing mechanism 64.

[0099] Next, the control unit 94 controls the splicer 66 of the yarn joining device 60 so that the second yarn end Y2 of the first yarn feeding package PA and the first yarn end Y1 of the second yarn feeding package PB are joined (connected) as shown in FIG. 14(B). Further, the control unit 94 controls the cutters 664 and 665 of the yarn joining device 60 so that, for example, an extra portion including a portion sucked and held by the suction nozzle 614 is cut and removed from the yarn joining processed portion of the second yarn end Y2 of the first yarn feeding package PA and the first yarn end Y1 of the second yarn feeding package PB.

[0100] Next, the control unit 94 controls the exchanging unit 93 (yarn splicing device 60) to move the yarn Y to the outside of the yarn splicing mechanism 64. Accordingly, as shown in FIG. 15A, the spliced yarn Y is pulled out from the yarn splicing device 60. Next, the control unit 94 controls the second motor 632 so that the second yarn splicing driver 631 is rotationally driven and the second yarn supply package PB is rotated around the extension direction of the yarn supply package support portion 251 as a rotation axis as shown in FIG. 15B. Accordingly, the slack of the spliced yarn Y hooked on the first clip 28 can be removed.

[0101] Additionally, in the first scene, although the procedure is different in that the first yarn end Y1 of the first yarn supply package PA is guided to the yarn splicing mechanism 64 while being hooked on the first clip 28, the second yarn end Y2 of the second yarn supply package PB is guided to the yarn splicing mechanism 64, the first yarn end Y1 and the second yarn end Y2 guided to the yarn splicing mechanism 64 are spliced, and the first yarn supply package PA is rotated around the extension direction of the yarn supply package support portion 251 as a rotation axis to remove the slack of the yarn Y, various controls performed by the control unit 94 are the same as those of the third scene. Therefore, detailed description is omitted.

[0102] Similarly, in the second scene, although the procedure is different in that the first yarn end Y1 of the second yarn supply package PB is guided to the yarn splicing mechanism 64 while being hooked on the first clip 28, the second yarn end Y2 of the first yarn supply package PA is guided to the yarn splicing mechanism 64, the first yarn end Y1 and the second yarn end Y2 guided to the yarn splicing mechanism 64 are spliced, and the second yarn supply package PB is rotated around the extension direction of the yarn supply package support portion 251 as a rotation axis to remove the slack of the yarn Y, various controls performed by the control unit 94 are the same those of the third scene. Therefore, detailed description is omitted.

[0103] Similarly, in the fourth scene, although the procedure is different in that the first yarn end Y1 of the first yarn supply package PA is guided to the yarn splicing mechanism 64 while being hooked on the second clip 29, the second yarn end Y2 of the second yarn supply package PB is guided to the yarn splicing mechanism 64, the first yarn end Y1 and the second yarn end Y2 guided to the yarn splicing mechanism 64 are spliced, and the first yarn supply package PA is rotated around the extension direction of the yarn supply package support portion 251 as a rotation axis to remove the slack of the yarn Y, various controls performed by the control unit 94 are the same as those of the third scene. Therefore, detailed description is omitted.

[0104] The operation and effect of the creel stand 20 of the embodiment will be described. In the creel stand 20 of the embodiment, the first clip 28 and the second clip 29 are respectively arranged in an upper area A1 and a lower area A2 of an area divided by the mounting portion line L1 as a boundary in the front view as shown in FIG. 6A. Accordingly, since it is possible to select the first clip 28 and the second clip 29 holding the yarn Y between both yarn supply packages PA and PB according to the position of the yarn Y pulled out from the (spare) yarn supply package P after switching, it is possible to hold the yarn Y between both yarn supply packages PA and PB in an appropriate state for each situation. As a result, it is possible to suppress problems from occurring when the yarn supply packages PA and PB are unwound or switched.

[0105] In the creel stand 20 of the embodiment, the first clip 28 and the second clip 29 are respectively arranged in the upper area A1 and the lower area A2 of the area divided by the mounting portion line L1 as a boundary in the front view and are arranged at positions far from the outer edge of the first yarn supply package PA or the outer edge of the

second yarn supply package PB with respect to the mounting portion line L1. Accordingly, since it is possible to select the clip 27 (the first clip 28 or the second clip 29) holding the yarn Y between both yarn supply packages PA and PB according to the position of the yarn Y pulled out from the (spare) yarn supply package P after switching, it is possible to hold the yarn Y between both yarn supply packages PA and PB in an appropriate state for each situation.

[0106] In the creel stand 20 of the embodiment, the first peg 25A and the second peg 25B are arranged line-symmetrically with respect to the guide portion/holding portion line L3 when the line passing through the guide portion 26, the first clip 28, and the second clip 29 is virtually set as the guide portion/holding portion line L3 in a plan view in which the first clip 28 and the second clip 29 overlap each other. Accordingly, it is possible to align the holding states of the yarn Y pulled out from the first yarn supply package PA and the yarn Y pulled out from the second yarn supply package PB by the first clip 28 and the second clip 29.

[0107] In the creel stand 20 of the embodiment, the first peg 25A and the second peg 25B are arranged line-symmetrically with respect to the guide portion/mounting portion line L4 when the line passing through the guide portion 26, the first peg 25A, and the second peg 25B is virtually set as the guide portion/mounting portion line L4 in a side view in which the first peg 25A and the second peg 25B overlap each other. Accordingly, it is possible to align the holding states of the yarn Y pulled out from the first yarn supply package PA and the yarn Y pulled out from the second yarn supply package PB by the first clip 28 and the second clip 29.

[0108] The yarn supply device 100 of the above-described embodiment includes the first rotation mechanism 62 and the second rotation mechanism 63 which remove the slack of the yarn Y connected between the first yarn supply package PA and the second yarn supply package PB by rotating at least one of the first yarn supply package PA mounted on the first peg 25A and the second yarn supply package PB mounted on the second peg 25B around the extension direction of the yarn supply package support portion 251 as a rotation axis. Accordingly, it is possible to perform the process of connecting the yarn end of the first yarn supply package PA and the yarn end of the second yarn supply package PB and the yarn hooking process of holding a part of the yarn Y in which the yarn supply packages PA and PB are connected to each other by the first clip 28 or the second clip 29 without requiring the hand of the worker. Accordingly, it is possible to reduce the burden of the worker who requires the yarn splicing process and the yarn hooking process.

[0109] Although the embodiment of an aspect of the present invention has been described above, an aspect of the present invention is not necessarily limited to the above-described embodiment, and various changes can be made without departing from the gist thereof.

(First modified example)

[0110] In the above-described embodiment, although an example in which one first clip 28 and one second clip 29 are provided as the clip 27 has been described, the present invention is not limited thereto. For example, as shown in FIG. 16, a first modified example may have a configuration in which the first clip 28 includes a first clip 28A for a first peg (a first holding portion for a first mounting portion) disposed at a position closer to the first peg 25A than the second peg 25B and a first clip 28B for a second peg (a first holding portion for a second mounting portion) disposed at a position closer to the second peg 25B than the first peg 25A and the second clip 29 includes a second clip 29A for a first peg (a second holding portion for a first mounting portion) disposed at a position closer to the first peg 25A than the second peg 25B and a second clip 29B for a second peg (a second holding portion for a second mounting portion) disposed at a position closer to the second peg 25B than the first peg 25A.

[0111] The arrangement relationship of the first clip 28A for the first peg and the first clip 28B for the second peg with respect to the second clip 29A for the first peg and the second clip 29B for the second peg in the creel stand 20 of the first modified example is the same as the arrangement relationship between the first clip 28 and the second clip 29 of the above-described embodiment. That is, as shown in FIG. 16, in the front view, the first clip 28A for the first peg and the first clip 28B for the second peg corresponding to the first clip 28 of the above-described embodiment and the second clip 29A for the first peg and the second clip 29B for the second peg corresponding to the second clip 29 of the above-described embodiment are arranged between the first peg 25A and the second peg 25B in the horizontal direction and are arranged to sandwich both the first peg 25A and the second peg 25B in the vertical direction. Further, in the front view, the first clip 28A for the first peg and the first clip 28B for the second peg corresponding to the first clip 28 of the above-described embodiment and the second clip 29A for the first peg and the second clip 29B for the second peg corresponding to the second clip 29 of the above-described embodiment are arranged to sandwich the fully wound first yarn supply package PA or the fully wound second yarn supply package PB in the vertical direction.

[0112] More specifically, the first clip 28 (the first clip 28A for the first peg and the first clip 28B for the second peg) in the configuration of the first modified example is disposed in the upper area A1 divided by the mounting portion line L1 as a boundary in the front view and the second clip 29 (the second clip 29A for the first peg and the second clip 29B for the second peg) is disposed in the lower area A2 divided by the mounting portion line L1 as a boundary.

[0113] In the creel stand 20 according to the first modified example, the yarn Y between both yarn supply packages PA and PB can be held in a more appropriate state according to the yarn Y pulled out from the first yarn supply package

PA or the yarn Y pulled out from the second yarn supply package PB. Accordingly, it is possible to more reliably suppress problems from occurring when the yarn supply packages PA and PB are unwound or switched.

[0114] Further, in the configuration (FIG. 16) according to the first modified example, a slack adjustment mechanism 70 shown in FIG. 18A may be provided to remove the slack of the yarn Y occurring between both yarn supply packages PA and PB when the first clip 28 or the second clip 29 holds the yarn Y connected between the first yarn supply package PA and the second yarn supply package PB instead of or in addition to the configuration of the first rotation mechanism 62 and the second rotation mechanism 63 of the above-described embodiment. The slack adjustment mechanism 70 is provided in the exchanging unit 93 (see FIG. 9) of the package exchanging device 9 (see FIG. 8). The slack adjustment mechanism 70 includes a hook portion 71 capable of hooking the yarn Y. The slack adjustment mechanism 70 includes the first guide mechanism 67 and the second guide mechanism 68 of the yarn splicing device 60 of the above-described embodiment.

[0115] Next, an operation of removing the slack of the yarn Y held by the second clip 29A for the first peg and the second clip 29B for the second peg after the yarn splicing device 60 splices the second yarn end Y2 of the first yarn supply package PA and the first yarn end Y1 of the second yarn supply package PB will be described. In the first modified example, the yarn Y connected between the first yarn supply package PA and the second yarn supply package PB is held by the second clip 29A for the first peg and the second clip 29B for the second peg as shown in FIG. 16 after the second yarn end Y2 of the first yarn supply package PA and the first yarn end Y1 of the second yarn supply package PB are spliced. Additionally, since the operation of the yarn splicing processing device 9A for bringing the yarn Y connected between the first yarn supply package PA and the second yarn supply package PB into the state shown in FIG. 16 is the same except that the yarn Y is held by both the second clip 29A for the first peg and the second clip 29B for the second peg, detailed description is omitted.

[0116] As shown in FIG. 17A, the slack adjustment mechanism 70 hooks the hook portion 71 biased by a spring force in a white arrow direction shown in FIG. 17B for moving the hook portion 71 to the portion of the yarn Y between the second clip 29A for the first peg and the second clip 29B for the second peg after the second yarn end Y2 of the first yarn supply package PA and the first yarn end Y1 of the second yarn supply package PB are spliced. Next, the hook portion 71 is moved in a black arrow direction shown in FIG. 18A so that the yarn Y is pulled to be wound on the second clip 29A for the first peg and the yarn Y is pushed between the pair of disk plates 291 and 292 constituting the second clip 29.

[0117] Additionally, a force Fs1 when the yarn Y is pushed into the pair of disk plates 291 and 292 is adjusted based on the detection result of the potentiometer provided in the first guide mechanism 67 and the second guide mechanism 68. Specifically, when the hook portion 71 is moved in the black arrow direction shown in FIG. 18A, the movement of the hook portion 71 is stopped at a time point when the detection result of the potentiometer is a force Fs3 larger than the force Fs1. After stopping the movement of the hook portion 71, the hook portion 71 is moved in the direction opposite to the movement direction before stopping and the hook portion 71 is released from the yarn Y as indicated by the black arrow of FIG. 18B.

[0118] Accordingly, as shown in FIG. 19, the slack adjustment mechanism 70 can remove the slack of at least one of the yarn Y between the second clip 29A for the first peg and the first yarn supply package PA and the yarn Y between the second clip 29B for the second peg and the second yarn supply package PB by adjusting the length of the yarn Y between the second clip 29A for the first peg and the second clip 29B for the second peg. FIG. 19 shows an example of removing the slack of both the yarn Y between the second clip 29A for the first peg and the first yarn supply package PA and the yarn Y between the second clip 29B for the second peg and the second yarn supply package PB.

[0119] Although not shown in the drawings, the slack adjustment mechanism 70 may remove the slack of at least one of the yarn Y between the first clip 28A for the first peg and the first yarn supply package PA and the yarn Y between the first clip 28B for the second peg and the second yarn supply package PB by adjusting the length of the yarn Y between the first clip 28A for the first peg and the first clip 28B for the second peg. Since the procedure in this case is also the same as the operation of the slack adjustment mechanism 70 that adjusts the length of the yarn Y between the second clip 29A for the first peg and the second clip 29B for the second peg, detailed description is omitted.

[0120] Additionally, the force Fs1 of pushing the yarn Y into the pair of disk plates 291 and 292 is smaller than a force Fs2 which is a reference value for determining whether or not the entanglement determination (yarn splicing determination) is successful, the force Fs2 which is the reference value is smaller than a force Fs3 which is a reference value for determining the timing of releasing the hook portion 71 (the timing of moving the hook portion 71 in the opposite direction), and the force Fs3 which is the reference value is smaller than a force Fs4 which is a reference for determining that the yarn Y is damaged.

[0121] In the creel stand 20 according to the first modified example, it is possible to perform the process of connecting the yarn end of the first yarn supply package PA and the yarn end of the second yarn supply package PB to each other and the yarn hooking process of holding a part of the yarn Y obtained by connecting the yarn supply packages PA and PB to each other by the first clip 28A for the first peg and the first clip 28B for the second peg provided as the first clip 28 or holding a part of the yarn Y obtained by connecting the yarn supply packages PA and PB to each other by the second clip 29A for the first peg and the second clip 29B for the second peg provided as the second clip 29 without

requiring the hand of the worker. Accordingly, it is possible to reduce the burden of the worker who requires the yarn splicing process and the yarn hooking process.

(Other modified examples)

[0122] In the above-described embodiment and the above-described modified example, although an example in which the yarn splicing processing device 9A connects the yarn end of the first yarn supply package PA and the yarn end of the second yarn supply package PB has been described, the present invention is not limited thereto. For example, even when the creel stand 20 is provided in a site in which the yarn splicing process is manually performed, the creel stand 20 can have the above-described operation and effect.

[0123] In the above-described embodiment and the above-described modified example, although an example in which the first peg 25A and the second peg 25B on which the first yarn supply package PA and the second yarn supply package PB used for the splicing operation are mounted are arranged adjacently in the horizontal direction has been described, the present invention is not limited thereto. For example, the first peg 25A and the second peg 25B may be arranged adjacently at different positions in the vertical direction.

REFERENCE SIGNS LIST

[0124] 1: false-twist texturing device, 2: yarn supply section, 3: processing section (yarn texturing device), 9: package exchanging device, 9A: yarn splicing processing device, 20: creel stand (yarn supply stand), 25: peg, 25A: first peg (first mounting portion), 25B: second peg (second mounting portion), 26: guide portion, 27: clip, 28: first clip, 28A: first clip for first peg (first holding portion for first mounting portion), 28B: first clip for second peg (first holding portion for second mounting portion), 29: second clip, 29A: second clip for first peg (second holding portion for first mounting portion), 29B: second clip for second peg (second holding portion for second mounting portion), 60: yarn splicing device, 62: first rotation mechanism (yarn supply package rotation device), 63: second rotation mechanism (yarn supply package rotation device), 70: slack adjustment mechanism, 71: hook portion, 90: traveling unit, 94: control unit, 100: yarn supply device.

Claims

1. A yarn supply device (100) comprising:

a yarn supply stand (20);
a yarn splicing processing device (9A); and
a yarn supply package rotation device (62, 63),
wherein the yarn supply stand (20) comprises

a first mounting portion (25A) on which a first yarn supply package (PA) obtained by winding a yarn (Y) on a bobbin B is mounted,
a second mounting portion (25B) on which a second yarn supply package (PB) obtained by winding a yarn (Y) on a bobbin B is mounted,
a guide portion (26) which guides the yarn (Y) unwound from an outer layer side of the first yarn supply package (PA) while a yarn end on an outer layer side of the second yarn supply package (PB) is connected to a yarn end on an inner layer side of the first yarn supply package (PA) or the yarn (Y) unwound from the outer layer side of the second yarn supply package (PB) while a yarn end on the outer layer side of the first yarn supply package (PA) is connected to a yarn end on an inner layer side of the second yarn supply package (PB) to a yarn processing device (3),
a first holding portion (28) which holds a part of the yarn (Y) between both yarn supply packages while the yarn end on the inner layer side of the first yarn supply package (PA) is connected to the yarn end on the outer layer side of the second yarn supply package (PB), and
a second holding portion (29) which holds a part of the yarn (Y) between both yarn supply packages while the yarn end on the inner layer side of the second yarn supply package (PB) is connected to the yarn end on the outer layer side of the first yarn supply package (PA),
wherein when a line passing through the first mounting portion (25A) and the second mounting portion (25B) is virtually set as a mounting portion line (L1) in a front view in which the guide portion (26) is located between the first mounting portion (25A) and the second mounting portion (25B) and the yarn processing device (3) is located behind the guide portion (26), one of the first holding portion (28) and the second holding portion (29) is disposed in an area on one side divided by the mounting portion line (L1) as a

boundary in the front view and an other of the first holding portion (28) and the second holding portion (29) is disposed in an area on an other side divided by the mounting portion line (L1) as a boundary,
wherein when a line passing through the first holding portion (28) and the second holding portion (29) is virtually set as a holding portion line (L2) in the front view, one of the first mounting portion (25A) and the second mountingportion (25B) is disposed in an area on one side divided by the holding portion line (L2) as a boundary in the front view and an other of the first mounting portion (25A) and the second mounting portion (25B) is disposed in an area on an other side divided by the holding portion line (L2) as a boundary,
wherein the yarn splicing processing device (9A) connects the yarn end of the first yarn supply package (PA) mounted on the first mounting portion (25A) to the yarn end of the second yarn supply package (PB) mounted on the second mounting portion (25B) and holds a part of the connected yarn (Y) by the first holding portion (28) or the second holding portion (29), and
wherein the yarn supply package rotation device (62, 63) rotates the first yarn supply package (PA) mounted on the first mounting portion (25A) around an extension direction of the first mounting portion (25A) as a rotation axis and rotates the second yarn supply package (PB) mounted on the second mounting portion (25B) around an extension direction of the second mounting portion (25B) as a rotation axis, and the yarn supply package rotation device (62, 63) rotates at least one of the first yarn supply package (PA) and the second yarn supply package (PB) to remove the slack of the yarn (Y) held by the first holding portion (28) or the yarn (Y) held by the second holding portion (29).

2. A holding method of holding connected yarn (Y) between a first yarn supply package (PA) and a second yarn supply package (PB) by a first holding portion (28) or a second holding portion (29) in a yarn supply stand (20),

the yarn supply stand (20) comprising

a first mounting portion (25A) on which the first yarn supply package (PA) obtained by winding a yarn (Y) on a bobbin B is mounted,
a second mounting portion (25B) on which the second yarn supply package (PB) obtained by winding a yarn (Y) on a bobbin B is mounted,
a guide portion (26) which guides the yarn (Y) unwound from an outer layer side of the first yarn supply package (PA) while a yarn end on an outer layer side of the second yarn supply package (PB) is connected to a yarn end on an inner layer side of the first yarn supply package (PA) or the yarn (Y) unwound from the outer layer side of the second yarn supply package (PB) while a yarn end on the outer layer side of the first yarn supply package (PA) is connected to a yarn end on an inner layer side of the second yarn supply package (PB) to a yarn processing device (3),
the first holding portion (28) which holds a part of the yarn (Y) between both yarn supply packages while the yarn end on the inner layer side of the first yarn supply package (PA) is connected to the yarn end on the outer layer side of the second yarn supply package (PB), and
the second holding portion (29) which holds a part of the yarn (Y) between both yarn supply packages while the yarn end on the inner layer side of the second yarn supply package (PB) is connected to the yarn end on the outer layer side of the first yarn supply package (PA),
wherein when a line passing through the first mounting portion (25A) and the second mounting portion (25B) is virtually set as a mounting portion line (L1) in a front view in which the guide portion (26) is located between the first mounting portion (25A) and the second mounting portion (25B) and the yarn processing device (3) is located behind the guide portion (26), one of the first holding portion (28) and the second holding portion (29) is disposed in an area on one side divided by the mounting portion line (L1) as a boundary in the front view and an other of the first holding portion (28) and the second holding portion (29) is disposed in an area on an other side divided by the mounting portion line (L1) as a boundary,
wherein when a line passing through the first holding portion (28) and the second holding portion (29) is virtually set as a holding portion line (L2) in the front view, one of the first mounting portion (25A) and the second mounting portion (25B) is disposed in an area on one side divided by the holding portion line (L2) as a boundary in the front view and an other of the first mounting portion (25A) and the second mounting portion (25B) is disposed in an area on an other side divided by the holding portion line (L2) as a boundary, and
wherein the first mounting portion (25A) is disposed on a left side of the guide portion (26), the second mounting portion (25B) is disposed on a right side of the guide portion (26), the first holding portion (28) is disposed on an upper side of the guide portion (26), and the second holding portion (29) is disposed on a lower side of the guide portion (26) in the front view,

the holding method comprising:

holding the connected yarn (Y) by the first holding portion (28) when the yarn (Y) of the first yarn supply package (PA) is wound clockwise, the yarn (Y) of the second yarn supply package (PB) is wound clockwise, and the yarn (Y) wound on the first yarn supply package (PA) is unwound in the front view;
holding the connected yarn (Y) by the second holding portion (29) when the yarn (Y) of the first yarn supply package (PA) is wound clockwise, the yarn (Y) of the second yarn supply package (PB) is wound clockwise, and the yarn (Y) wound on the second yarn supply package (PB) is unwound in the front view; holding the connected yarn (Y) by the second holding portion (29) when the yarn of the first yarn supply package (PA) is wound counterclockwise, the yarn (Y) of the second yarn supply package (PB) is wound counterclockwise, and the yarn (Y) wound on the first yarn supply package (PA) is unwound in the front view; and
holding the connected yarn (Y) by the first holding portion (28) when the yarn (Y) of the first yarn supply package (PA) is wound counterclockwise, the yarn (Y) of the second yarn supply package (PB) is wound counterclockwise, and the yarn (Y) wound on the second yarn supply package (PB) is unwound in the front view.

3. The holding method according to claim 2,

wherein in the yarn supply stand (20)

the first holding portion (28) includes a first holding portion (28A) for a first mounting portion disposed at a position closer to the first mounting portion (25A) than the second mounting portion (25B) and a first holding portion (28B) for a second mounting portion disposed at a position closer to the second mounting portion (25B) than the first mounting portion (25A), and
the second holding portion (29) includes a second holding portion (29A) for a first mounting portion disposed at a position closer to the first mounting portion (25A) than the second mounting portion (25B) and a second holding portion (29B) for a second mounting portion disposed at a position closer to the second mounting portion (25B) than the first mounting portion (25A),

the holding method comprising:

holding the connected yarn (Y) by both the first holding portion (28A) for the first mounting portion and the first holding portion (28B) for the second mounting portion when the yarn (Y) of the first yarn supply package (PA) is wound clockwise, the yarn (Y) of the second yarn supply package (PB) is wound clockwise, and the yarn (Y) wound on the first yarn supply package (PA) is unwound in the front view;
holding the connected yarn (Y) by both the second holding portion (29A) for the first mounting portion and the second holding portion (29B) for the second mounting portion when the yarn (Y) of the first yarn supply package (PA) is wound clockwise, the yarn (Y) of the second yarn supply package (PB) is wound clockwise, and the yarn (Y) wound on the second yarn supply package (PB) is unwound in the front view;
holding the connected yarn (Y) by both the second holding portion (29A) for the first mounting portion and the second holding portion (29B) for the second mounting portion when the yarn of the first yarn supply package (PA) is wound counterclockwise, the yarn (Y) of the second yarn supply package (PB) is wound counterclockwise, and the yarn (Y) wound on the first yarn supply package (PA) is unwound in the front view; and
holding the connected yarn (Y) by both the first holding portion (28A) for the first mounting portion and the first holding portion (28B) for the second mounting portion when the yarn (Y) of the first yarn supply package (PA) is wound counterclockwise, the yarn (Y) of the second yarn supply package (PB) is wound counterclockwise, and the yarn (Y) wound on the second yarn supply package (PB) is unwound in the front view.

Fig.1

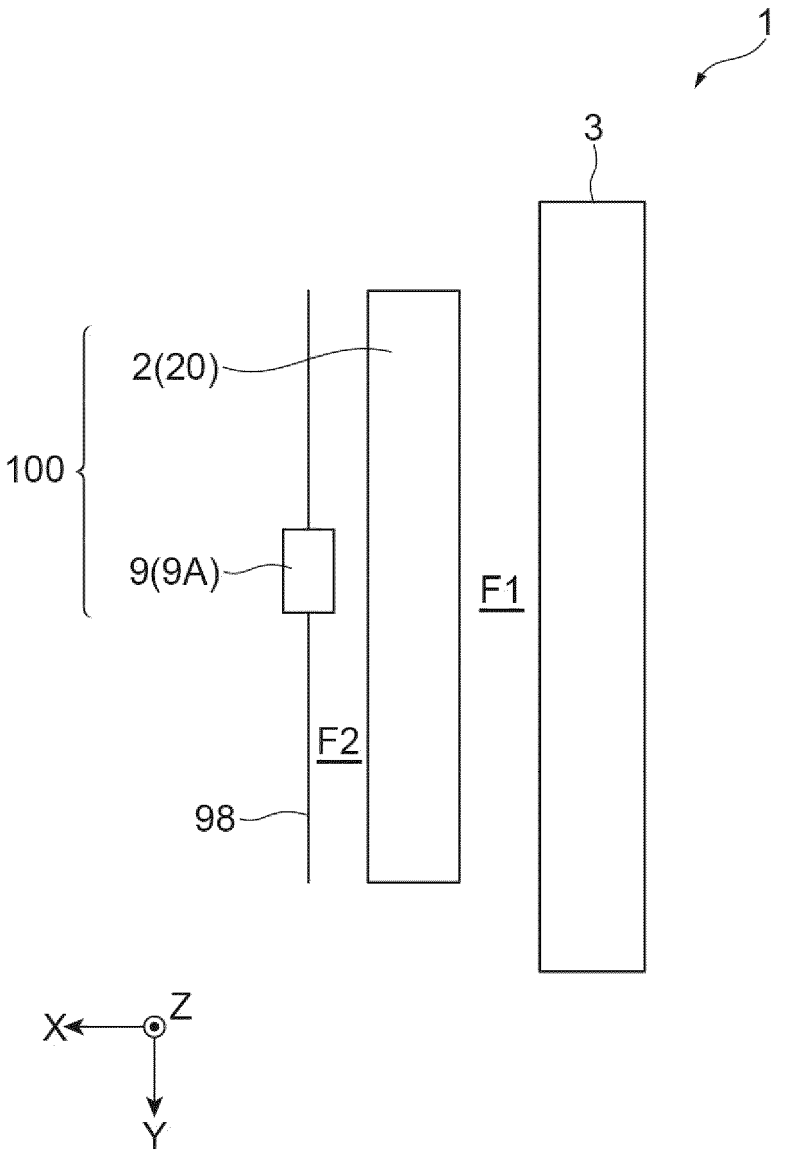


Fig.2

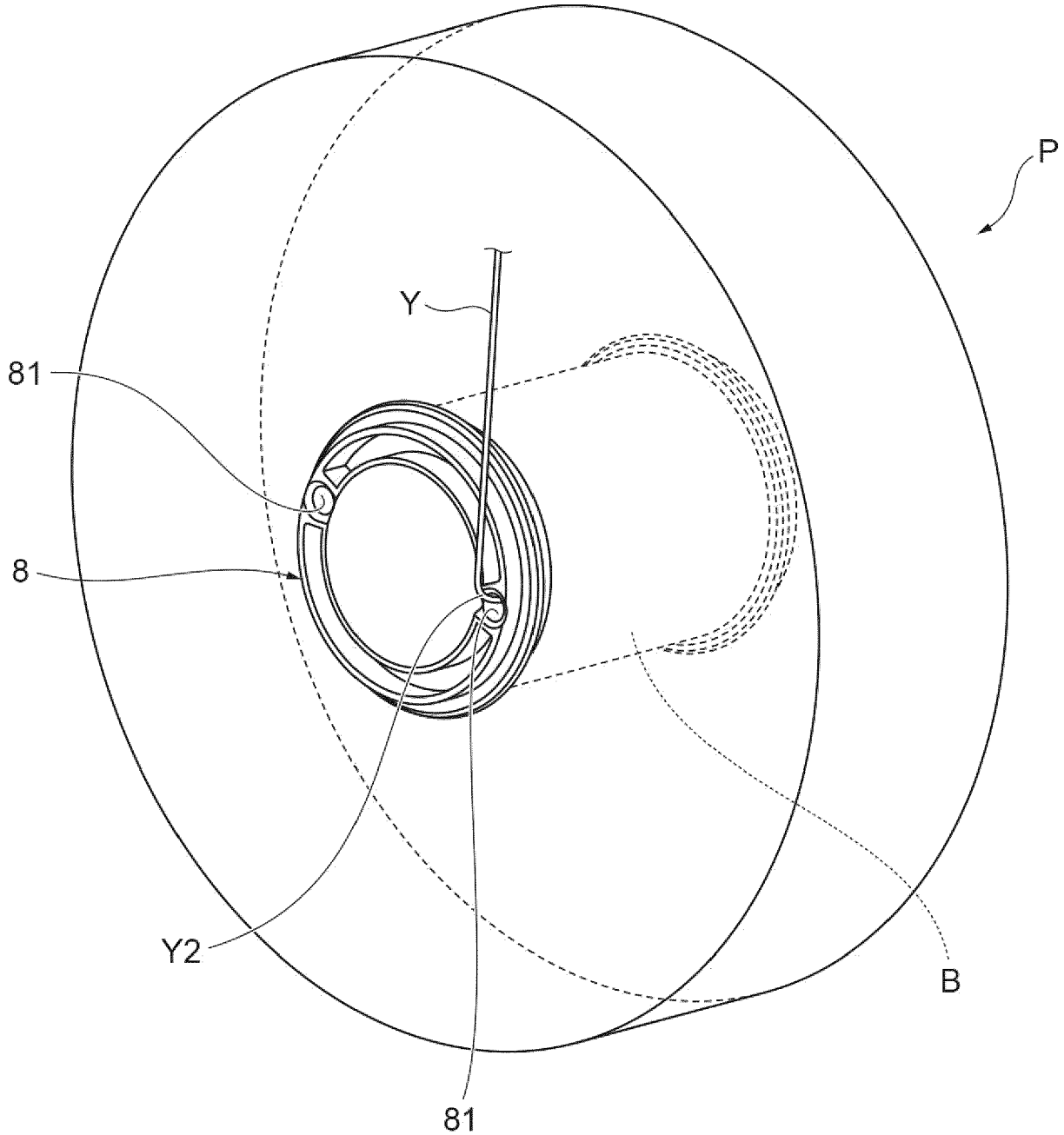


Fig.3

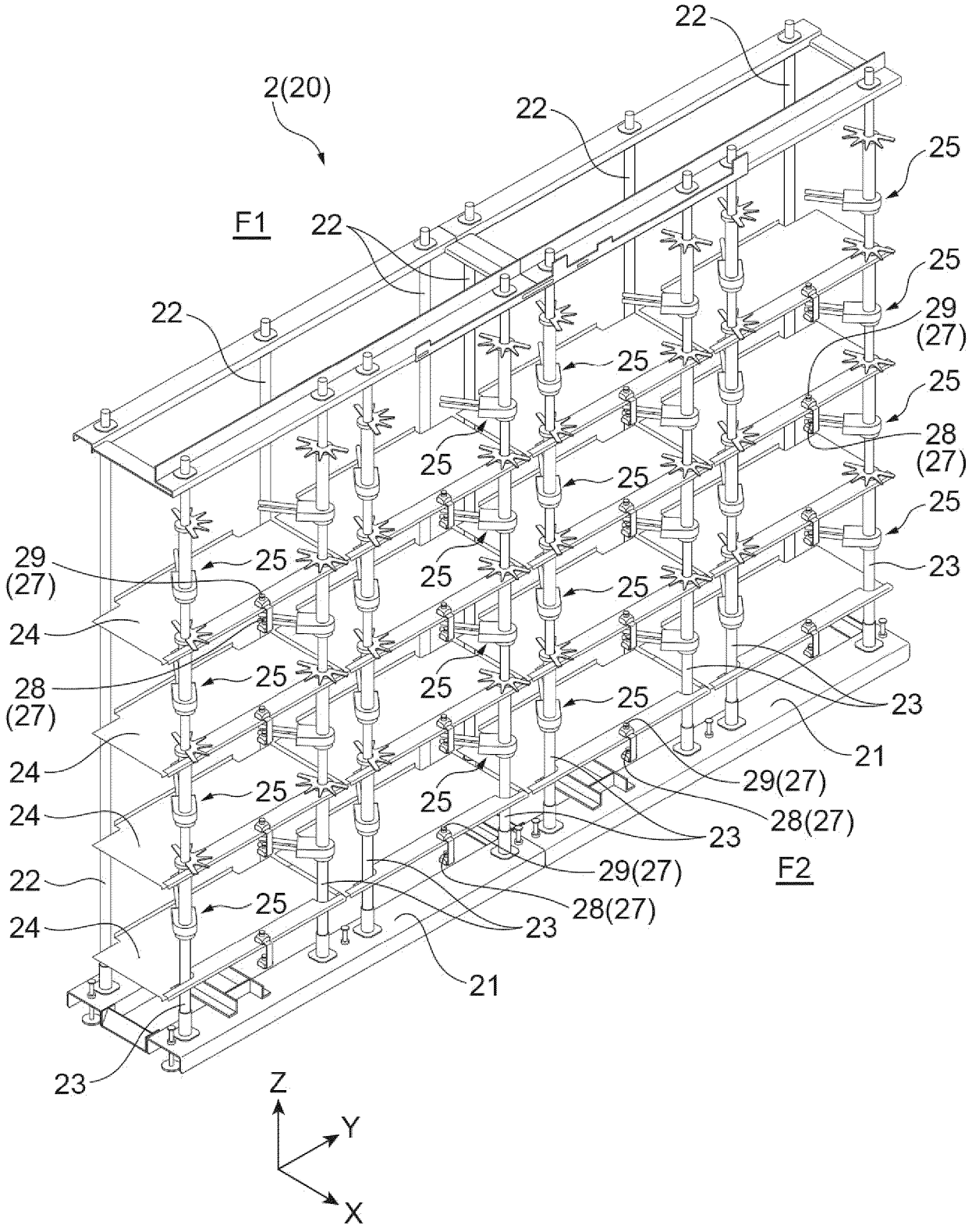


Fig.4

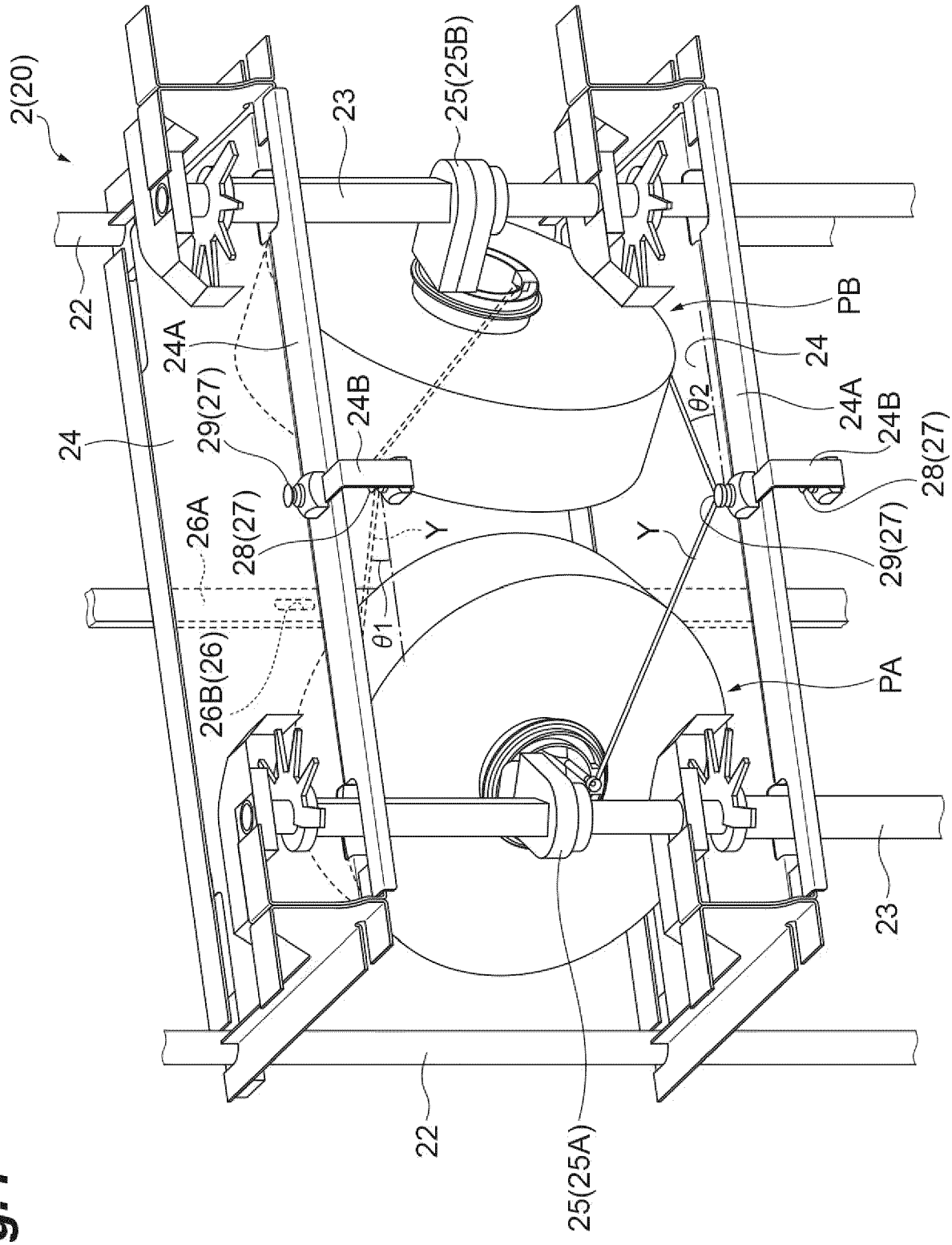

2(20)
23
25(25B)
22
24A
24
PB
29(27)
24B
θ2
24A
24B
28(27)
24
26A
28(27)
Y
Y
29(27)
θ1
26B(26)
PA
23
22
25(25A)

Fig.5

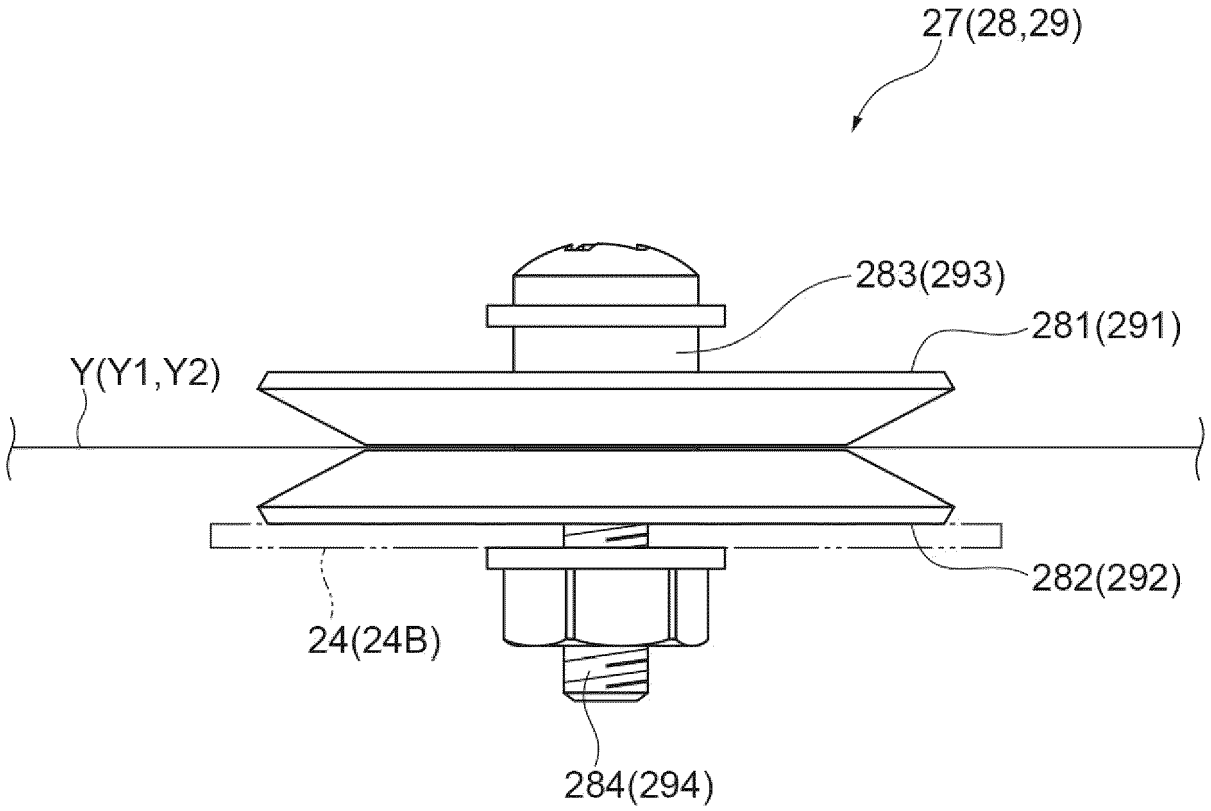
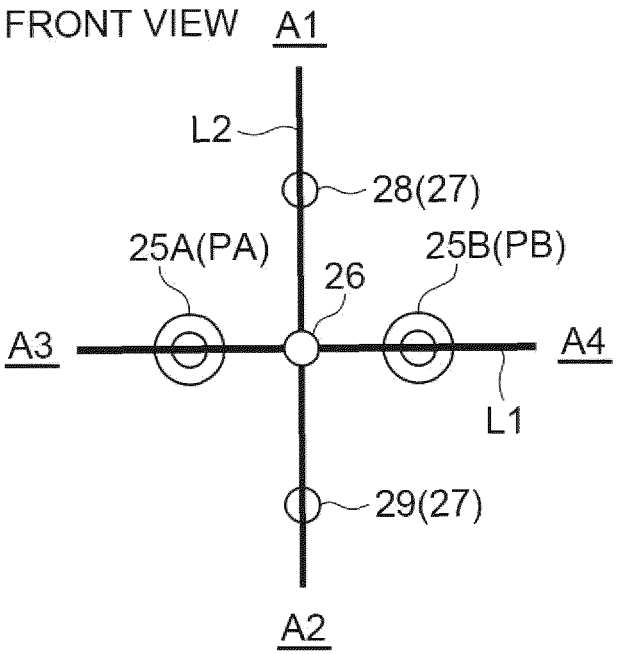


Fig.6

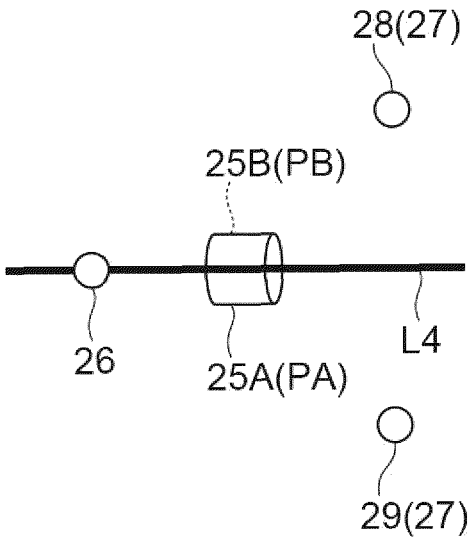
(A)

FRONT VIEW



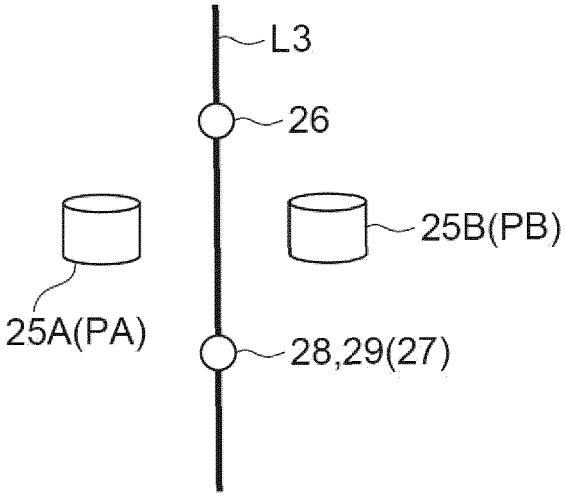
(C)

SIDE VIEW



(B)

PLAN VIEW



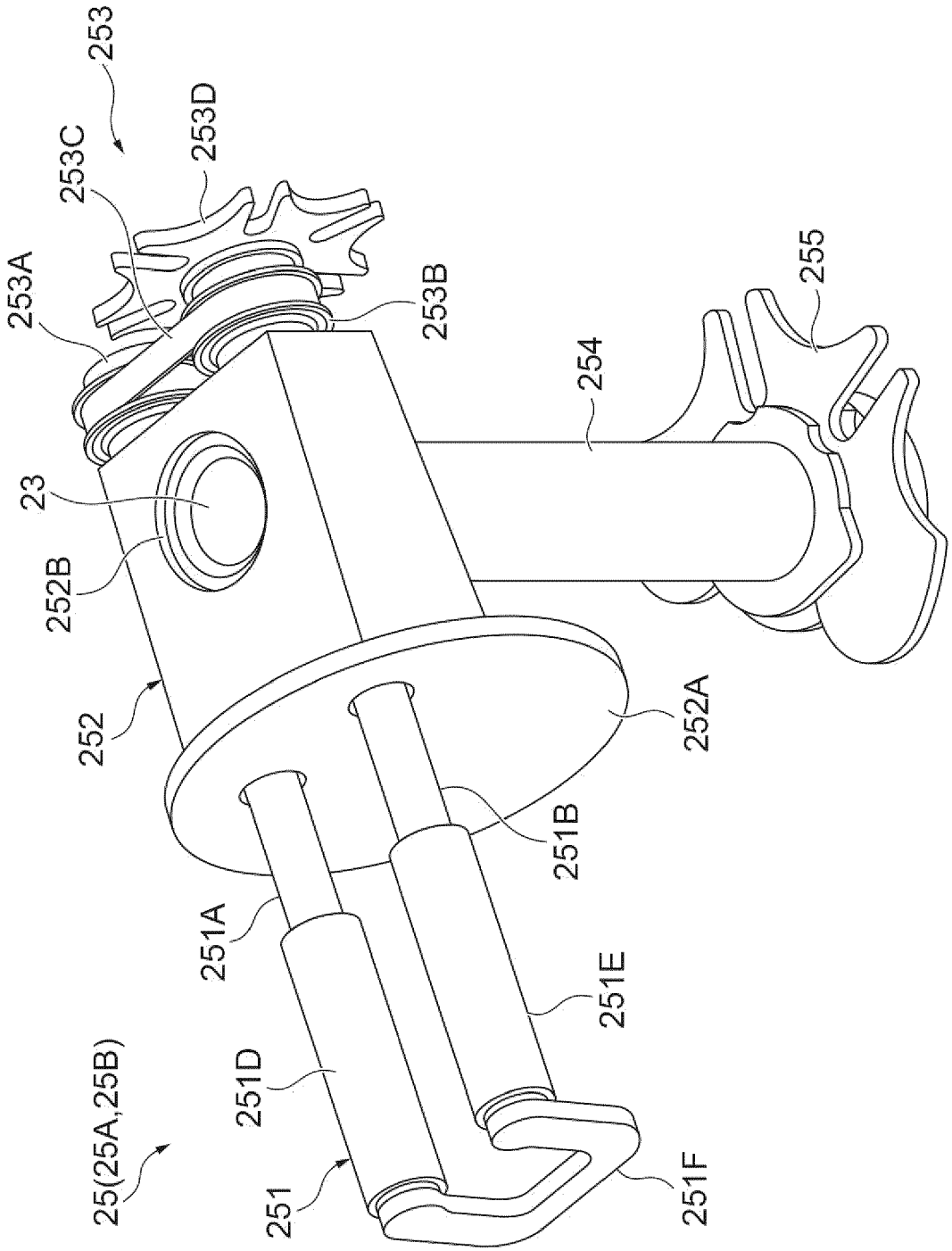
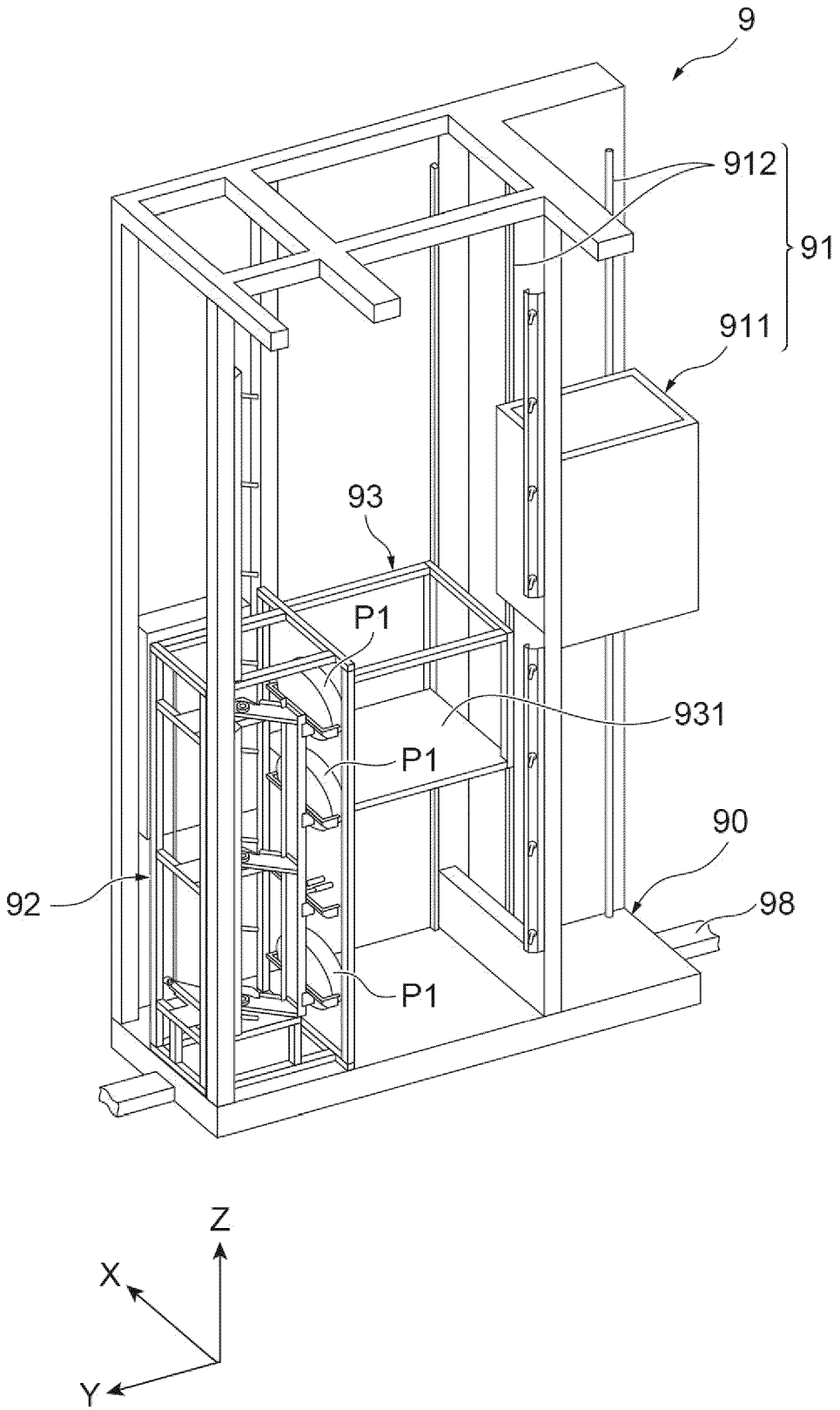

253
253C
253D
253A
253B
255
254
23
252B
252
252A
251B
251A
251E
25(25A,25B)
251D
251
251F

Fig.7

Fig.8



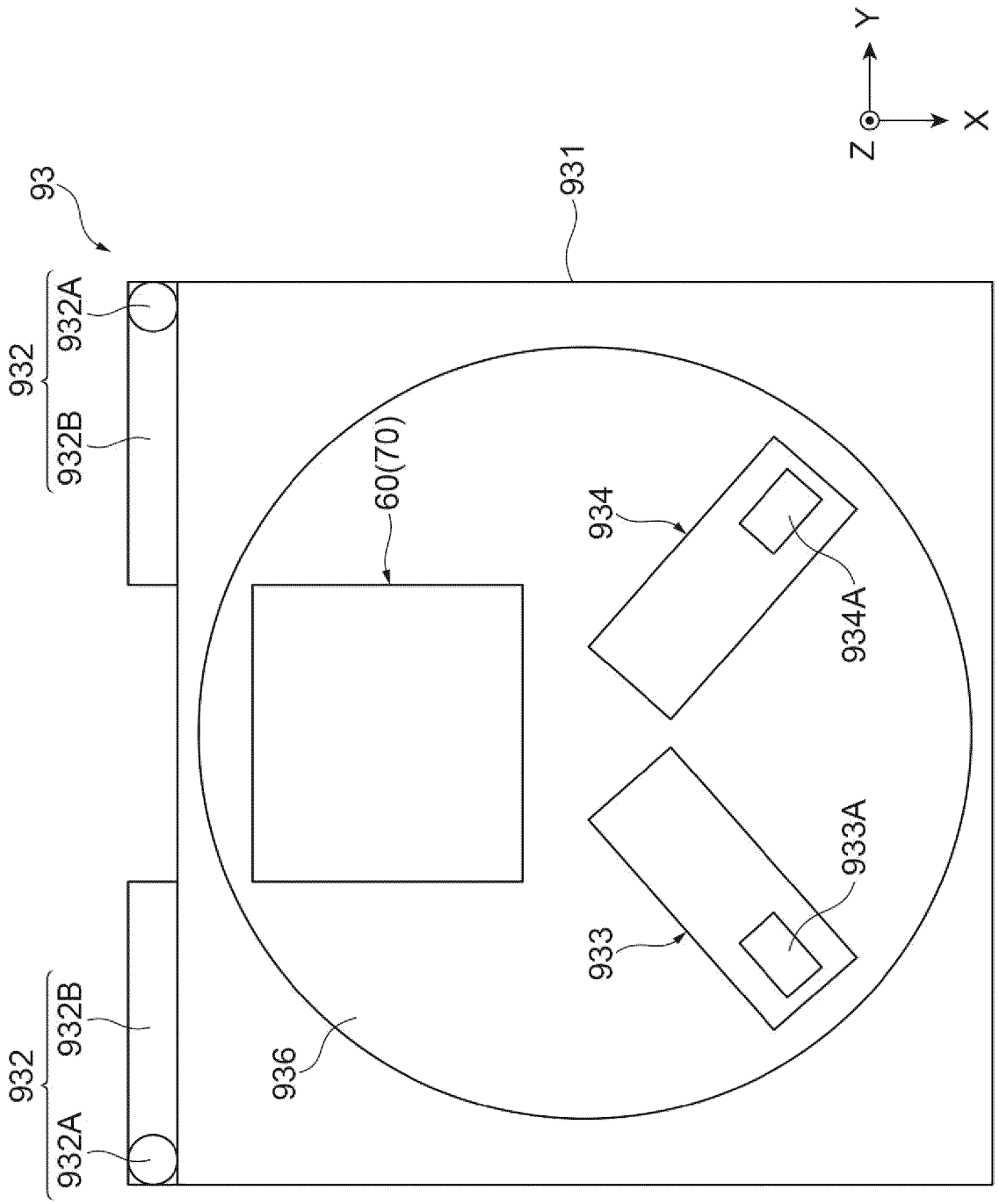


Fig.9

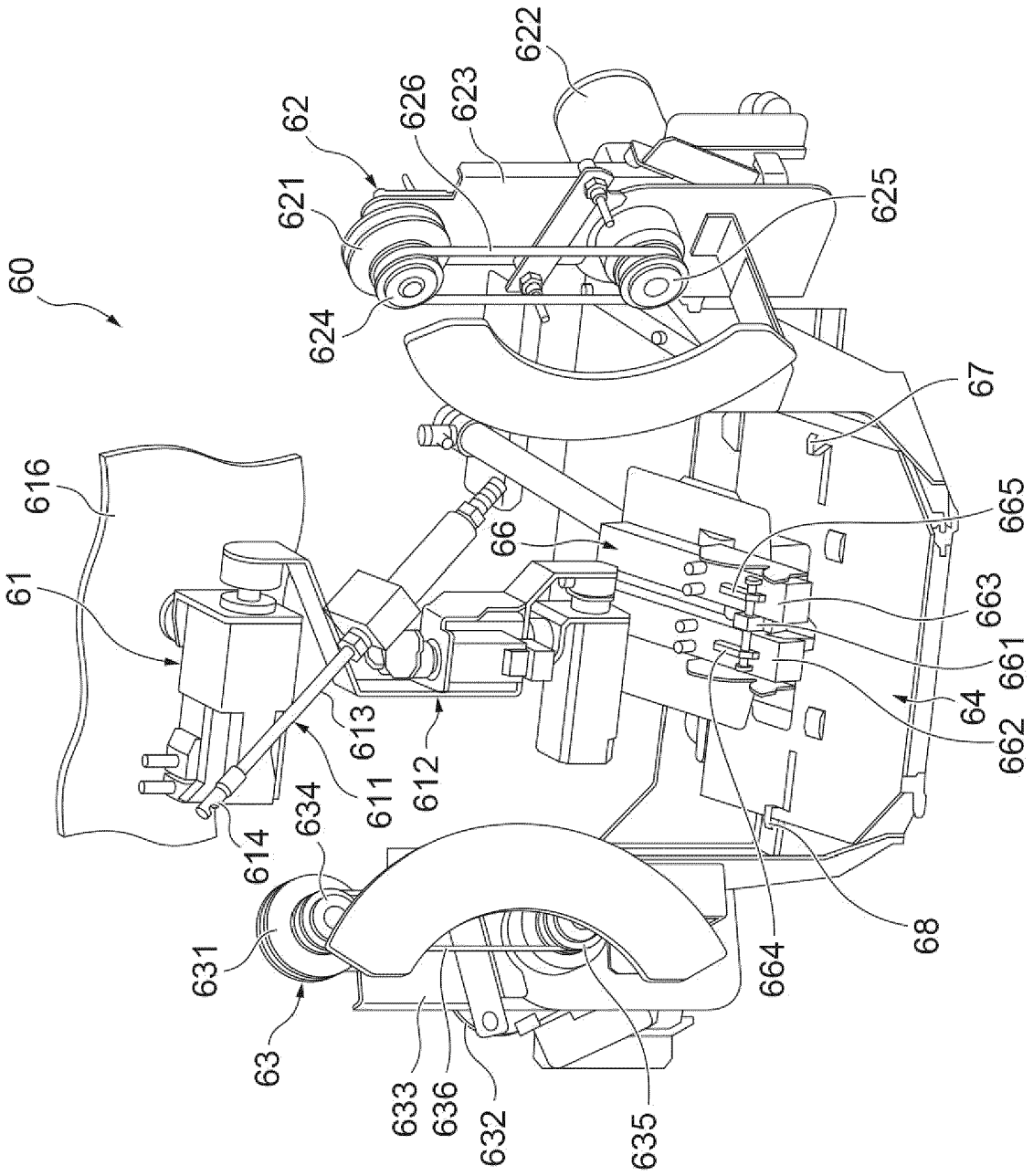

60
61
62
621
622
623
624
625
626
63
631
632
633
634
635
636
64
661
662
663
664
665
66
67
68
611
612
613
614
616

Fig.10

Fig.11

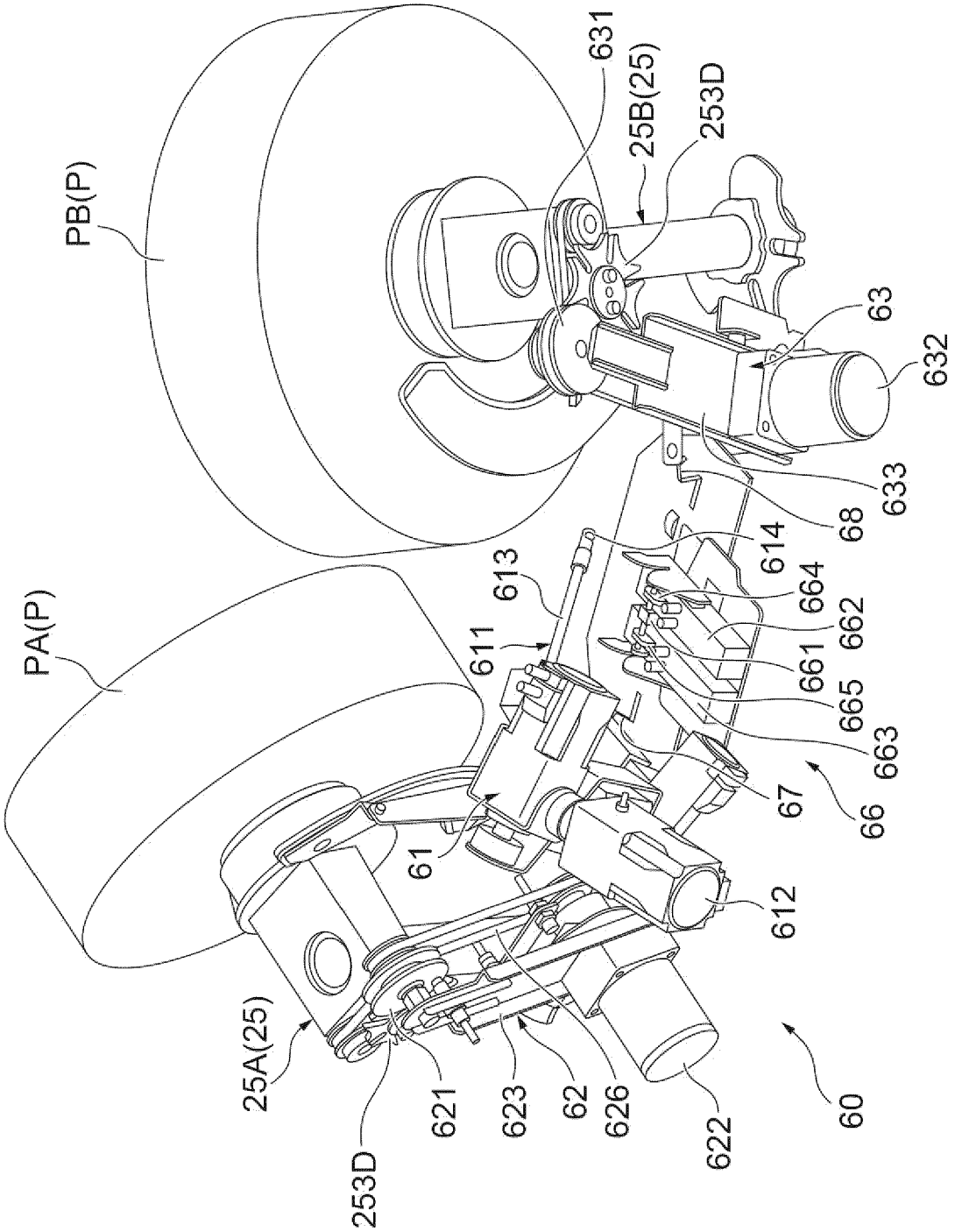

PB(P)
PA(P)
631
25B(25)
253D
63
632
633
68
614
613
664
662
611
661
665
663
67
66
61
612
25A(25)
621
623
62
626
622
60
253D

Fig.12

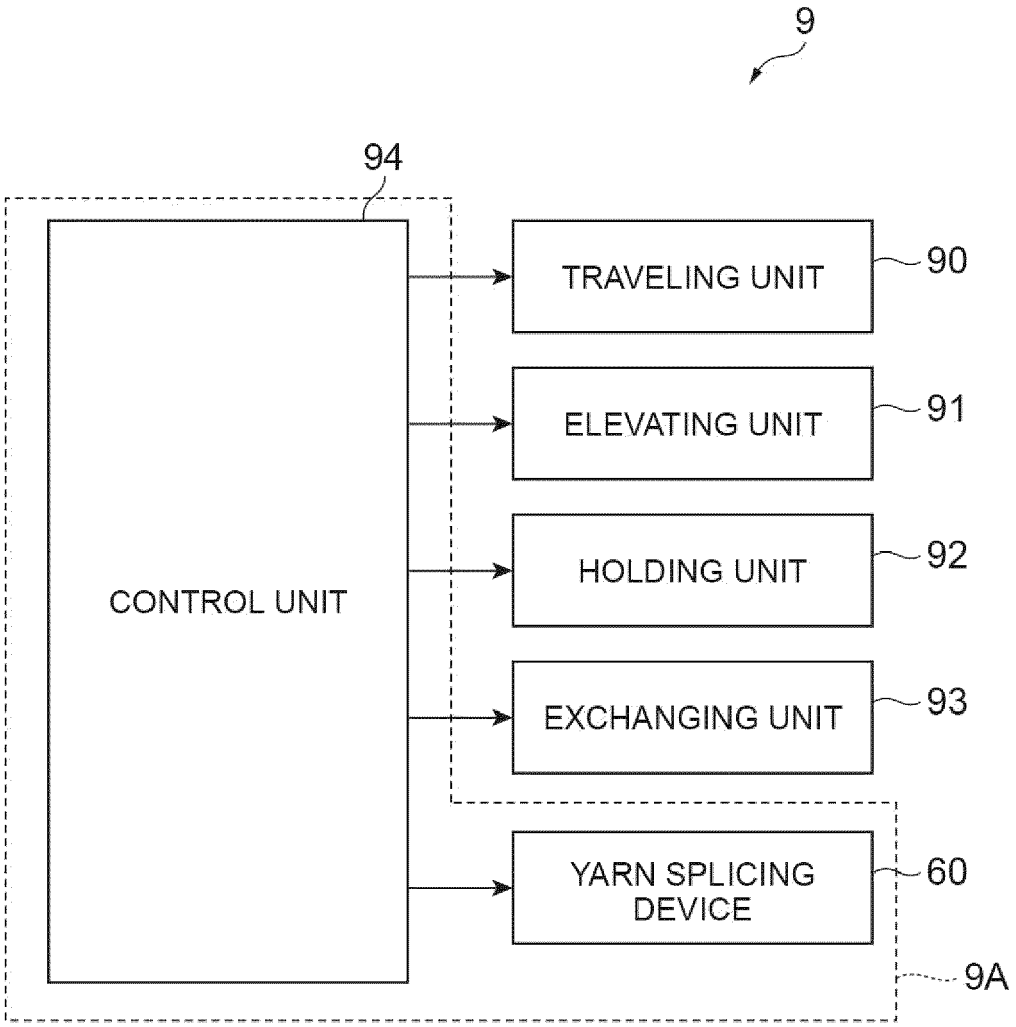

9
94
CONTROL UNIT
TRAVELING UNIT
90
ELEVATING UNIT
91
HOLDING UNIT
92
EXCHANGING UNIT
93
YARN SPLICING DEVICE
60
9A

Fig.13

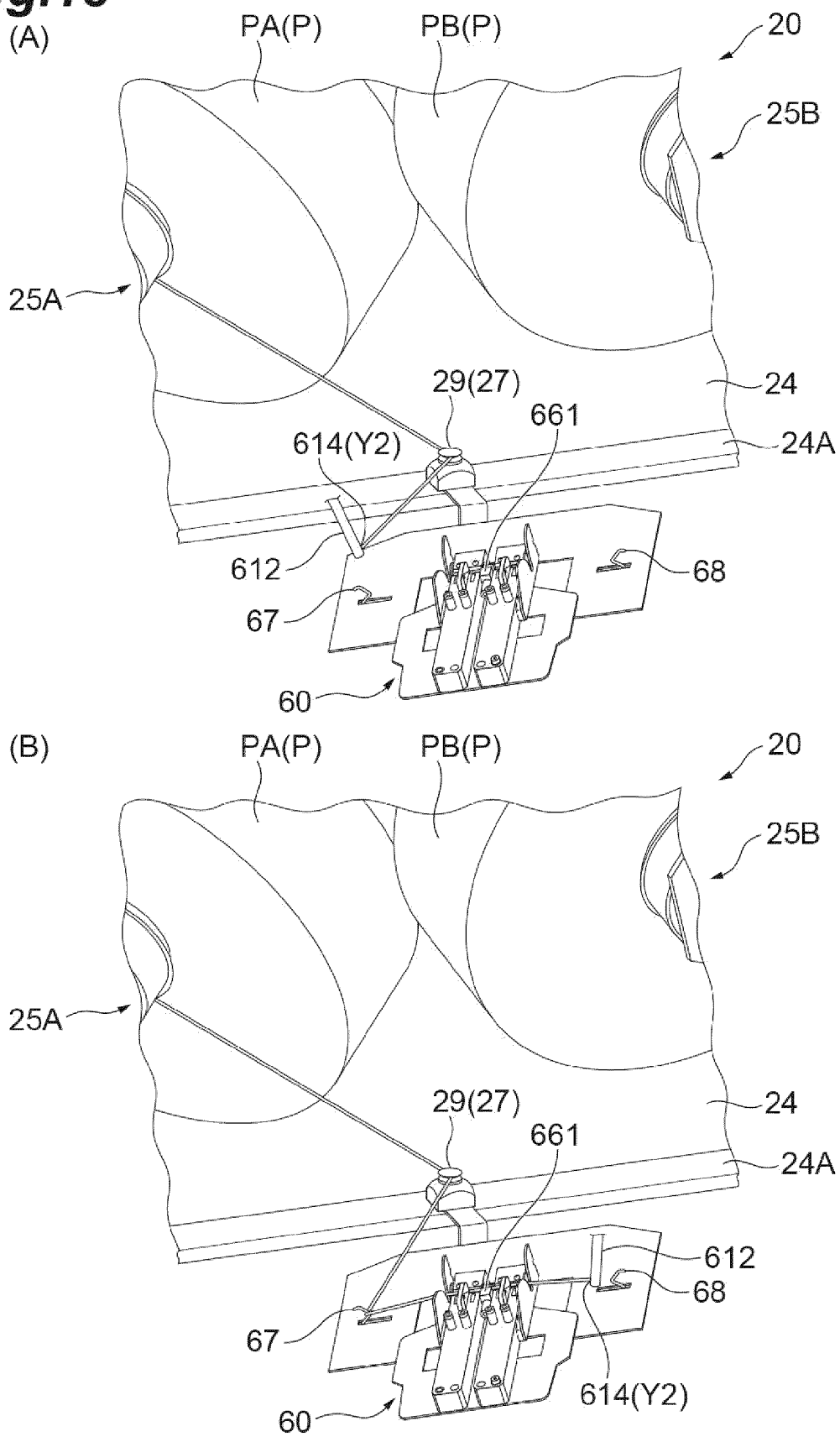

(A)
PA(P)
PB(P)
20
25B
25A
29(27)
661
24
614(Y2)
24A
612
68
67
60
(B)
PA(P)
PB(P)
20
25B
25A
29(27)
661
24
24A
612
68
67
614(Y2)
60

Fig.14

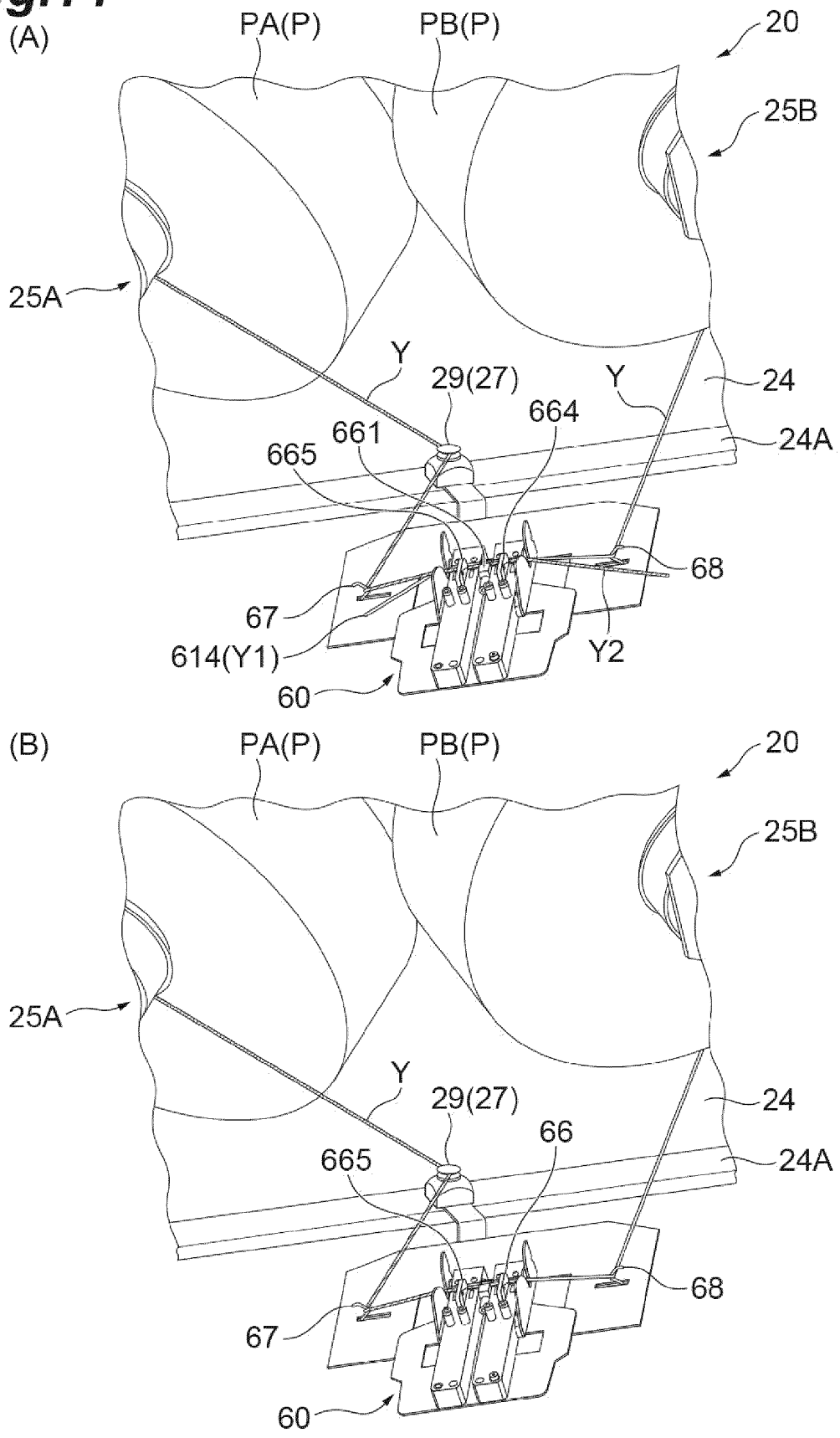

(A)
PA(P)
PB(P)
20
25B
25A
Y
29(27)
Y
24
664
661
24A
665
68
67
614(Y1)
Y2
60
(B)
PA(P)
PB(P)
20
25B
25A
Y
29(27)
24
66
665
24A
68
67
60

Fig.15

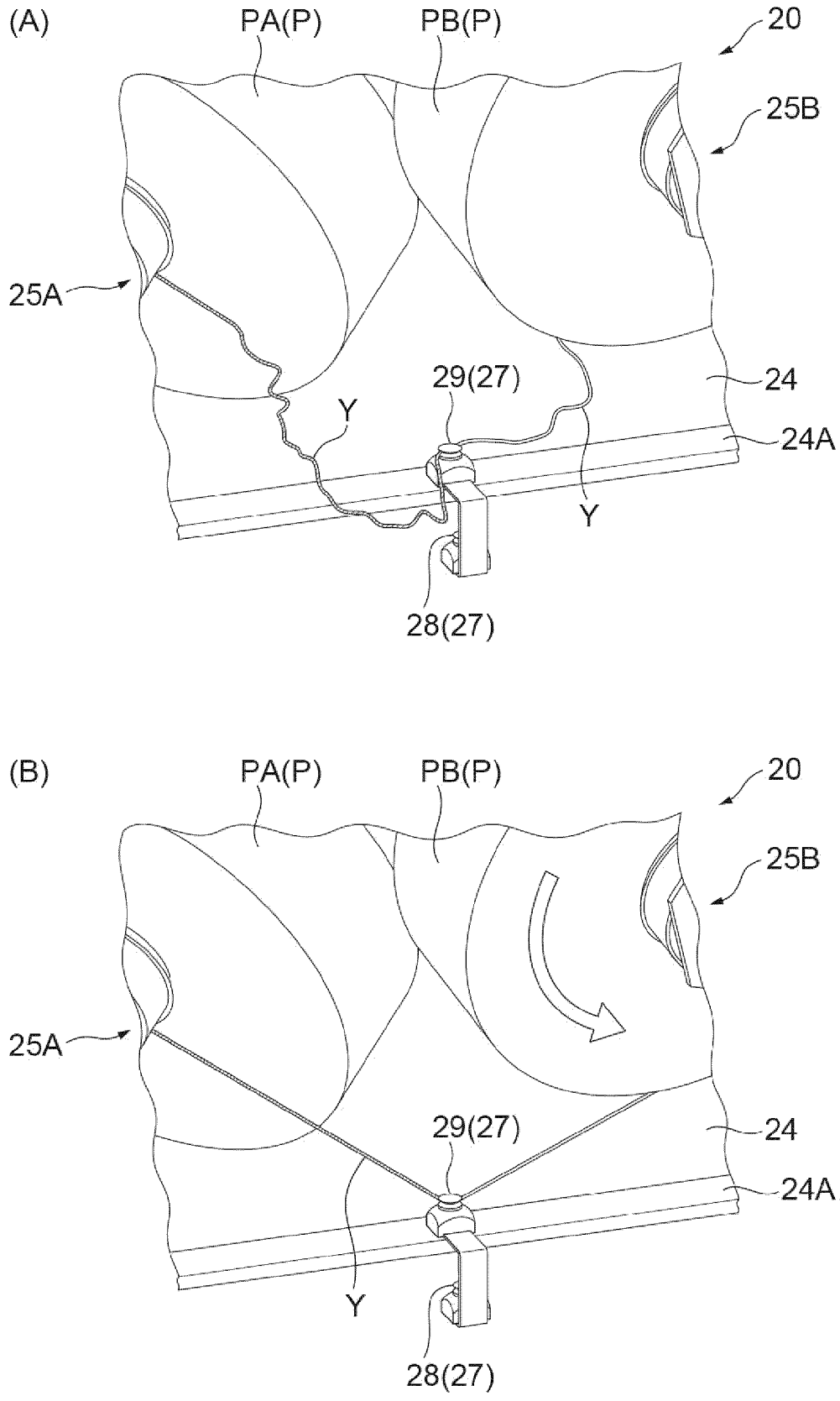

(A)
PA(P)
PB(P)
20
25B
25A
29(27)
24
Y
24A
Y
28(27)
(B)
PA(P)
PB(P)
20
25B
25A
29(27)
24
24A
Y
28(27)

Fig.16

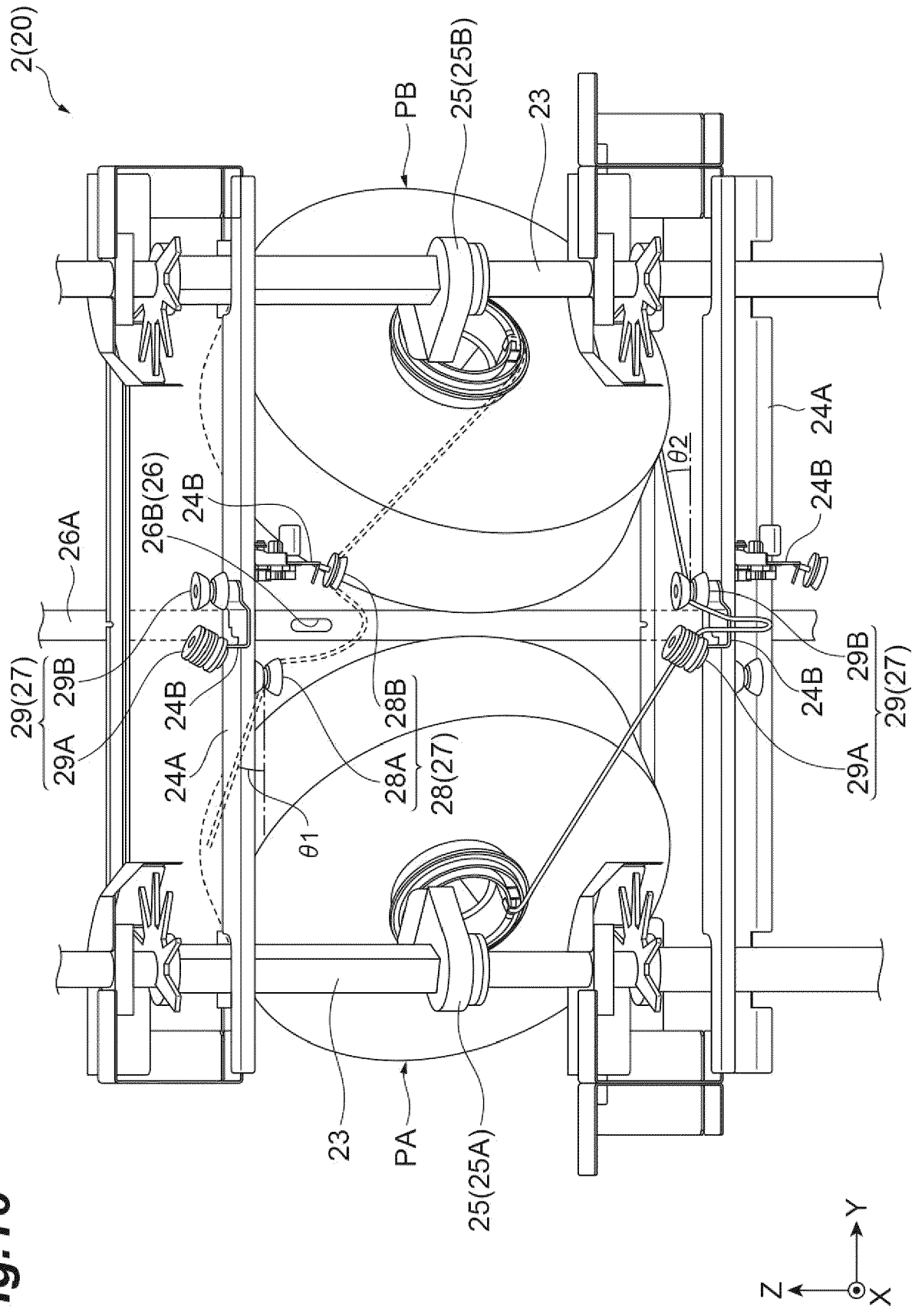

2(20)
PB
25(25B)
23
24A
θ2
24B
26B(26)
24B
26A
29(27)
29B
29A
24A
24B
θ1
28B
28A
28(27)
24B
29B
29A
29(27)
23
PA
25(25A)
Y
Z
X

Fig.17

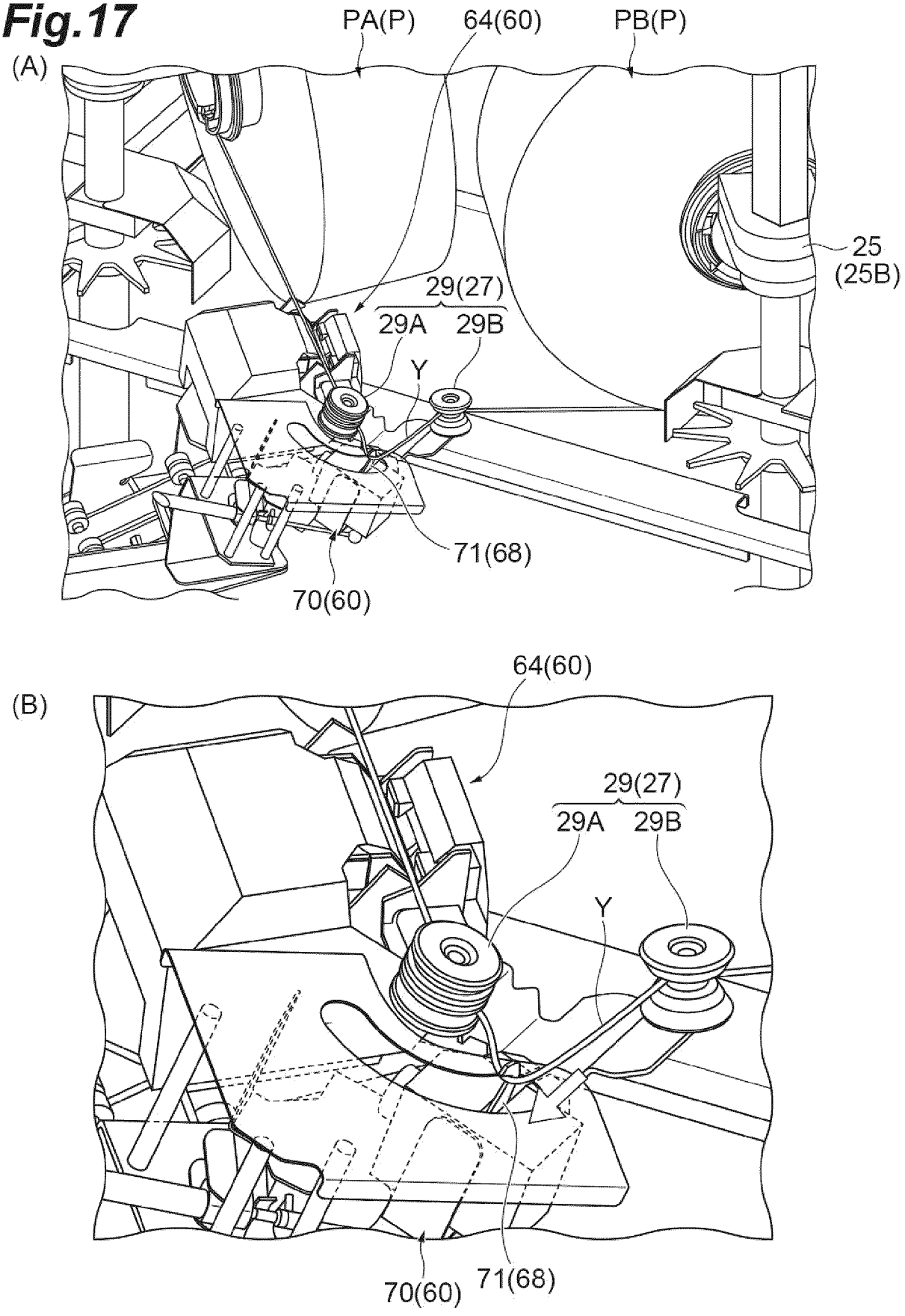
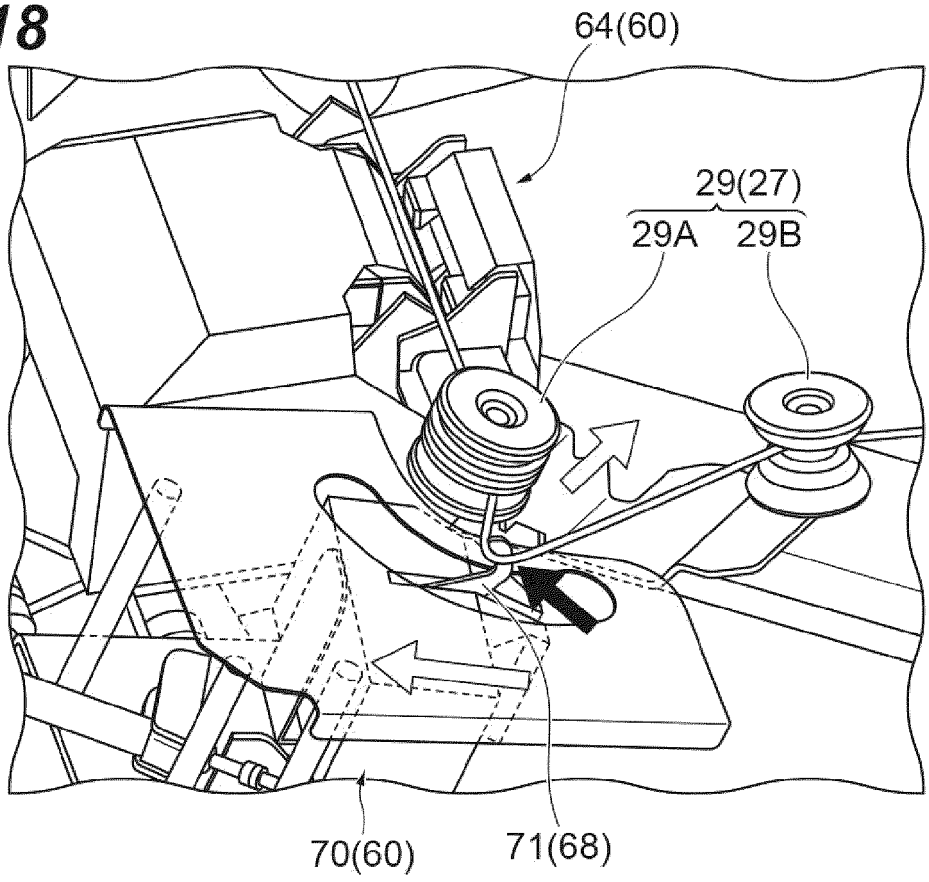

(A)
PA(P)
64(60)
PB(P)
25
(25B)
29(27)
29A
29B
Y
71(68)
70(60)
(B)
64(60)
29(27)
29A
29B
Y
70(60)
71(68)

Fig.18

(A)



(B)

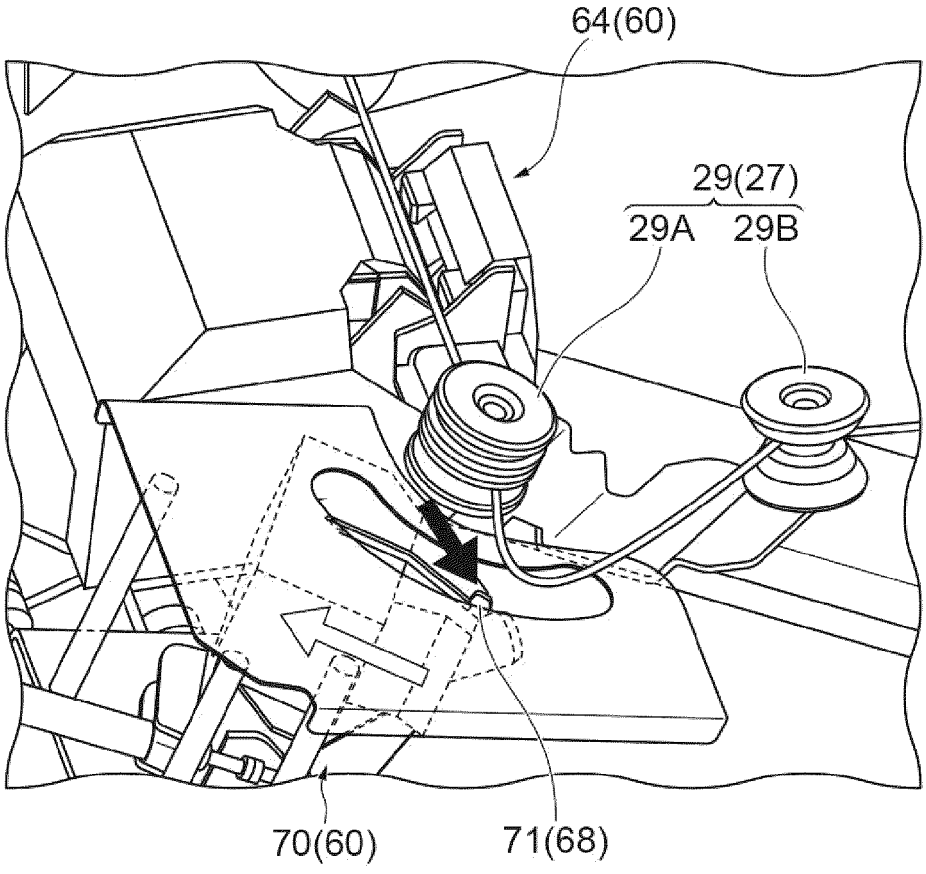
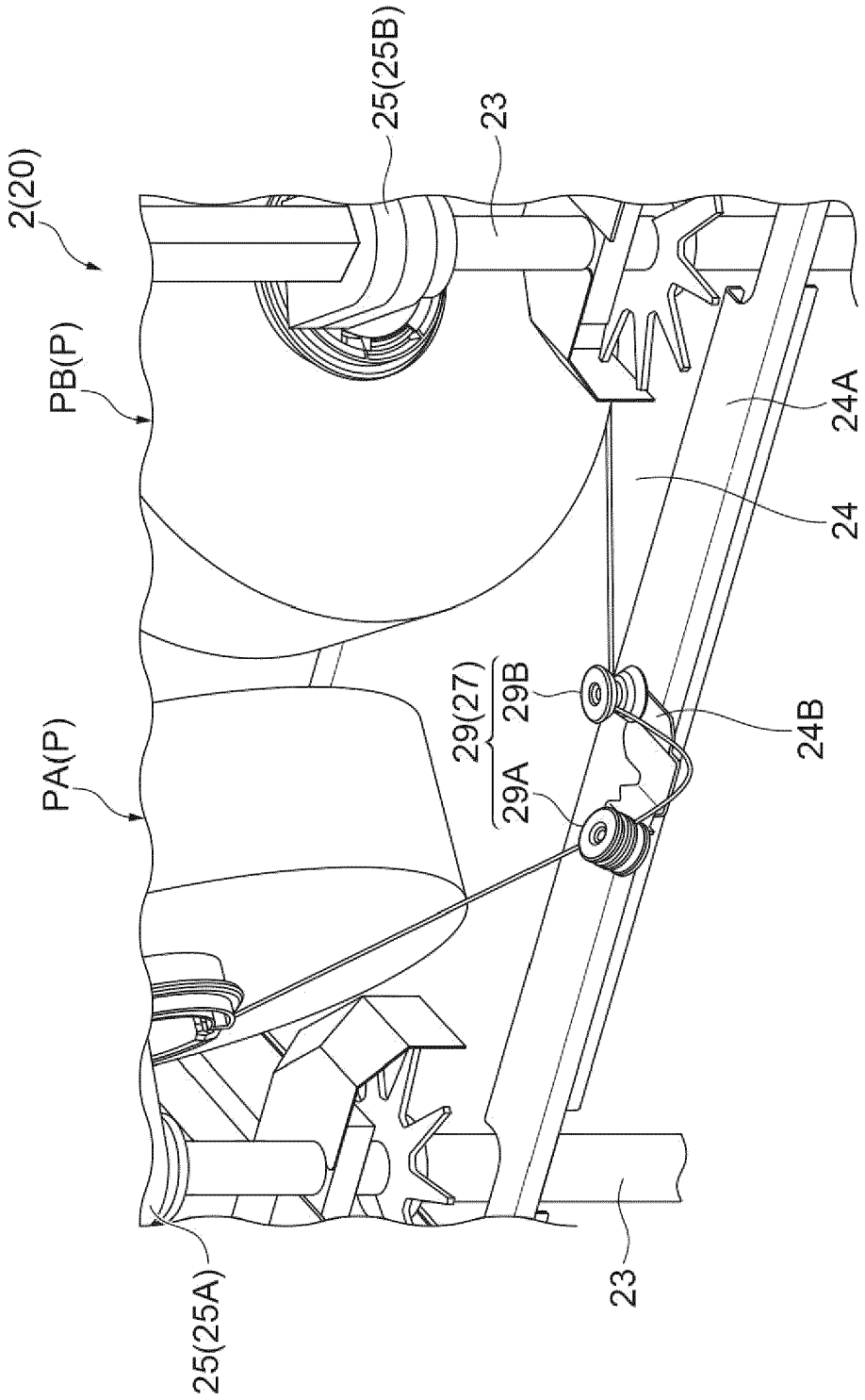


Fig.19



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2021024744 A **[0002]**
- JP H967064 A **[0004]**