(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 650 594 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
13.05.2020 Bulletin 2020/20

(51) Int Cl.:
D03D 47/48 *(2006.01)*

(21) Application number: **19205302.3**

(22) Date of filing: **25.10.2019**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **07.11.2018 JP 2018209408**

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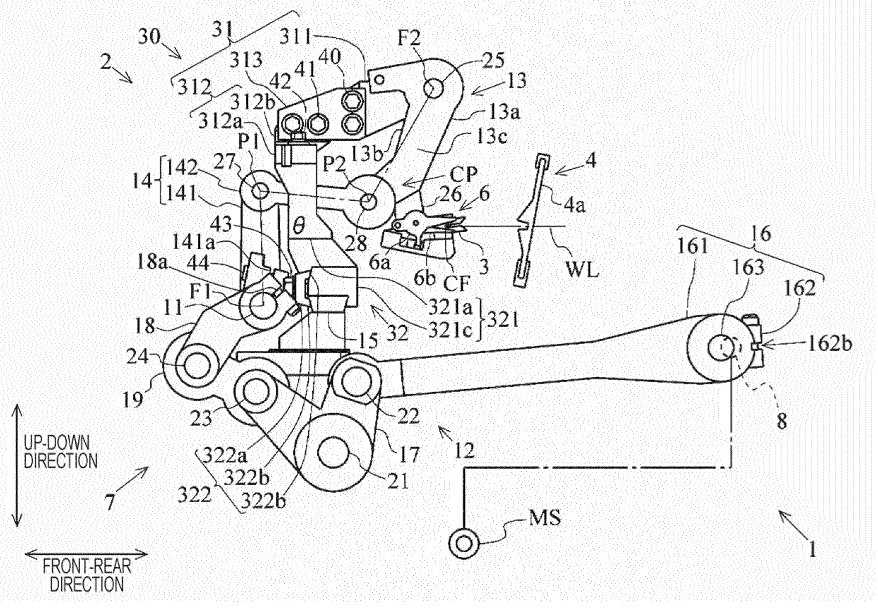
(54) AIR TUCK-IN DEVICE OF AN AIR JET LOOM

(57) A reciprocating motion mechanism (7) includes an intermediate transmission shaft (11) that is rotatably supported by a frame of a loom (1) and that extends in a weaving-width direction, a reverse driving section (12) that connects the intermediate transmission shaft (11) and a driving shaft (8) to each other and that reciprocatingly reversely drives the intermediate transmission shaft (11), a swinging arm (13) that is supported at one end by a supporting shaft (25) provided above a warp line, that is provided so as to be swingable around an axis of the supporting shaft (25), and that supports at other end a tuck-in head (3), and a driving transmission section (14) that connects the swinging arm (13) and the intermediate transmission shaft (11) to each other and that is mounted on the intermediate transmission shaft (11) so that a position of the driving transmission section (14) in the weaving-width direction with respect to the intermediate transmission shaft (11) is changeable.

FIG. 3



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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to an air tuck-in device of an air jet loom. The air tuck-in device is provided in the air jet loom and performs a tuck-in operation by air jetting with tuck-in nozzles. The air tuck-in device includes a pair of tuck-in heads that are each provided on a corresponding one of a weft-supply side and a side opposite to the weft-supply side and that have the tuck-in nozzles, a driving shaft that is continuously rotationally driven in one direction in synchronism with a main shaft of the loom, and a reciprocating motion mechanism that supports at least the tuck-in head provided on the side opposite to the weft-supply side, that uses the driving shaft as a driving source, and that causes the tuck-in head to undergo a reciprocating motion between a first position that is situated on a side of a cloth fell and a second position that is situated away from the cloth fell in a front-rear direction of the loom. The first position is a position where the reciprocating motion causes the tuck-in head to overlap the cloth fell, and the second position is a position where the tuck-in head is situated away from the cloth fell on a side opposite to a side of a reed.

2. Description of the Related Art

[0002] As a tuck-in device that is provided in an air jet loom, a so-called air tuck-in device that is an air jet tuck-in device is provided. The air tuck-in device performs a tuck-in operation on the weft-supply side and the side opposite to the weft-supply side. In the tuck-in operation, an end portion of a weft that has been inserted is folded in (tucked in) by air jetting into a warp shed in which a subsequent weft is inserted. The tuck-in device includes tuck-in heads having tuck-in nozzles for performing air jetting. In the tuck-in device, the tuck-in heads are each provided on a corresponding one of the weft-supply side and the side opposite to the weft-supply side.

[0003] In an air jet loom including such an air tuck-in device, when a weaving width of a cloth that is woven is changed, the disposition of a tuck-in head is changed in the weaving-width direction in correspondence with the positions of selvages after changing the weaving width of the cloth. Incidentally, in this case, in a general loom, the disposition of the tuck-in head on the side opposite to the weft-supply side is changed. However, in a so-called center-reference loom in which a center in the weaving-width direction is a reference, the arrangement of the tuck-in head on the weft-supply side and the tuck-in head on the side opposite to the weft-supply side is changed.

[0004] When the disposition of a tuck-in head is changed in the weaving-width direction as described above, in order to prevent interference between the tuck-in head and a reed (reed dent) when beating is performed, the reed is, in general, also changed. That is, when the disposition of the tuck-in head is changed due to the change in the weaving width, the reed is also changed to a reed having a width corresponding to the changed weaving width. However, in this case, it is necessary to provide a plurality of reeds having widths corresponding to respective possible weaving widths.

[0005] On the other hand, a so-called retraction-type air tuck-in device in which, in a front-rear direction of a loom, a tuck-in head is caused to reciprocate between a tuck-in position, where the tuck-in operation is performed, and a retracted position, where the above-described interference is prevented, has been hitherto proposed as an air tuck-in device that is provided for the purpose of making it unnecessary to provide such a plurality of reeds. A device that is disclosed in European Unexamined Patent Application Publication No. 0534429 (hereunder referred to as "existing device") is provided as an example of such a retraction-type air tuck-in device.

[0006] Specifically, the existing device is formed so that a tuck-in head (tuck-in nozzles) is caused to reciprocate as described above by a reciprocating motion mechanism in which a driving shaft is a driving source. The reciprocating motion mechanism includes a cam mechanism that serves as a driving mechanism and a link mechanism that transmits the motion of the cam mechanism to the tuck-in head.

[0007] Regarding the configuration of the reciprocating motion mechanism, the cam mechanism includes a cam that is mounted on the driving shaft so as to be incapable of rotating relative to the driving shaft, and a lever (cam lever) that is provided so as to swing in the front-rear direction of the loom in accordance with the rotation of the cam. The link mechanism includes a link rod that is connected at one end to the cam lever with a pin of the link rod being inserted in a long hole of the cam lever, and a slide member that is connected at one end to the link rod so as to be pivotally connected to the other end of the link rod and that is supported so as to be slidable in the front-rear direction at the loom.

[0008] In addition, in the existing device, the nozzles (tuck-in head) that perform air jetting for performing a tuck-in operation is supported so as to be fixed to the other end of the slide member. By virtue of this structure, in the existing device, when the cam lever swings due to the rotation of the cam, the slide member that is connected to the cam lever via the link rod slides in the front-rear direction, so that the tuck-in head reciprocates as described above.

[0009] The retraction-type tuck-in device is a device that is based on the assumption that the disposition of a tuck-in head is changed in the weaving-width direction in accordance with the change in the weaving width as described above. However, even in the loom that is provided with the existing device described above, when the weaving width of a cloth that is woven is changed, naturally, the disposition of the tuck-in head is changed in the weaving-width direction in accordance with the change in the weaving width of the cloth that is woven.

[0010] When the disposition of the tuck-in head is changed in this way, in the existing device formed as described above, the slide member, which is a member that directly supports the tuck-in head, is moved in the weaving-width direction. However, in the existing device, since the slide member is formed so that the slide member is connected to the driving mechanism (cam mechanism) by the link rod, when changing the disposition of the tuck-in head, not only the slide member, but also the driving mechanism that is connected to the slide member needs to be moved in the weaving-width direction. That is, in the existing device, when the disposition of the tuck-in head is changed due to the change in the weaving width, the entire reciprocating motion mechanism needs to be moved in the weaving width direction. Therefore, it is very troublesome to change the disposition of the tuck-in head.

SUMMARY OF THE INVENTION

[0011] In view of the above-described circumstances, it is an object of the prevent invention to provide a configuration that easily allows the disposition of a tuck-in head to be changed in a weaving-width direction in an air tuck-in device of an air jet loom that includes a reciprocating motion mechanism such as that described above.

[0012] As described above, the present invention assumes an air tuck-in device of an air jet loom, the air tuck-in device including a reciprocating motion mechanism that causes a tuck-in head to undergo a reciprocating motion between a first position that is situated on a side of a cloth fell and a second position that is situated away from the cloth fell in a front-rear direction of the loom.

[0013] The so-called "first position" in the present invention is a position where the tuck-in head overlaps the cloth fell in the front-rear direction of the loom when the tuck-in head reciprocates. More specifically, the "first position" is a position where the above-described tuck-in operation can be performed due to the tuck-in head being positioned at or near the first position, specifically, a position where the cloth fell is positioned in the range of existence of the slit formed in the tuck-in head in the front-rear direction of the loom. The so-called "second position" in the present invention is a position where the tuck-in head is situated away from the cloth fell on the side opposite to the side of the reed in the front-rear direction of the loom when the tuck-in head reciprocates. More specifically, the "second position" is a position (retracted position) where the tuck-in head does not interfere with the reed and is retracted from the reed even if the reed has reached the most advanced position when the tuck-in head is positioned at the second position.

[0014] In the air tuck-in device according to the present invention, the reciprocating motion mechanism includes an intermediate transmission shaft that is rotatably supported by a frame of the loom and that extends in a weaving-width direction, a reverse driving section that connects the intermediate transmission shaft and the driving shaft to each other and that reciprocatingly reversely drives the intermediate transmission shaft, a swinging arm that is supported at one end by a supporting shaft provided above a warp line, that is provided so as to be swingable around an axis of the supporting shaft, and that supports at other end the tuck-in head, and a driving transmission section that connects the swinging arm and the intermediate transmission shaft to each other and that is mounted on the intermediate transmission shaft so that a position of the driving transmission section in the weaving-width direction with respect to the intermediate transmission shaft is changeable.

[0015] In the air tuck-in device according to the present invention, in the front-rear direction, the supporting shaft may be disposed in a range near the cloth fell, the range including a location directly above the cloth fell. Further, in the air tuck-in device, the driving transmission section may include a first connecting lever that is mounted at one end on the intermediate transmission shaft so as to be incapable of rotating relative to the intermediate transmission shaft, and a second connecting lever that is connected at one end to other end of the first connecting lever so as to be rotatable with respect to the other end of the first connecting lever and that is connected at other end to the swinging arm so as to be rotatable with respect to the swinging arm.

[0016] When the driving transmission section includes the first connecting lever and the second connection lever, a connection portion where the swinging arm and the second connecting lever are connected to each other is positioned closer than an intermediate portion of the swinging arm in the longitudinal direction to a side of the other end of the swinging arm. Further, when the driving transmission section is formed in this way, a position of the connection portion and lengths of both the connecting levers are set so that an angle formed by the first connecting lever and the second connecting lever is substantially 90 degrees in a state in which the tuck-in head is positioned at one of the first position and the second position, and a position of the supporting shaft is set so that the angle is substantially 90 degrees even in a state in which the tuck-in head is positioned at other of the first position and the second position with respect to the one of the first position and the second position.

[0017] In the air tuck-in device according to the present invention, the reverse driving section may be an articulated link mechanism including a crank mechanism that is mounted on the driving shaft. Further, when the reverse driving section includes the articulated link mechanism including the crank mechanism, the crank mechanism may include a crank hub that is mounted on the driving shaft so as to be incapable of rotating relative to the driving shaft, and may be formed so that a mounting phase of the crank hub with respect to the driving shaft is changeable.

[0018] In the reciprocating motion mechanism of the air tuck-in device according to the present invention, a tuck-in head is supported by the swinging arm, and the driving transmission section is connected to the swinging arm to impart a reciprocating swinging motion to the swinging arm. In addition, in the reciprocating motion mechanism, the reverse driving section corresponding to the driving mechanism of the above-described existing device is not directly connected to the link rod that imparts a reciprocating motion to the slide member that supports the tuck-in head as it is in the existing device, but is connected to the driving transmission section via the intermediate transmission shaft that is provided so as to extend in the weaving-width direction. That is, the reciprocating motion mechanism of the tuck-in device according to the present invention has a configuration in which the reverse driving section causes the intermediate transmission shaft to be reciprocatingly reversely driven, and the swinging arm is reciprocatingly swingingly driven with the intermediate transmission shaft that undergoes reciprocating reverse motion in this way being a driving source.

[0019] Moreover, in the reciprocating motion mechanism, since the mounting position of the driving transmission section connected to the swinging arm with respect to the intermediate transmission shaft can be changed in the weaving-width direction that is an axial direction of the intermediate transmission shaft, the arrangement of the driving transmission section and the swinging arm to which the driving transmission section is connected can be changed in the weaving-width direction. That is, the reciprocating motion mechanism is formed so that, of the entire reciprocating motion mechanism, only the swinging arm that supports the tuck-in head and the driving transmission section connected to the swinging arm can move in the weaving-width direction.

[0020] Therefore, according to the air tuck-in device according to the present invention, when changing the disposition of a tuck-in device due to a change in the weaving width, it is not necessary to move the entire reciprocating motion mechanism as it is in the existing device, and the disposition of the tuck-in head is changed by only moving the swinging arm, which directly supports the tuck-in head, and the driving transmission section, which is an accompanying portion of the swinging arm, without changing the disposition of the reverse driving section of the reciprocating motion mechanism. Therefore, compared to the existing device, the disposition of the tuck-in head can be easily changed in the weaving-width direction without considerable trouble.

[0021] In the air tuck-in device according to the present invention, the tuck-in head is supported at the other end of the swinging arm that can swing around the axis of the supporting shaft disposed at the side of the one end, and the tuck-in head reciprocates by swinging around the axis of the supporting shaft. Moreover, by forming the air tuck-in device so that the supporting shaft is disposed in the above-described range near the cloth fell, compared to when the supporting shaft is disposed outside this range, the path of the tuck-in head that undergoes a reciprocating swinging motion is in a state that is closer to a parallel state with respect to the warp line. Therefore, even if the tuck-in head is formed so as to be displaced by swinging, the first position where the above-described tuck-in operation can be performed is a position that is closer to the warp line. As a result, the above-described tuck-in operation can be more properly performed.

[0022] Further, in the air tuck-in device according to the present invention, by forming the driving transmission section so as to include the first connecting lever and the second connecting lever as described above, compared to when the driving transmission section includes a single connecting lever, the life of the swinging arm and the life of the driving transmission section can be increased.

[0023] Specifically, when the driving transmission section includes a single connecting lever, the swinging arm becomes swingable. Therefore, the connection structure for connecting the swinging arm and the connecting lever needs to be a structure in which a connection portion that is provided on one of the swinging arm and the connecting lever can be displaced in a longitudinal direction of the other of the swinging arm and the connecting lever. This is because, since the swing fulcrum of the swinging arm and the swing fulcrum of the connecting lever differ from each other, for example, when the connection portion is provided at a predetermined position on the swinging arm, the distance from the connection portion to the swing fulcrum of the connecting lever (axis of the intermediate transmission shaft) changes due to the swinging of the swinging arm. As such a connection structure, for example, a structure in which a connecting pin is provided at the swinging arm as the connection portion, a long hole extending in a longitudinal direction of the connecting lever is formed in the connecting lever, and the connecting pin is inserted into the long hole to connect them to each other may be considered. However, in this connection structure, the connecting pin slides and is displaced in the long hole due to the swinging of the swinging arm, as a result of which the distance from the swing fulcrum of the connecting lever to the connection portion changes.

[0024] In contrast, when the driving transmission section is formed so as to include the first connecting lever and the second connecting lever as described above, the driving transmission section has a configuration in which, since the angle between the first connecting lever and the second connecting lever changes, the linear distance between the one end of the first connecting lever and the other end of the second connecting lever can change. Therefore, according to the structure, even if the connection portion of the swinging arm is connected to the other end of the driving transmission section (second connecting lever) so as to be incapable of being displaced from the other end of the driving transmission section, since the angle between the first connecting lever and the second connecting lever changes due to the swinging of the swinging arm, the change in distance between the connection portion and the axis of the intermediate transmission shaft caused by the swinging can be absorbed. Therefore, since the driving transmission section can have a configuration that does not include a portion that is displaced by sliding as it is included in the configuration described above, for example, wear caused by the sliding does not occur, as a result of which the life of the swinging arm and the life of the driving transmission section can be increased.

[0025] In the driving transmission section formed in this way, by setting the position of the connection portion, where the swinging arm and the second connecting lever are connected to each other, closer to the other end side than the intermediate portion in a longitudinal direction of the swinging arm, the life of the bearing that is provided at the connection portion can be increased. That is, by setting the position of the connection portion in this way, the distance from the supporting shaft that supports the swinging arm to the connection portion is increased. Therefore, a moment load (force that causes the swinging arm that supports the tuck-in head to swing) that acts upon the bearing is reduced, as a result of which the life of the bearing can be increased.

[0026] Further, when the driving transmission section is formed so as to include the first connecting lever and the second connecting lever as described above, by forming the air tuck-in device so as to set the position of the connection portion, the length of each connecting lever, and the position of the supporting shaft so that the angle between both of the connecting levers is substantially 90 degrees in a state in which the tuck-in head is in the first position and the second position, motion is efficiently transmitted when swinging the swinging arm due to reciprocating rotation of the intermediate transmission shaft. Therefore, the tuck-in head is efficiently reciprocated by the reciprocating motion mechanism, and the load that is exerted upon the reciprocating motion when the tuck-in head is caused to undergo a predetermined reciprocating motion is reduced.

[0027] In the air tuck-in device according to the present invention, by forming the reverse driving section from the articulated link mechanism that converts the rotation of the driving shaft into a reciprocating motion by the crank mechanism, manufacturing costs of the air tuck-in device according to the present invention can be reduced.

[0028] Specifically, in order to more stably perform the above-described tuck-in operation, it is desirable that the reverse driving section be formed so that a stopping period for allowing the tuck-in head to be stopped as long as possible near the first position is provided. Moreover, as a configuration for acquiring such a stopping period, in general, a configuration using a cam mechanism can be considered. However, when a cam mechanism is used as a device configuration, the device is relatively expensive. In contrast, when the articulated link mechanism including a crank mechanism as that described above is formed as the configuration of the reverse driving section, and the reverse driving section is formed so that the above-described stopping period is provided, compared to the case in which the cam mechanism is used as described above, the reverse driving section is inexpensive. Therefore, by forming the reverse driving section in this way, the manufacturing costs of the air tuck-in device can be reduced.

[0029] Further, when the reverse driving section is formed in this way, by forming the crank mechanism so that the mounting phase of the crank hub of the crank mechanism with respect to the driving shaft can be changed, it is possible to easily deal with a change in timing in which the tuck-in head is positioned at the first position due to a change in a weaving condition.

[0030] Specifically, when the weaving condition for weaving is changed, an optimal timing in which the above-described tuck-in operation is performed may change. In this case, the timing in which the tuck-in head is positioned at the first position needs to be changed. Therefore, in the air tuck-in device in the present invention, when the reverse driving section includes the articulated link mechanism including the crank mechanism as described above, by forming the crank mechanism so that the mounting phase can be changed, the phase of the reciprocating motion of the tuck-in head can be changed by only changing the mounting phase, so that it is possible to easily deal with a change in the timing in which the tuck-in head is positioned at the first position due to a change in the weaving condition.

BRIEF DESCRIPTION OF THE DRAWINGS

[0031]

Fig. 1 is a schematic view showing an example of an air jet loom that is assumed by the present invention;
Fig. 2 is a side view showing an example of a tuck-in head;
Fig. 3 is a front view showing an example of a reciprocating motion mechanism of an air tuck-in device according to the present invention;
Fig. 4 is a left view showing the example of the reciprocating motion mechanism of the air tuck-in device according to the present invention;
Fig. 5 is a partial sectional view showing an example of a mounting structure of a crank hub with respect to a driving shaft;
Fig. 6 shows the relationship between the position of the tuck-in head that is reciprocatingly driven and the angle of a crank; and
Fig. 7 is a schematic view of an example of a reverse driving section that is formed from a 4-link mechanism.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0032] An embodiment of an air tuck-in device of an air jet loom according to the present invention is described below on the basis of Figs. 1 to 6.

[0033] As shown in Fig. 1, an air jet loom 1 that is assumed in the present invention includes an air tuck-in device 2 that performs a tuck-in operation in which an end portion of a weft Y (hereunder referred to as "weft end portion") that has been inserted by compressed air that is jetted from a main nozzle MN is folded in (tucked in) by air jetting into a shed of a warp W in which a succeeding weft Y is inserted.

[0034] The air tuck-in device 2 includes tuck-in heads 3 for performing a tuck-in operation. As shown in Fig. 2, each tuck-in head 3 includes a slit 3a in which the weft end portion is inserted and a plurality of tuck-in nozzles 3c that are used for performing the air jetting for performing the tuck-in operation, with the direction of arrangement of the tuck-in nozzles 3c being the same as the direction of extension of the slit 3a at locations above and below the slit 3a. A tip-end portion of each tuck-in head 3 is a guide unit 3d having an inclined surface 3e extending continuously with the slit 3a in an up-down direction to make it easier to insert the weft Y into the slit 3a. Each tuck-in head 3 includes a release nozzle 3f that is used for performing air jetting for tucking in the weft end portion from the inside of the slit 3a towards the inside of a jetting area of each tuck-in nozzle 3c (range of the air jetting by each tuck-in nozzle 3c).

[0035] Moreover, the air tuck-in device 2 includes such tuck-in heads 3, one on a weft-supply side (main-nozzle-MN side) and the other on a side opposite to the weft-supply side in the air jet loom 1. In the present embodiment, the tuck-in head 3 on the weft-supply side and the tuck-in head on the side opposite to the weft-supply side have different configurations. The tuck-in head 3 on the weft supply side includes, in addition to the aforementioned slit 3a and each aforementioned nozzle, a holding hole and a holding nozzle (neither of which are shown) for holding the weft end portion in the slit 3a. Each tuck-in head 3 can perform the tuck-in operation at the first position on a cloth-fell-CF side in a front-rear direction of the loom 1 (hereunder, simply referred to as "front-rear direction"). Specifically, the first position is set as a position where the position of a bottom portion 3b of the slit 3a is substantially aligned with the position of the cloth fell CF (position that is shown by a solid line in Fig. 1) in the front-rear direction.

[0036] Regarding the arrangement of each tuck-in head 3 in a weaving-width direction, the tuck-in head 3 on the weft-supply side is provided near a selvage on the weft-supply side and is positioned between the main nozzle MN and the selvage on the weft-supply side. Regarding the tuck-in head 3 on the side opposite to the weft-supply side, the air jet loom 1 includes a catch cord C on an outer side of a selvage on the side opposite to the weft-supply side as illustrated, and the tuck-in head 3 on the side opposite to the weft-supply side is provided near the selvage on the side opposite to the weft-supply side and is positioned between the catch cord C and the selvage on the side opposite to the weft-supply side. Therefore, in the air jet loom 1, each tuck-in head 3 is disposed at a position overlapping a reed 4 (reed dent 4a) in the weaving-width direction.

[0037] In the air jet loom 1, a thread cutter 5 that cuts the weft Y each time weft insertion is performed on the weft-supply side is provided on a side opposite to a selvage side with respect to the tuck-in head 3 on the weft-supply side and is disposed at a position between the tuck-in head 3 on the weft-supply side and the main nozzle MN. A cutter 6 that cuts the weft Y that is formed consecutively with the catch cord C on the side opposite to the weft-supply side is provided on a side opposite to a selvage side with respect to the tuck-in head 3 on the side opposite to the weft-supply side and is disposed at a position between the tuck-in head 3 on the side opposite to the weft-supply side and the catch cord C. However, the cutter 6 on the side opposite to the weft-supply side performs a cutting operation each time weft insertion is performed for performing the tuck-in operation, and it can be said that the cutter 6 functions as a part of the air tuck-in device 2.

[0038] In the air jet loom 1 described above, when the weaving width of a cloth T that is woven is changed, the position of the selvage on the side opposite to the weft-supply side changes, so that the position of the tuck-in head 3 on the side opposite to the weft-supply side and the position of the cutter 6 are also changed. When the relationship between the position of the tuck-in head 3 and the reed 4 in the weaving-width direction does not change as on the weft-supply side, by cutting out a part of the reed dent 4a of the reed 4, interference between the tuck-in head 3 and the reed dent 4a caused by beating is prevented from occurring. However, regarding the side opposite to the weft-supply side where the position of the tuck-in head 3 can change as described above, the reed dent 4a cannot be cut out as it is on the weft-supply side.

[0039] Accordingly, the air tuck-in device of the present invention is formed so that the tuck-in head that may interfere with the reed dent 4a due to a beating operation (in the present embodiment, the tuck-in head 3 on the side opposite to the weft-supply side) is swingingly displaced (is reciprocated) in accordance with the beating operation. That is the air tuck-in device of the present invention includes a reciprocating motion mechanism for reciprocating the tuck-in head in such a manner. The reciprocating motion is performed between the first position, where the tuck-in operation can be performed as described above, and the second position (retracted position), where interference as that described above is prevented from occurring. The retracted position is set as a position (in Fig. 1, the position indicated by dotted lines) that is situated away from the cloth fell CF in the front-rear direction and where the tuck-in head 3 on the side opposite to the weft-supply side is situated away from the cloth fell CF on a side opposite to a reed-4 side due to the reciprocating motion.

[0040] An example of such a reciprocating motion mechanism of the air tuck-in device of the present invention is described in detail below as a configuration of the present embodiment. In the present embodiment, as described above, only the tuck-in head 3 on the side opposite to the weft-supply side is driven so as to be reciprocated by a reciprocating motion mechanism 7. That is, in the present embodiment, the tuck-in head with which the reciprocating motion mechanism 7 is related is the tuck-in head 3 on the side opposite to the weft-supply side. Accordingly, unless otherwise particularly noted, "tuck-in head" refers to the tuck-in head on the side opposite to the weft-supply side.

[0041] First, in addition to the reciprocating motion mechanism 7 that reciprocates the tuck-in head 3 as described above, the air tuck-in device 2 includes driving shafts 8 serving as driving sources of the reciprocating motion mechanism 7 (see Fig. 3). With one end portion of each driving shaft 8 projecting outwardly of its corresponding loom frame 9 in the weaving-width direction, each driving shaft 8 is rotatably supported with respect to its corresponding loom frame 9 via a bearing 10. Each driving shaft 8 is mechanically connected to a loom main shaft MS, and is provided so as to be continuously rotationally driven in one direction in synchronism with the loom main shaft MS. In the present embodiment, a pair of driving shafts 8 are provided, one on the weft-supply side and the other on the side opposite to the weft-supply side in the air jet loom 1.

[0042] Moreover, the reciprocating motion mechanism 7 is provided so as to be connected to the driving shafts 8. More specifically, the reciprocating motion mechanism 7 includes an intermediate transmission shaft 11 that extends in the weaving-width direction and that is common to both driving shafts 8, and a pair of reverse driving sections 12 that connect the intermediate transmission shaft 11 and each driving shaft 8 and that reciprocatingly reversely drive the intermediate transmission shaft 11. Further, the reciprocating motion mechanism 7 includes a swinging arm 13 that is supports the tuck-in head 3 and that is swingably provided at the loom 1, and a driving transmission section 14 that transmits the reciprocating reverse motion of the intermediate transmission shaft 11 to the swinging arm 13. Each structural element of the reciprocating motion mechanism 7 is as follows in detail.

[0043] At a position situated closer to a take-up side of the cloth T than the retracted position in the front-rear direction, the intermediate transmission shaft 11 is provided so as to extend between the left and right loom frames 9. At the loom 1, a temple bar 15 is provided so as to extend in the weaving-width direction, and the intermediate transmission shaft 11 is provided at a position situated closer to the take-up side of the cloth T than the temple bar 15. The intermediate transmission shaft 11 is rotatably supported with respect to the loom frames 9 via a bearing (not shown), and both end portions of the intermediate transmission shaft 11 are provided so as to protrude outwardly of the corresponding loom frames 9.

[0044] Next, the reverse driving sections 12 are each provided outwardly of a corresponding one of the loom frame 9 on the weft-supply side and the loom frame 9 on the side opposite to the weft-supply side. The reverse driving section 12 on the weft-supply side and the reverse driving section 12 on the side opposite to the weft-supply side are symmetrically formed in the weaving-width direction. Accordingly, only the reverse driving section 12 on the side opposite to the weft-supply side is described below.

[0045] As shown in Fig. 3, the reverse driving section 12 is formed from an articulated link mechanism including a crank mechanism 16 mounted on the driving shaft 8. In the present embodiment, the articulated link mechanism that constitutes the reverse driving section 12 is a 6-link mechanism. Specifically, the reverse driving section 12 includes the crank mechanism 16 including a con'rod 161, a swinging lever 17 whose one end is connected to the con'rod 161 of the crank mechanism 16 and that is swingably supported with respect to the loom frame 9, a driving lever 18 whose one end is mounted on the intermediate transmission shaft 11 so as to be incapable of rotating relative to the intermediate transmission shaft 11, and a connecting rod 19 that connects the other end of the swinging lever 17 and the other end of the driving lever 18 to each other.

[0046] In the reverse driving section 12, as shown in Fig. 5, the crank mechanism 16 includes a crank hub 162 that is mounted on the one end portion of the driving shaft 8 so as to be incapable of rotating relative to the one end portion of the driving shaft 8, an eccentric shaft 162 that is fixed to the crank hub 162 so that the axis is positioned at a location that is decentered from the axis of the driving shaft 8 with the crank hub 162 mounted on the driving shaft 8 in this way, and a con'rod 161 that is mounted on the eccentric shaft 163 so as to be incapable of rotating relative to the eccentric shaft 163.

[0047] More specifically, the crank hub 162 has a shaft shape as a whole, and has an insertion hole 162a in which the one end portion of the driving shaft 8 is fitted and inserted. However, the insertion hole 162a is a hole that has a bottom and that is open at an end surface on one end side of the crank hub 162 in an axial direction. Further, the crank hub 162 has a split clamp structure including a slotted portion 162b that communicates with the insertion hole 162a. By a split-clamp fixing operation by the split clamp structure, the clamp hub 162 is mounted on the driving shaft 8 (its one end portion above) so as to be incapable of rotating relative to the driving shaft 8 inserted through the insertion hole 162a.

[0048] The eccentric shaft 163 is a shaft to which the con'rod 161 is connected, and, in the present embodiment, is integrated with the crank hub 162. The eccentric shaft 163 is provided so as to protrude from an end surface on a side opposite to the one end side (the other end side) of the crank hub 162. However, the eccentric shaft 163 is provided so that the axis is positioned at a location that is decentered from the center of the insertion hole 162a of the crank hub 162. Therefore, with the crank hub 162 being mounted on the driving shaft 8 as described above, the eccentric shaft 163 is in a state in which its axis is positioned at a location that is decentered from the axis of the driving shaft 8.

[0049] The con'rod 161 is a lever-like member having two through holes, one in each end thereof. The con'rod 161 is connected at one end to the eccentric shaft 163 so as to be rotatable relative to the eccentric shaft 163. Specifically, a bearing 20 is fitted to the through hole 161a at one end portion of the con'rod 161. By fitting and inserting the eccentric shaft 163 into the bearing 20, the con'rod 161 is connected to the eccentric shaft 163 so as to be rotatable relative to the eccentric shaft 163. Therefore, the con'rod 161 is in a state in which its one end is connected to the crank hub 162 via the eccentric shaft 163.

[0050] The swinging lever 17 is a substantially L-shaped lever member that is bent at an intermediate portion of the swinging lever 17. The swinging lever 17 is supported by the loom frame 9 so that its bent portion at its intermediate portion is swingable with respect to the loom frame 9. Regarding the supporting of the swinging lever 17, specifically, a lever shaft 21 for supporting the swinging lever 17 is provided on the side of the loom frame 9 so as to protrude outward. On the other hand, a through hole for assembling the swinging lever 17 to the lever shaft 21 is formed in the bent portion of the swinging lever 17. Moreover, by assembling the swinging lever 17 to the lever shaft 21 via a bearing, or by supporting the lever shaft 21 by the loom frame 9 so as to be rotatable with respect to the loom frame 9, the swinging lever 17 is supported by the loom frame 9 so as to be swingable with respect to the loom frame 9.

[0051] Two through holes are formed, one in each end portion of the swinging lever 17. The swinging lever 17 is connected at one end portion to the other end portion of the con'rod 161 so as to be rotatable relative to the other end portion of the con'rod 161. Specifically, by fitting and inserting a bearing (not shown) into one of the through hole in the one end portion of the swinging lever 17 and the through hole in the other end portion of the con'rod 161, and by fitting and inserting a connecting shaft 22 inserted into the other of the through holes into the bearing, the swinging lever 17 and the con'rod are connected so as to be rotatable relative to each other.

[0052] The driving lever 18 is a lever member having a shape that is slightly bent at its intermediate portion. Two through holes are formed, one in each end portion of the driving lever 18. Further, the driving lever 18 has a split clamp structure including a slotted portion 18a that communicates with the through hole at its one end portion. By a split-clamp fixing operation by the split clamp structure with the intermediate transmission shaft 11 (one of the two end portions that is on the side opposite to the weft-supply side) inserted through the one end portion of the driving lever 18, the driving lever 18 is mounted at its one end portion on the intermediate transmission shaft 11 so as to be incapable of rotating relative to the intermediate transmission shaft 11.

[0053] The connecting rod 19 is a lever-like member having two through holes, one in each end thereof. The connecting rod 19 is connected at its one end portion to the other end portion of the swinging lever 17 so as to be rotatable relative to the other end portion of the swinging lever 17. Specifically, by fitting a bearing (not shown) into one of the through hole in the one end portion of the connecting rod 19 and the through hole in the other end portion of the swinging lever 17, and by fitting and inserting a connecting shaft 23 inserted into the other of the through holes into the bearing, the connecting rod 19 and the swinging lever 17 are connected so as to be rotatable relative to each other.

[0054] The connecting rod 19 is connected at its other end portion to the other end portion of the driving lever 18 so as to be rotatable relative to the other end portion of the driving lever 18. Specifically, by fitting a bearing (not shown) into one of the through hole in the other end portion of the connecting rod 19 and the through hole in the other end portion of the driving lever 18, and by fitting and inserting a connecting shaft 24 inserted into the other of the through holes into the bearing, the connecting rod 19 and the driving lever 18 are connected so as to be rotatable relative to each other.

[0055] Next, the swinging arm 13 that supports the tuck-in head 3 is a lever-like member having two through holes, one in each end portion. The swinging arm 13 has a shape that is slightly bent between an intermediate portion 13c and the other end portion. In the swinging arm 13, of the four side surfaces extending in a longitudinal direction, the two side surfaces that are parallel to a thickness direction correspond to a front side surface 13a and a rear side surface 13b, and the side surface on the outer side of the bent portion corresponds to the front side surface 13a.

[0056] The swinging arm 13 is supported by a supporting shaft 25 above a warp line WL. More specifically, the supporting shaft 25 is provided above the warp line WL at the loom 1 so as to be supported by a support mechanism 30 (described below). The supporting shaft 25 is disposed above the cloth fell CF in the front-rear direction, and is disposed between the loom frame 9 on the side opposite to the weft-supply side and the selvage on the side opposite to the weft-supply side in the weaving-width direction. Further, in the above-described supported state, the supporting shaft 25 is provided so that its axial direction is the same as the weaving-width direction (axial direction of the intermediate transmission shaft 11). Moreover, the swinging arm 13 is supported at its one end portion by the supporting shaft 25. Therefore, the swinging arm 13 is positioned above the warp line WL, and is positioned between the loom frame 9 on the side opposite to the weft-supply side and the selvage on the side opposite to the weft-supply side in the weaving-width direction. However, the swinging arm 13 is supported by the supporting shaft 25 with its front side surface 13a facing the side of the reed 4.

[0057] Regarding the supporting of the swinging arm 13, by assembling the swinging arm 13 to the supporting shaft 25 so that the supporting shaft 25 is inserted into the through hole in the one end portion of the swinging arm 13, the swinging arm 13 is supported at its one end portion to the supporting shaft 25. Moreover, by assembling the swinging arm 13 and the supporting shaft 25 by a bearing (not shown), or by supporting the supporting shaft 25 by the support mechanism 30 so as to be rotatable with respect to the support mechanism 30, the swinging arm 13 in the above-described disposition is swingable around the axis of the supporting shaft 25.

[0058] The tuck-in head 3 is supported by the swinging arm 13 that is supported as described above. More specifically, a bracket 26 is mounted on the swinging arm 13 at the position of the other end side of the swinging arm 13 adjacent to the bent portion of the swinging arm 13. The bracket 26 in its mounted state protrudes from the front side surface 13a of the swinging arm 13 when viewed in the thickness direction of the swinging arm 13, and is mounted on the swinging arm 13 so that a protrusion direction forms an acute angle with respect to the direction of extension of a portion of the swinging arm 13 situated closer than the bent portion to the other end side. Moreover, the tuck-in head 3 is mounted on a tip end portion of the bracket 26. That is, the tuck-in head 3 is supported by the swinging arm 13 via the bracket 26.

[0059] However, in the supported state, the tuck-in head 3 is in a state in which its guide unit 3d faces the side of the reed 4. In its supported state, the tuck-in head 3 is in a state in which, in the process of displacing (moving) the tuck-in head 3 towards the reed 4, in the front-rear direction, when the guide unit 3d reaches the position of the cloth fell CF, the direction of extension of the slit 3a is substantially parallel to the warp line WL.

[0060] Further, the above-described cutter 6 on the side opposite to the weft-supply side is mounted on the tip end portion of the bracket 26. In its mounted state, the cutter 6 on the side opposite to the weft-supply side is in a state in which a tip end of a movable blade 6a and a tip end of a stationary blade 6b are positioned closer than a portion where the movable blade 6a and the stationary blade 6b are supported to the side of the reed 4. The cutter 6 on the side opposite to the weft-supply side is positioned between the tuck-in head 3 and the catch cord C as described above in the weaving-width direction, and is positioned so that the cutter 6 can cut the weft Y inserted into the slit 3a of the tuck-in head 3 in a positional relationship with the tuck-in head 3 in the front-rear direction.

[0061] Next, the driving transmission section 14 that transmits a reciprocating reverse motion of the intermediate transmission shaft 11 to the swinging arm 13 includes a first connecting lever 141 that is mounted at one end on the intermediate transmission shaft 11 so as to be incapable of rotating relative to the intermediate transmission shaft 11, and a second connecting lever 142 that connects the other end of the first connecting lever 141 and the other end of the swinging arm 13 to each other.

[0062] In the driving transmission section 14, the first connecting lever 141 is a lever member having two through holes, one in each end portion. The first connecting lever 141 has a split clamp structure including a slotted portion 141a that communicates with the through hole in its one end portion. By a split-clamp fixing operation by the split clamp structure with the intermediate transmission shaft 11 inserted through the through hole in the one end portion of the first connecting lever 141, the first connecting lever 141 is mounted at the one end portion on the intermediate transmission shaft 11 so as to be incapable of rotating relative to the intermediate transmission shaft 11.

[0063] The second connecting lever 142 is a lever member having two through holes, one in each end portion. The second connecting lever 142 is connected at its one end portion to the other end portion of the first connecting lever 141 so as to be rotatable relative to the other end portion of the first connecting lever 141. Specifically, by fitting a bearing (not shown) into one of the through hole in the one end portion of the second connecting lever 142 and the through hole in the other end portion of the first connecting lever 141, and by fitting and inserting a connecting shaft 27 inserted into the other of the through holes into the bearing, the second connecting lever 142 and the first connecting lever 141 are connected to each other so as to be rotatable relative to each other.

[0064] The second connecting lever 142 is connected at its other end portion to the other end portion of the swinging arm 13 so as to be rotatable relative to the other end portion of the swinging arm 13. Specifically, by fitting a bearing (not shown) to one of the through hole in the other end portion of the second connecting lever 142 and the through hole in the other end portion of the swinging arm 13, and by fitting and inserting a connecting shaft 28 inserted into the other of the through holes into the bearing, the second connecting lever 142 and the swinging arm 13 are connected to each other so as to be rotatable relative to each other. A portion CP where the second connecting lever 142 and the swinging arm 13 are connected to each other in this way (a portion where the connecting shaft 28 exists) corresponds to "connection portion".

[0065] According to the reciprocating motion mechanism 7 including each structural element as described above, when the driving shaft 8 is rotationally driven by the loom main shaft MS, a reciprocating motion in the front-rear direction of the con'rod 161 is generated in the crank mechanism 16. The driving shaft 8 is rotationally driven in synchronism with the loom main shaft MS so that the driving shaft 8 rotates once each time the loom main shaft MS rotates once (every one weaving cycle of the loom 1). Therefore, the con'rod 161 is reciprocated once every one weaving cycle of the loom 1. When the con'rod 161 reciprocates in such a manner, in accordance with the motion of the con'rod 161, the swinging lever 17 connected to the con'rod 161 is driven, and the driving lever 18 connected to the swinging lever 17 via the connecting rod 19 is swingingly driven around the axis of the intermediate transmission shaft 11. Therefore, the intermediate transmission shaft 11 to which the driving lever 18 is connected so as to be incapable of rotating relative to the intermediate transmission shaft 11 is reciprocatingly reversely driven once every one weaving cycle of the loom 1. In this way, the intermediate transmission shaft 11 is reciprocatingly reversely driven by the reverse driving section 12.

[0066] Further, when the intermediate transmission shaft 11 is reciprocatingly reversely driven in this way, in the driving transmission section 14, the first connecting lever 141 connected to the intermediate transmission shaft 11 so as to be incapable of rotating relative to the intermediate transmission shaft 11 is swingingly driven around the axis of the intermediate transmission shaft 11. Therefore, the swinging arm 13 connected to the first connecting lever 141 by the second connecting lever 142 of the driving transmission section 14 is reciprocatingly reversely driven in the front-rear direction around the axis of the supporting shaft 25. The swinging lever 17 reciprocatingly swings once every one weaving cycle of the loom 1. As a result, as described above, the tuck-in head 3 that is supported by the swing arm 13 and the cutter 6 on the side opposite to the weft-supply side reciprocate in the front-rear direction once every one weaving cycle of the loom 1. In this way, the reciprocating motion mechanism 7 reciprocates the tuck-in head 3 and the cutter 6 on the side opposite to the weft-supply side.

[0067] Next, the relationship between the position of the tuck-in head 3, which is reciprocatingly driven as described above, in the front-rear direction and the rotation angle of the loom main shaft MS (so-called "crank angle"; hereunder referred to as "crank angle") is described so as to include the swinging motion of the reed 4 on the basis of Fig. 6. Fig. 6 is a figure in which the horizontal axis indicates the crank angle (for one weaving cycle) and the vertical axis indicates the displacement amount in the front-rear direction of the tuck-in head 3 and the reed 4 with respect to the position of the cloth fell CF. In addition, in this figure, the displacement of the reed 4 is indicated by an alternate long and short dashed line, and the displacement of the tuck-in head 3 is indicated by an alternate long and two short dashed line.

[0068] As illustrated, when the crank angle is 0 degrees, the reed 4 reaches a most advanced position, at which time the inserted weft Y is beaten at the cloth fell CF. A tip end portion of the weft Y is held by the catch cord C. On the other hand, when the crank angle is 0 degrees, the tuck-in head 3 is positioned near the second position (the retracted position). Specifically, the tuck-in head 3 is positioned at the retracted position when the crank angle is 5 degrees.

[0069] Next, as illustrated, the reed 4 is displaced towards a most withdrawn position and reaches a location near the most retreated position when the crank angle is substantially 135 degrees, and reaches the most retreated position when the crank angle is 180 degrees. Then, the reed 4 advances forward towards the most retreated position. In the process of advancing forward, the reed 4 is positioned near the most retreated position from a crank angle of 180 degrees to a crank angle of substantially 225 degrees.

[0070] With respect to such a displacement of the reed 4, the tuck-in head 3 starts to be displaced towards the first position from when the crank angle is 5 degrees, and reaches the first position when the crank angle is 185 degrees. The tuck-in head 3 starts to retract towards the retracted position from when the crank angle is 185 degrees. The reverse driving section 12 of the reciprocating motion mechanism 7 that displaces the tuck-in head 3 in this way is formed from the 6-link mechanism as described above. Therefore, the tuck-in head 3 is positioned near the first position when the crank angle is substantially 150 degrees to substantially 220 degrees.

[0071] In the process of displacing the tuck-in head 3 as described above, the tuck-in head 3 is in a state in which the guide unit 3d reaches the position of the cloth fell CF when the crank angle is substantially 70 degrees. Therefore, when the tuck-in head 3 is displaced towards the first position from this angle, a part of a portion that is positioned between the catch cord C and the selvage at the weft Y whose tip end portion has been caught by the catch cord C is inserted in the slit 3a of the tuck-in head 3. Then, when the tuck-in head 3 has reached the first position (when the crank angle is 185 degrees), the part of the weft Y is in a state in which it has reached the bottom portion 3b of the slit 3a of the tuck-in head 3.

[0072] In the tuck-in head 3, after the crank angle has become 180 degrees, air jetting is started by each tuck-in nozzle 3c. The air jetting performed by each tuck-in nozzle 3c is continued until the crank angle becomes 225 degrees. While the air jetting is performed by each tuck-in nozzle 3c, the cutter 6 on the side opposite to the weft-supply side supported by the swinging arm 13 along with the tuck-in head 3 cuts the weft Y More specifically, when the crank angle becomes 210 degrees, the cutter 6 is driven, and another portion (weft end portion) of the weft Y that is formed consecutively with the selvage at the above-described portion is cut by the cutter 6 on the side opposite to the weft-supply side on a side that is closer than the tuck-in head 3 to the catch cord C.

[0073] Further, in the tuck-in head 3, from when the crank angle is 206 degrees, which is prior to when the crank angle is 210 degrees at which the cutting is performed, air jetting is started by the release nozzle 3f. Therefore, the weft end portion is blown away up to the jetting area of each tuck-in nozzle 3c by the air jetting by the release nozzle 3f, and then the weft end portion is tucked in by the air jetting by each tuck-in nozzle 3c and is inserted into the shed of the weft W, so that the tuck-in operation is completed.

[0074] The tuck-in head 3 is positioned near the first position that overlaps the cloth fell CF in the front-rear direction when the crank angle is substantially 150 degrees to substantially 220 degrees as described above. However, from larger angles, the tuck-in head 3 is largely displaced towards the retracted position, and, when the crank angle is substantially 300 degrees, the tuck-in head 3 is completely situated away from the cloth fell CF in the front-rear direction. Therefore, as described above, although, at crank angles lager than substantially 225 degrees, the reed 4 is displaced from the vicinity of the most retreated position towards the most advanced position, the tuck-in head 3 is situated away from the cloth fell CF before the reed 4 reaches the most advanced position (crank angle = 360 degrees) as described above. Therefore, even if the tuck-in head 3 is disposed at any position in a range that overlaps the reed 4 (reed dent 4a) in the weaving-width direction, the tuck-in head 3 does not interfere with the reed 4.

[0075] Next, regarding the supporting of the swinging arm 13 in the reciprocating motion mechanism 7 that reciprocates the tuck-in head 3 as described above, the support mechanism 30 that supports the supporting shaft 25 is disposed on the temple bar 15 that is provided at the loom 1 as described above. The configuration of the support mechanism 30 is as follows in detail.

[0076] The support mechanism 30 includes a supporting section 31 that supports the supporting shaft 25, and a mounting section 32 on which the supporting section 31 is mounted and that is mounted on the temple bar 15. The supporting section 31 includes a combination of three brackets. Specifically, the supporting section 31 includes a first bracket 311 that supports the supporting shaft 25, a second bracket 312 that is mounted on the mounting section 32, and a third bracket 313 for causing the first bracket 311 to be supported with respect to the second bracket 312.

[0077] More specifically, the first bracket 311 is a plate-shaped bracket. A through hole (not shown) for supporting the supporting shaft 25 is formed in one end portion of the first bracket 311 so as to extend through the one end portion of the first bracket 311 in a plate thickness direction. Further, two internally threaded holes (not shown) into which screw members (first screw members) 40 for mounting the first bracket 311 onto the third bracket 313 are formed in the other end portion of the first bracket 311. The two internally threaded holes are also formed so as to extend through the first bracket 311 in the plate thickness direction.

[0078] The third bracket 313 is also a plate-shaped bracket. Two through holes (not shown) through which the first screw members 40 are inserted are formed in one end portion of the third bracket 313 so as to extend through the one end portion of the third bracket 313 in the plate thickness direction. By inserting the first screw members 40 inserted through the through holes of the third bracket 313 into the internally threaded holes of the first bracket 311, the first bracket 311 is assembled to the third bracket 313.

[0079] Two through holes (not shown) are also formed in the other end side of the third bracket 313 so as to extend through the other end side of the third bracket 313 in the plate thickness direction. Screw members (second screw members) 41 for mounting the third bracket 313 onto the second bracket 312 are inserted through these through holes. However, these two through holes are formed so that their direction of arrangement differs from the direction of arrangement of the two through holes through which the aforementioned first screw members 40 are inserted (specifically, the directions of arrangements are made orthogonal to each other).

[0080] The second bracket 312 includes a plate-shaped base section 312a that serves as a base, and a protruding section 312b that protrudes from a portion of the base section 312a near an intermediate portion of the base section 312a in one of the plate thickness directions of the base section 312a and that is plate-shaped. The protruding section 312b has two internally threaded holes (not shown) into which the second screw members 41 are inserted. The two internally threaded holes are formed so as to extend through the protruding section 312b in the plate thickness direction. The two internally threaded holes are formed so that their arrangement direction is parallel to an upper surface of the base section 312a (the surface from which the protruding section 312b protrudes).

[0081] Moreover, by inserting the second screw members 41 inserted through the respective through holes formed on the other end side of the third bracket 313 into the internally threaded holes, the third bracket 313 to which the first bracket 311 is assembled to the second bracket 312 as described above. By assembling each bracket in this way, the supporting section 31 that supports the supporting shaft 25 is formed.

[0082] Two through holes (not shown) are formed in respective end portions in the base section 312a of the second bracket 312 so as to extend through the base section 312a in the plate thickness direction, the end portions being end portions in the plate thickness direction of the protruding section 312b (longitudinal direction of the base section 312a). The through holes are holes for inserting screw members (third screw members) 42 for mounting the second bracket 312 (supporting section 31) on the mounting section 32.

[0083] Next, the mounting section 32 on which the supporting section 31 (second bracket 312) is mounted includes a mounting bracket 321 that is provided vertically on the temple bar 15, and stopping members 322 for causing the mounting bracket 321 to be in a fixed state with respect to the temple bar 15. The mounting bracket 321 is a single member, and includes a supporting-section mounting portion 321a on which the supporting section 31 is mounted, and a fixing portion 321c that is directly fixed to the temple bar 15 in a state in which the mounting bracket 321 is provided vertically on the temple bar 15.

[0084] Regarding the mounting bracket 321, the supporting-section mounting portion 321a has a substantially rectangular parallelepiped shape in which the width of a side surface is smaller than the width of front and rear surfaces. The width of the supporting-section mounting portion 321a (dimension in a width direction of the front and rear surfaces) is substantially the same as the dimension of the base section 312a of the above-described supporting section 31 in a longitudinal direction. However, a groove 321b is formed in the supporting-section mounting portion 321a so as to open in an upper surface and the front and rear surfaces. The groove 321b is for allowing the second connecting lever 142 of the driving transmission section 14 to be disposed as described above. The groove 321b is formed so that its groove width (the space defined by an inner surface of the groove 321b) is smaller than the interval between the two through holes formed in the base section 312a of the supporting section 31. Two internally threaded holes (not shown) in which the aforementioned third screw members 42 are inserted are formed in the supporting-section mounting portion 321a so as to open in an upper surface thereof on respective sides of the groove 321b at the upper surface.

[0085] The fixing portion 321c is a portion that is directly fixed to the temple bar 15 with the mounting bracket 321 provided vertically on the temple bar 15 as described above. However, the fixing is performed with the fixing portion 321c placed on the temple bar 15. As is commonly known, the temple bar 15 is provided so as to extend in the weaving-width direction at a location between the left and right loom frames 9. That is, a longitudinal direction (extension direction) of the temple bar 15 is the same as the weaving-width direction. Accordingly, in the description below, the longitudinal direction and a direction parallel to the longitudinal direction are both referred to as the weaving-width direction for description. With respect to the front-rear directions, in the description below, the side of the reed 4 of a portion (device) under consideration corresponds to a rear (side), and the side opposite to the side of the reed 4 is the front (side).

[0086] More specifically, the fixing portion 321c is formed so that a substantially rectangular parallelepiped portion is the main body. The fixing portion 321c is such that its main portion (the substantially rectangular parallelepiped portion, hereunder referred to as "main body section") is placed on the temple bar 15. However, in the placed state (installed state) of the main body section, the fixing portion 321c is such that a long-side direction of a rectangular lower surface of the main body section is the same as the weaving-width section, and one end of the lower surface in a short-side direction is aligned with a front-side edge of an upper surface of the temple bar 15.

[0087] However, the main body section of the fixing portion 321c is formed so that the dimension of its lower surface in the short-side direction is larger than the dimension of the upper surface of the temple bar 15 in the front-rear direction. That is, in the aforementioned installed state, the main body section has a size that makes it protrude rearward from the temple bar 15 in the front-rear direction. Moreover, in the installed state, the main body section has a stepped section disposed in its lower surface and having a shape in accordance with the shape of the temple bar 15 so that a lower surface of the protruding portion is positioned below the upper surface of the temple bar 15.

[0088] In the installed state, internally threaded holes (not shown) are formed in the main body section so as to open in a surface that faces the front side (front surface). In the installed state, two internally threaded holes are formed in respective sides of an intermediate portion of the front surface in the weaving-width direction. The internally threaded holes are holes for inserting screw members (fourth screw members) 43 for causing the fixing portion 321c (mounting bracket 321) to be fixed to the temple bar 15.

[0089] The fixing portion 321c has a portion formed so as to protrude from an upper surface of the main body section. In addition, in the mounting bracket 321, the fixing portion 321c is integrated with the supporting-section mounting portion 321c so that, in the portion that protrudes from the upper surface of the main body section, the fixing portion 321c is formed continuously with a lower surface of the supporting-section mounting portion 321a. In the mounting bracket 321 formed in this way, the width direction of the front and rear surfaces of the supporting-section mounting portion 321a and a long-side direction of the lower surface of the fixing portion 321c are the same.

[0090] Each stopping member 322 for causing the mounting bracket 321 formed as described above to be fixed to the temple bar 15 is such that a plate-shaped receiving section 322a that receives a head of the screw member is a main body. Each receiving section 322a has a substantially rectangular shape when viewed in the plate thickness direction. Each stopping member 322 has projecting portions 322b that project in one direction from the receiving section 322a in the plate thickness direction and that are formed so as to extend in a short-side direction of the receiving section 322a. The two projecting portions 322b are formed at respective end portions of the receiving section 322a in a long-side direction. Each stopping member 322 is formed so that each projecting section 322b and the receiving section 322a are integrated with each other.

[0091] A through hole (not shown) is formed in the center of the receiving section 322a of each stopping member 322 so as to extend therethrough in the plate thickness direction. Each through hole is a hole for inserting the fourth screw member 43. Further, although, in each stopping member 322, the two projecting portions 322b are positioned on respective sides of the through hole formed in the receiving section 322a in the long-side direction of the receiving section 322a, the size of the interval between the projecting portions 322b allows one of the projecting portions 322b to be positioned forwardly of the temple bar 15 with the fourth screw members 43 that are inserted through the through holes being inserted into the internally threaded holes of the fixing portion 321c placed on the temple bar 15 and the long-side direction of each receiving section 322a being the same as the up-down direction. In other words, the receiving section 322a of each stopping member 322 has a size (dimension) that allows the projecting portions 322b to be formed with such an interval in the long-side direction.

[0092] In fixing the mounting bracket 321 (fixing portion 321c) to the temple bar 15, the fixing portion 321c of the mounting bracket 321 is placed on the temple bar 15. However, in the placed state, the stepped section of the lower surface of the fixing portion 321c is in contact with a rear-side surface of the temple bar 15. Further, two stopping members 322 and 322 are combined with respect to the fixing portion 321c in such a state and in correspondence with the two internally threaded holes formed in the fixing portion 321c. Specifically, by causing a surface of the receiving section 322a of each stopping member 322 where the projecting portions 322b project to face the fixing portion 321c, and by inserting the fourth screw members 43 through the through holes of the receiving sections 322a from a side of a surface of the receiving section 322a on a side opposite to the surface where the projecting portions 322b project and by inserting the fourth screw members 43 into the internally threaded holes of the fixing portion 321c, the fixing portion 321c and the stopping member 322 are in a combined state.

[0093] Moreover, with each stopping member 322 being faced so that the long-side direction of the receiving section 322a is the same as the up-down direction, the fourth screw members 43 are tightened. Therefore, with the heads of the fourth screw member 43 being in contact with the respective receiving sections 322a, one of the projecting portions 322b of each stopping member 322 is in contact with the temple bar 15, and the other projecting portion 322b is in contact with the fixing portion 321c. The fixing portion 321c and the stopping members 322 assembled with respect to each other sandwich the temple bar 15 by the stepped section of the fixing portion 321c and one of the projecting portions 322b of each stopping member 322. In addition, when the temple bar 15 is subjected to a force (clamping force) that acts upon the stopping members 322 (receiving sections 322a) via the heads due to the tightening of the fourth screw members 43, the temple bar 15 is sandwiched by the stepped section and one of the projecting portions 322b. As a result, the fixing portion 321c (mounting bracket 321) is fixed to the temple bar 15.

[0094] As described above, the support mechanism 30 that is placed on the temple bar 15 is such that the first bracket 311 of the supporting section 31 supports the supporting shaft 25 for supporting the above-described swinging arm 13. More specifically, in the support mechanism 30, by inserting the third screw members 42 through the respective through holes formed in the base section 312a of the second bracket 312 and by inserting the third screw members 42 into the internally threaded holes formed in the supporting-section mounting portion 321a of the mounting bracket 321, the supporting section 31 is assembled to the mounting bracket 321.

[0095] However, the supporting section 31 is assembled so that, with the supporting mechanism 30 installed on the temple bar 15 (the aforementioned installed state), the first bracket 311 mounted on the protruding section 312b of the second bracket 312 on the mounting bracket 321 via the third bracket 313 extends rearward. Therefore, in the installed state, the first bracket 311 at the supporting section 31 extends rearward from the temple bar 15 in the front-rear direction. Moreover, the through hole formed in the one end portion of the first bracket 311 is positioned substantially above the cloth fell CF.

[0096] The supporting shaft 25 is supported by the first bracket 311 (support mechanism 30) so that, on the one end portion side of the supporting shaft 25, the supporting shaft 25 is inserted into the through hole in the one end portion of the first bracket 311, and the other end portion protrudes towards the loom frame 9 on the side opposite to the weft-supply side in the weaving-width direction. The supporting shaft 25 is supported by being inserted through the through hole in the first bracket 311 at the one end portion, or by fitting a bearing (not shown) to the through hole and fitting and inserting the supporting shaft 25 into the bearing at the one end portion. The swinging arm 13 is supported as described above at the other end portion of the supporting shaft 25 that is supported in this way.

[0097] The swinging arm 13 that is supported by the supporting shaft 25 in this way and the intermediate transmission shaft 11 are connected to each other by the driving transmission section 14 formed as described above. Regarding the driving transmission section 14, the first connecting lever 141 is mounted on the intermediate transmission shaft 11 with a mounting phase in which, when the tuck-in head is positioned at the first position (when the crank angle is 185 degrees), the first connecting lever 141 extends substantially upward from the intermediate transmission shaft 11. As described above, the first position is a position where the position of the bottom portion 3b of the slit 3a of the tuck-in head 3 is substantially aligned with the position of the cloth fell CF.

[0098] In the mounted state, the first connecting lever 141 has a length that allows the position of the height of the through hole in the other end portion of the first connecting lever 141 to be substantially aligned with the position of the height of the through hole in the other end portion of the swinging arm 13 with the tuck-in head 3 positioned at the first position. Further, in the mounted state, the second connecting lever 142 has a length that allows the first connecting lever 141 and the swinging arm 13 to be in a connected state.

[0099] As a result, in a state in which, in the driving transmission section 14, the first connecting lever 141 is mounted on the intermediate transmission shaft 11 and the second connecting lever 142 is connected to the first connecting lever 141 and the swinging arm 13, an angle θ that is formed by the first connecting lever 141 and the second connecting lever 142 (hereunder referred to as "connection angle") in the driving transmission section 14 is substantially 90 degrees. That is, in this state, a longitudinal direction of the second connecting lever 142 is a substantially horizontal direction.

[0100] By connecting the driving transmission section 14 and the swinging arm 13 as described above, this portion is formed as a link mechanism that includes the first connecting lever 141 and the second connecting lever 142 of the driving transmission section 14 and the swinging arm 13. The link mechanism is formed so that the while the tuck-in head 3 is reciprocatingly driven between the first position and the second position (the retracted position), the connection angle θ is kept at a substantially constant value.

[0101] Specifically, in the link mechanism, a connection point where the first connecting lever 141 and the second connecting lever 142 are connected to each other (axis of a connection axis 27) is a first connection point P1, and a connection point where the swinging arm 13 and the second connecting lever 142 are connected to each other (axis of a connection shaft 28) is a second connection point P2. A swing center of the first connecting lever 141 (axis of the intermediate transmission shaft 11), which is a fulcrum on one end side of the link mechanism, is a first fulcrum F1, and a swing center of the swinging arm 13 (axis of the supporting shaft 25), which is a fulcrum on the other end side of the link mechanism is a second fulcrum F2. Moreover, the link mechanism is formed so that the distance from the first fulcrum F1 to the first connection point P1, the distance from the second fulcrum F2 to the second connection point P2, and an angle of a line segment connecting the second fulcrum F2 and the second connection point P2 with respect to a line segment connecting the first fulcrum F1 and the first connection point P1 are set in a relationship that maintains the connection angle θ at the same angle during the reciprocation driving operation. Therefore, during the reciprocation driving operation, the connection angle θ is substantially 90 degrees.

[0102] Regarding such a configuration, since the position of the axis of the intermediate transmission shaft 11 (first fulcrum F1) and the lengths of the first connecting lever 141 and the second connecting lever 142 are mechanically determined, on the basis of the fact that the connection angle θ is substantially 90 degrees with the tuck-in head 3 at the first position, the position of the connection portion CP is specified. However, in realizing the position of the connection portion CP and positioning the tuck-in head 3 at the first position, the position of the supporting shaft 25 is not limited to a specified position, and may differ in accordance with the shape of the swinging arm 13. Depending upon the position of the supporting shaft 25, the connection angle θ may not be substantially 90 degrees during the reciprocation driving operation. Therefore, the above-described configuration is also a configuration in which the position of the supporting shaft 25 is set so that the connection angle θ is substantially 90 degrees during the reciprocation driving operation (even if the tuck-in head 3 is at the retracted position).

[0103] As described above, the swinging arm 13 supported by the support mechanism 30 via the supporting shaft 25 is positioned at a location that overlaps the mounting section 32 (mounting bracket 321) of the support mechanism 30. Therefore, the driving transmission section 14 that is connected to the swinging arm 13 is also disposed so as to overlap the mounting bracket 321 in the weaving-width direction. As described above, the intermediate transmission shaft 11 is disposed forwardly of the temple bar 15, whereas the swinging arm 13 is supported by the supporting shaft 25 disposed above the cloth fell CF that is positioned rearwardly of the temple bar 15. Therefore, the driving transmission section 14 that connects the intermediate transmission shaft 11 and the swinging arm 13 to each other is disposed so that a part of the second connecting lever 142 overlaps the mounting bracket 321.

[0104] However, as described above, the groove 321b that opens in the front and rear surfaces of the supporting-section mounting portion 321a is formed in the mounting bracket 321. In the installed state of the support mechanism 30, the groove 321b is formed so that the position of the second connecting lever 142 of the driving transmission section 14 is included in an existence range of the groove 321b in the up-down direction. Therefore, with the intermediate transmission shaft 11 and the swinging arm 13 connected to each other, the driving transmission section 14 is in a state in which the second connecting lever 142 extends in the groove of the mounting bracket 321.

[0105] In the air jet loom 1 including the air tuck-in device 2 described above, when the cloth T that is woven is changed and the weaving width of another cloth T after the change differs from the weaving width of the cloth T before the change, the arrangement of the tuck-in head 3 and the cutter 6 on the side opposite to the weft-supply side is changed in accordance with the changing of the cloth T (weaving width). The arrangement is changed as follows.

[0106] First, in the driving transmission section 14, a screw member 44 of the split clamp structure of the first connecting lever 14 is operated and a split-clamp fixed state is eased, and the first connecting lever 141 (driving transmission section 14) that is fixed to the intermediate transmission shaft 11 is unfixed. Therefore, with the intermediate transmission shaft 11 inserted through the through hole formed in the one end portion of the first connecting lever 141, the driving transmission section 14 is in a movable state relative to the intermediate transmission shaft 11 in the axial direction.

[0107] Next, in the support mechanism 30 that supports the swinging arm 13 via the supporting shaft 25, the mounting section 32 is unfixed from the temple bar 15. Specifically, the fourth threaded members 43 are loosened, and a state in which the clamping force acts upon the temple bar 15 is stopped. As a result, along with the fact that the driving transmission section 14 has been unfixed from the intermediate transmission shaft 11 as described above, the support mechanism 30 and the swinging arm 13, supported by the support mechanism 30, and the driving transmission section 14, connected to the swinging arm 13, can have their positions adjusted in the weaving-width direction with respect to the intermediate transmission shaft 11 and the temple bar 15 fixedly provided at the loom 1 (in particular, the temple bar 15 that supports the swinging arm 13 via, for example, the support mechanism 30).

[0108] Moreover, in order to arrange the tuck-in head 3 and the cutter 6 on the side opposite to the weft-supply side at desired positions, the position of, for example, the support mechanism 30 is changed. The position is changed by sliding the support mechanism 30 on the temple bar 15 and sliding the driving transmission section 14 with respect to the intermediate transmission shaft 11. Then, with the tuck-in head 3 disposed at the desired position, in order to determine this position, the support mechanism 30 is fixed again to the temple bar 15 and the driving transmission section 14 is fixed to the intermediate transmission shaft 11. Therefore, the positions of the tuck-in head 3 and the cutter 6 on the side opposite to the weft-supply side are changed to positions corresponding to the change in the cloth T (weaving width).

[0109] In this way, according to the air tuck-in device 2, in changing the disposition of the tuck-in head 3 due to the change in the weaving width, as described above, by changing only the position of, for example, the support mechanism 30 (the support mechanism 30, the swinging arm 13, and the driving transmission section 14), the disposition of the tuck-in head 3 can be changed. In other words, in changing the disposition of the tuck-in head 3 due to the change in the weaving width, the disposition of the tuck-in head 3 can be changed without changing the disposition of the reverse driving section 12 connected to a side of the intermediate transmission shaft 11 opposite to, for example, the support mechanism 30 (driving-shaft-8 side). Therefore, according to the air tuck-in device 2, the disposition of the tuck-in head 3 can be easily changed.

[0110] Incidentally, the support mechanism 30 is formed so that the position of the first bracket 311 of the supporting section 31 with respect to the mounting section 32 can be adjusted in three directions, that is, the weaving-width direction, the front-rear direction, and the up-down direction. Specifically, in the support mechanism 30, the through holes formed in the base section 312a of the second bracket 312 are long holes that are long in the longitudinal direction of the base section 312a (the weaving-width direction in the installed state). Therefore, the position of the second bracket 312 with respect to the mounting section 32 can be adjusted in a range of the long holes (through holes).

[0111] The through holes in the third bracket 313 through which the aforementioned second screw members 41 are inserted are long holes that are long in the front-rear direction in the installed state. Further, the through holes in the third bracket 313 through which the aforementioned first screw members 40 are inserted are long holes that are long in the up-down direction in the installed state. Therefore, the position of the third bracket 313 with respect to the protruding portion 312b of the second bracket 312 can be changed in a range of the long holes (the through holes) through which the second screw members 41 are inserted. Further, the position of the first bracket 311 with respect to the third bracket 313 can be changed in a range of the long holes (the through holes) in the third bracket 313 through which the first screw members 40 are inserted.

[0112] As a result of these structures, in the installed state, the position of the first bracket 311 with respect to the mounting section 32 can be adjusted in the three directions. Therefore, in the installed state, the position of the tuck-in head 3 that is supported by the first bracket 311 via the supporting shaft 25 and the swinging arm 13 can be adjusted in the three directions.

[0113] As described above, the supporting shaft 25 is disposed above the cloth fell CF in the front-rear direction. That is, in the front-rear direction, the supporting shaft 25 is disposed in a range near the cloth fell CF, the range including a location directly above the cloth fell CF. In the reciprocating motion mechanism 7 of the present embodiment, a swing radius of the tuck-in head 3 around the axis of the supporting shaft 25 as a swing center is a swing radius that does not allow the tuck-in head 3 to be greatly displaced in a radial direction at a swing angle based on a swing range such as that described above. Moreover, as described above, the tuck-in head 3 is supported by the swinging arm 13 so that, when, in the process of a reciprocating motion, the guide unit 3d has reached the position of the cloth fell CF, the extension direction of the slit 3a is substantially parallel to the warp line WL.

[0114] Therefore, in a swing displacement from when the guide unit 3d reaches the position of the cloth fell CF to when the tuck-in head 3 reaches the first position in the front-rear direction, the slit 3a of the tuck-in head 3 is displaced in a substantially parallel state with respect to the warp line WL. That is, the path of the motion of the tuck-in head 3 during such a time is substantially parallel to the warp line WL.

[0115] Therefore, according to a configuration in which the path is substantially parallel to the warp line WL in this way, in the process of a reciprocating motion, the tuck-in head 3 receives the weft Y into the slit 3a with the extension direction of the slit 3a substantially parallel to the warp line WL, and the tuck-in head 3 reaches the first position with the substantially parallel state of the extension direction of the slit 3a with respect to the warp line WL being substantially kept. In the tuck-in head 3, as described above, since the direction of arrangement of the plurality of tuck-in nozzles 3c is the same as the direction of extension of the slit 3a, the air tuck-in device 2 can properly perform the above-described tuck-in operation.

[0116] The link mechanism including the first connecting lever 141 and the second connecting lever 142 of the driving transmission section 14 and the swinging arm 13 is formed so that, as described above, the connection angle θ is kept at substantially 90 degrees during the above-described reciprocation driving operation. Therefore, according to this configuration, since the motion of the intermediate transmission shaft 11 is more efficiently transmitted to the swinging arm 13, the desired reciprocating motion of the tuck-in head 3 can be realized by reciprocating rotation of the intermediate transmission shaft 11 with a smaller rotation amount. Therefore, in reciprocating the tuck-in head 3 as described above, since the amount of movement of each member that reciprocates in the reverse driving section 12, which reciprocatingly reversely drives the intermediate transmission shaft 11, and the amount of movement of each member that reciprocates due to the rotation of the intermediate transmission shaft 11 can be made small, the load that is exerted upon each portion of the reciprocating motion mechanism 7 is reduced.

[0117] In the crank mechanism 16 of the reverse driving section 12, as described above, the crank hub 162 has a split clamp structure, and is mounted on the driving shaft 8 so as to be incapable of rotating with respect to the driving shaft 8 by a split-clamp fixing operation. That is, in an arbitrary mounting phase, the clamp hub 162 can be mounted on the driving shaft 8. By changing the mounting phase of the clamp hub 162 with respect to the driving shaft 8, the position in the front-rear direction of the tuck-in head 3, which is reciprocatingly driven, with respect to the crank angle (the phase of the reciprocating motion of the tuck-in head 3) is changed. In this way, the air tuck-in device 2 of the present embodiment is formed so that the phase of the reciprocating motion of the tuck-in head 3 can be changed. Therefore, even if an optimal timing of performing the tuck-in operation when, for example, the weaving condition is changed is changed, it is possible to easily deal with such a change.

[0118] The present invention is not limited to the above-described embodiment, and can be carried out even in modified modes as in (1) to (6) below.

(1) In the present embodiment, the reverse driving section 12 is formed from an articulated link mechanism including the crank mechanism 16 that is mounted on the driving shaft 8. Moreover, the articulated link mechanism is a 6-link mechanism. However, when the reverse driving section of the present invention is formed from an articulated link mechanism including the crank mechanism, the reverse driving section of the present invention is not limited to one formed from a 6-link mechanism described above, and may be formed from a 4-link mechanism. When the reverse driving section is formed from a 4-link mechanism in this way, the swinging lever that is connected to the con'rod of the crank mechanism and the connecting rod that connects the swinging lever and the driving lever to each other in the reverse driving section (6-link mechanism) are not used. Specifically, as shown in Fig. 7, a structure 50 becomes a structure in which a con'rod 51 and a driving lever 52 are directly connected to each other so as to be rotatable relative to each other. In the 4-link mechanism formed in this way, although the period in which the tuck-in head is positioned near the first position (stopping period) is shorter than such a period of the 6-link mechanism, the tuck-in operation can be performed without any problem.

(2) In the foregoing description, the case in which the reverse driving section is formed from an articulated link mechanism including the crank mechanism is described. However, in the present invention, the reverse driving section is not limited to one using such a crank mechanism, and may be one using a cam mechanism. That is, in the configuration described above, the reverse driving section may be formed by replacing the crank mechanism by a cam mechanism. Specifically, when the reverse driving section has the same configuration as that of the portions of the embodiment excluding the crank mechanism, a cam mechanism is connected to the swinging lever in this configuration.

More specifically, the cam mechanism includes a cam that is mounted on the driving shaft so as to be incapable of rotating with respect to the driving shaft, a cam lever that is provided so as to swing in accordance with the rotation of the cam, and a lever-like rod that is connected at one end to the cam lever and that is driven so as to be displaced when the cam lever swings (corresponding to the "con'rod" of the above-described embodiment). Moreover, in the cam mechanism, the swinging lever is connected to the other end of the rod. In the connected state, a longitudinal direction of the rod is a substantially horizontal direction. Therefore, in this configuration, when the cam lever swings due to the rotation of the cam, with the longitudinal direction of the rod being in the substantially horizontal direction, the rod reciprocates in a front-rear direction, so that the swinging lever is reciprocatingly swingingly driven as in the above-described embodiment.

(3) In the present invention, the reverse driving section is connected to the driving shaft so that the driving shaft is a driving source, and a member that is directly connected to the driving shaft is mounted on the driving shaft so as to be incapable of rotating relative to the driving shaft. Moreover, in the above-described embodiment, the crank hub 162 of the crank mechanism 16, which is this member, has a split clamp structure, and is mounted on the driving shaft 8 by a split-clamp fixing operation. However, when the reverse driving section in the present in-

vention includes the crank mechanism, as a structure for mounting the crank hub, the crank hub is not limited to one having the split clamp structure.

For example, the crank hub is a cylindrical member that does not include the slotted portion for the split clamp structure. Further, the structure of the crank hub is one in which a plurality of internally threaded holes extend through the crank hub in a radial direction and that are arranged side by side at equal intervals in a circumferential direction. Moreover, in the reverse driving section (crank mechanism), with the one end portion of the driving shaft being fitted and inserted into the crank hub, screw members are inserted into the respective internally threaded holes of the crank hub, and, with the screw members in press-contact with the one end portion of the driving shaft, the crank hub is mounted on the driving shaft so as to be incapable of rotating relative to the driving shaft.

Alternatively, with the crank hub being a cylindrical member as described above, the structure of the crank hub is one in which one or more (desirably, a plurality of) through holes extending through the crank hub in a radial direction are formed. On the other hand, the driving shaft has a structure in which a plurality of internally threaded holes that are arranged side by side in a circumferential direction are formed in the one end portion. However, the plurality of internally threaded holes are formed so as to correspond with an assumed plurality of mounting phases of the crank hub in terms of the through holes in the crank hub. Moreover, in the reverse driving section (crank mechanism), with the one end portion of the driving shaft inserted into the crank hub, by inserting the screw members into the internally threaded holes of the driving shaft that match the through holes of the crank hub in a desired one of the mounting phases, the crank hub is mounted so as to be incapable of rotating with respect to the driving shaft.

Regarding such a mounting of the member of the reverse driving section that is directly connected to the driving shaft onto the driving shaft, even if the reverse driving section includes the cam mechanism as described above, the cam is mounted on the driving shaft by using a structure that is the same as the structure for mounting the crank hub described above.

In the foregoing description, regarding the structure for mounting the member of the reverse driving section that is directly connected to the driving shaft onto the driving shaft (mounting structure), that the mounting phase of the member onto the driving shaft can be change has been described. However, in the reverse driving section in the present invention, the mounting structure is not limited to one in which the mounting phase can be changed as it is changeable above. When the weaving condition of the loom that is assumed is not changed, the mounting phase may be one that cannot be changed.

(4) In the above-described embodiment, the driving transmission section 14 includes two connecting levers (the first connecting lever 141 and the second connecting lever 142). Moreover, the driving transmission section 14 including the two connecting levers is formed so that, with the tuck-in head 3 positioned at the first position, the connection angle θ is substantially 90 degrees. However, in the present invention, even if the driving transmission section includes two such connecting levers, the driving transmission section is not limited to one in which the connection angle is substantially 90 degrees with the tuck-in head positioned at the first position.

Specifically, the driving transmission section may be formed so that, when the tuck-in head is positioned at the first position, the mounting phase of the first connecting lever with respect to the intermediate transmission shaft allows the first connecting lever to be mounted on the intermediate transmission shaft with the first connecting lever extending in a direction that is at an angle to the vertical direction from the intermediate transmission shaft. In addition, when the mounting phase is the same as that in the above-described embodiment, with the tuck-in head positioned at the first position, the driving transmission section may be one in which the first connecting lever is formed so that the height position of the through hole in the other end portion of the first connecting lever differs from the height position of the through hole in the other end portion of the swinging arm. In either case, in order for the first connecting lever and the swinging arm to be connected to each other, the second connecting lever has a length differing from that in the above-described embodiment.

In the above-described embodiment, with the driving transmission section 14 being formed so that the connection angle θ is substantially 90 degrees in a state in which the tuck-head head 3 is positioned at the first position, the position of the supporting shaft 25 is set so that the connection angle θ is kept at a substantially constant value while the tuck-in head 3 is reciprocatingly driven between the first position and the second position (the retracted position). However, in the present invention, the position of the supporting shaft is not limited to one that is set in such a manner, and may be set so that the connection angle changes during the above-described reciprocation driving operation.

When the link mechanism including the two connecting levers of the drive transmission section and the swinging arm is formed differently from that of the above-described embodiment as described above, the efficiency with which the motion of the intermediate transmission shaft is transmitted to the swinging arm becomes poorer than in the above-described embodiment. However, even if the link mechanism is formed in this way, by forming the reverse driving section so that the amount of rotation of the intermediate transmission shaft is larger than that in the above-described embodiment, a desired reciprocating motion of the swinging arm (tuck-in head) can be realized.

In the above-described embodiment, the connection portion CP where the swinging arm 13 and the second connecting lever 142 are connected to each other is set at a position that is closer than the intermediate portion 13c of the swinging arm 13 in the longitudinal direction to the other end side of the swinging arm 13. However, the position of the connection portion is not limited to the other end side of the swinging arm 13, and may be set at, for example, the intermediate portion of the swinging arm.

In the foregoing description, the case in which the driving transmission section includes two connecting levers has been described. However, in the present invention, the driving transmission section is not limited to one including two connecting levers, and may include a single connecting lever. However, in this case, when the connection structure for connecting the connecting lever and the swinging arm to each other is the same as the connection structure in the above-described embodiment for connecting the second connecting lever 142 and the swinging arm 13 to each other, the swinging arm is incapable of swinging. Therefore, in this case, the connection structure for connecting the single connecting lever and the swinging arm to each other may be, for example, a structure including a connecting shaft fitted to one of the connecting lever and the swinging arm and a hole into which the connecting shaft is inserted and that is formed in the other of the connecting lever and the swinging arm, or a structure in which a hole in the other of the connecting lever and the swinging arm is formed as a long hole that allows the above-described swinging.

(5) The above-described embodiment is an example in which the present invention is applied to the reciprocating motion mechanism 7 that reciprocates the tuck-in head 3 on the side opposite to the weft-supply side in the air tuck-in device in the air jet loom (single-width loom) 1 that weaves the single cloth T in the weaving-width direction. However, the air jet loom that is assumed by the present invention is not limited to such a single-width loom described above, and may be a double-width loom that weaves at the same time cloths that are divided into a plurality in the weaving-width direction. When the air jet loom is such a double-width loom, the reciprocating motion mechanism of the air tuck-in device 2 according to the present invention may be applied as a mechanism that reciprocates, in addition to the tuck-in head on the side opposite to the weft-supply side, a tuck-in head for forming a center selvage.

Two tuck-in heads for forming a center selvage are provided between cloths that are divided so as to be adjacent to respective selvages of the cloth. However, the structural members (for example, the swinging arm and the driving transmission section) for reciprocating two such tuck-in heads when the present invention is applied to the tuck-in heads for forming a center selvage as described above is not limited to one in which one set is applied to one tuck-in head as in the above-described embodiment. For example, a swinging arm may be provided for each tuck-in head (two swinging arms may be supported by the supporting shaft), and the single driving transmission section may be connected to both of the swinging arms. In addition, two tuck-in heads may be supported by a single swinging arm, and the single swinging arm and the driving transmission section may be used in common for the two tuck-in heads.

As an air jet loom, there exists a so-called center-reference loom in which, with the center of the maximum weaving width in the weaving-width direction at the loom being a reference, the positions of the left and right selvages are changed with respect to the center to change the weaving width. In the center-reference loom, when the weaving width of the cloth that is woven is changed, the arrangement of the tuck-in head on the weft-supply side and the tuck-in head on the side opposite to the weft-supply side is changed. Accordingly, when the air jet loom is such a center-reference loom, the reciprocating motion mechanism of the air tuck-in device of the present invention can also be applied as a mechanism that reciprocates the tuck-in head on the weft-supply side.

(6) In the present embodiment, the reciprocating motion mechanism 7 has a structure in which the intermediate transmission shaft 11 is driven on both sides in the axial direction thereof (both-side driving). That is, the reciprocating motion mechanism 7 is formed so that two reverse driving sections 12 are provided on respective sides of the air jet loom 1, and the reverse driving sections 12 are connected to respective end portions of the intermediate transmission shaft 11. However, in the present invention, the reciprocating motion mechanism is not limited to one in which the intermediate transmission shaft is driven on both the sides in this way. The reverse driving section may be provided on only one side of the air jet loom, and one end of the intermediate transmission shaft and the driving shaft may be connected at the reverse driving section to drive the intermediate transmission shaft on one side.

[0119] Regarding the driving shaft as being a driving source of the reciprocating motion mechanism, in the above-described embodiment, the driving shaft 8 is mechanically connected to the loom main shaft MS, and is rotationally driven by the loom main shaft MS. That is, in the above-described embodiment, the driving source that is formed so as to rotationally drive the driving shaft 8 is an electric motor of the loom that rotationally drives the loom main shaft MS. However, in the present invention, the driving source that is formed so as to rotationally drive the driving shaft is not limited to such an electric motor, and may be a dedicated motor provided independently of the electric motor. In this case, the driving of the dedicated driving motor is controlled in synchronism with the electric motor.

[0120] The present invention is not limited to the practical forms described above, and can be variously modified without departing from the spirit of the present invention.

Claims

1. An air tuck-in device (2) of an air jet loom (1), the air tuck-in device (2) being provided in the air jet loom (1) and performing a tuck-in operation by air jetting with tuck-in nozzles (3c), the air tuck-in device (2) comprising
a pair of tuck-in heads (3) that are each provided on a corresponding one of a weft-supply side and a side opposite to the weft-supply side and that have the tuck-in nozzles (3c),
a driving shaft (8) that is continuously rotationally driven in one direction in synchronism with a main shaft of the loom (1), and
a reciprocating motion mechanism (7) that supports at least the tuck-in head (3) provided on the side opposite to the weft-supply side, that uses the driving shaft (8) as a driving source, and that causes the tuck-in head (3) to undergo a reciprocating motion between a first position that is situated on a side of a cloth fell and a second position that is situated away from the cloth fell in a front-rear direction of the loom (1), the first position being a position where the reciprocating motion causes the tuck-in head (3) to overlap the cloth fell, the second position being a position where the tuck-in head (3) is situated away from the cloth fell on a side opposite to a side of a reed,
wherein the reciprocating motion mechanism (7) includes an intermediate transmission shaft (11) that is rotatably supported by a frame of the loom (1) and that extends in a weaving-width direction, a reverse driving section (12) that connects the intermediate transmission shaft (11) and the driving shaft (8) to each other and that reciprocatingly reversely drives the intermediate transmission shaft (11), a swinging arm (13) that is supported at one end by a supporting shaft (25) provided above a warp line, that is provided so as to be swingable around an axis of the supporting shaft (25), and that supports at other end the tuck-in head (3), and a driving transmission section (14) that connects the swinging arm (13) and the intermediate transmission shaft (11) to each other and that is mounted on the intermediate transmission shaft (11) so that a position of the driving transmission section (14) in the weaving-width direction with respect to the intermediate transmission shaft (11) is changeable.

2. The air tuck-in device (2) of the air jet loom (1) according to claim 1, wherein in the front-rear direction, the supporting shaft (25) is disposed in a range near the cloth fell, the range including a location directly above the cloth fell.

3. The air tuck-in device (2) of the air jet loom (1) according to claim 1 or claim 2, wherein the driving transmission section (14) includes a first connecting lever (141) that is mounted at one end on the intermediate transmission shaft (11) so as to be incapable of rotating relative to the intermediate transmission shaft (11), and a second connecting lever (142) that is connected at one end to other end of the first connecting lever (141) so as to be rotatable with respect to the other end of the first connecting lever (141) and that is connected at other end to the swinging arm (13) so as to be rotatable with respect to the swinging arm (13).

4. The air tuck-in device (2) of the air jet loom (1) according to claim 3, wherein a connection portion (CP) where the swinging arm (13) and the second connecting lever (142) are connected to each other is positioned closer than an intermediate portion (13c) of the swinging arm (13) in the longitudinal direction to a side of the other end of the swinging arm (13).

5. The air tuck-in device (2) of the air jet loom (1) according to claim 3 or claim 4, wherein a position of the connection portion (CP) and lengths of both the connecting levers (141, 142) are set so that an angle formed by the first connecting lever (141) and the second connecting lever (142) is substantially 90 degrees in a state in which the tuck-in head (3) is positioned at one of the first position and the second position, and a position of the supporting shaft (25) is set so that the angle is substantially 90 degrees even in a state in which the tuck-in head (3) is positioned at other of the first position and the second position with respect to the one of the first position and the second position.

6. The air tuck-in device (2) of the air jet loom (1) according to any one of claims 1 to 5, wherein the reverse driving section (12) is an articulated link mechanism including a crank mechanism (16) that is mounted on the driving shaft (8).

7. The air tuck-in device (2) of the air jet loom (1) according to claim 6, wherein the crank mechanism (16) includes a crank hub (162) that is mounted on

the driving shaft (8) so as to be incapable of rotating relative to the driving shaft (8), and is formed so that a mounting phase of the crank hub (162) with respect to the driving shaft (8) is changeable.

FIG. 1

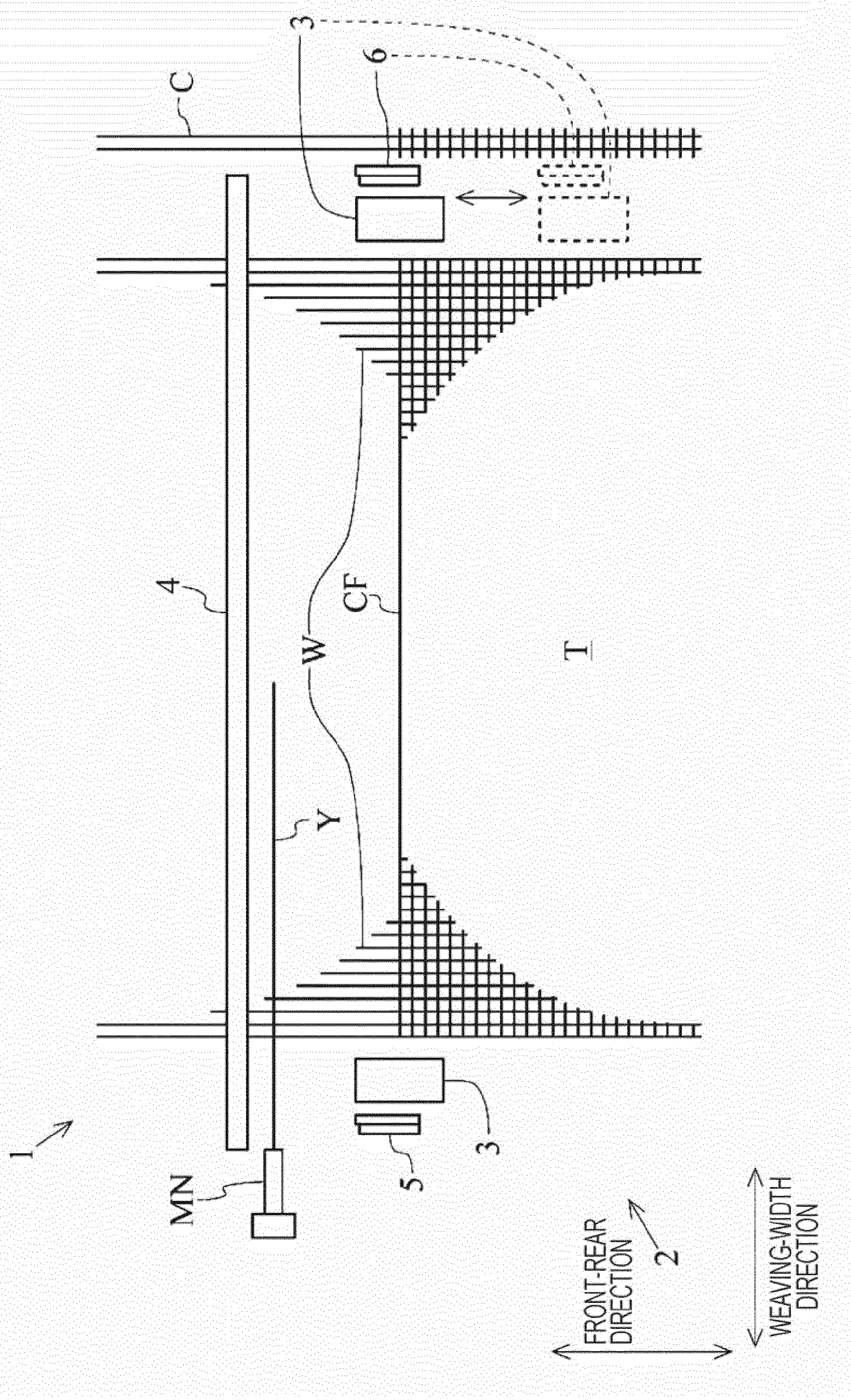

C
3
6
4
W
CF
Y
T
1
MN
5
3
2
FRONT-REAR DIRECTION
WEAVING-WIDTH DIRECTION

FIG. 2

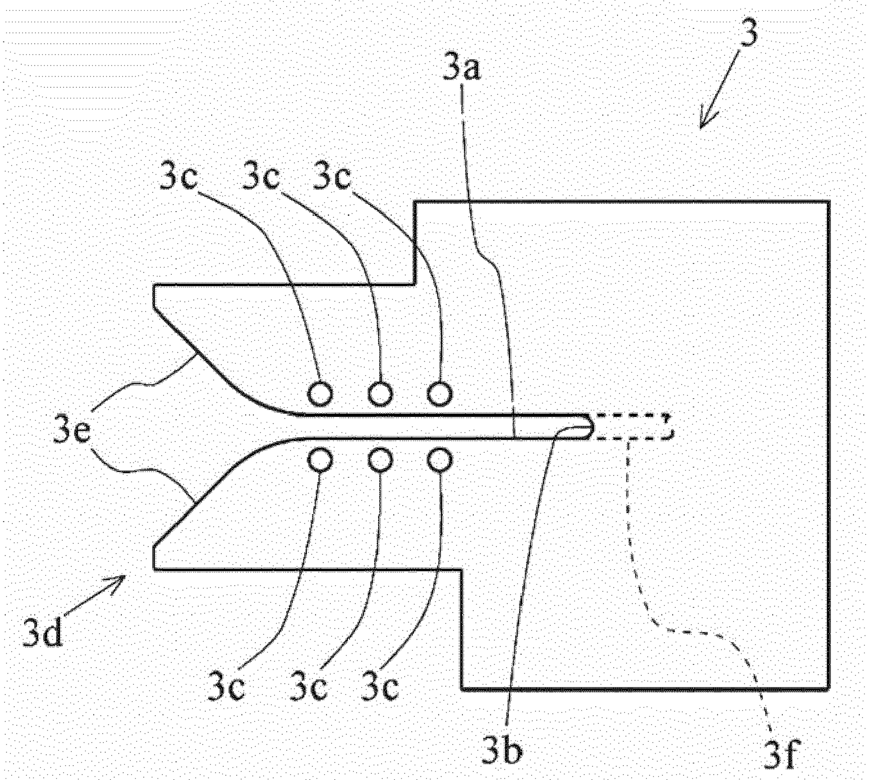


FIG. 3

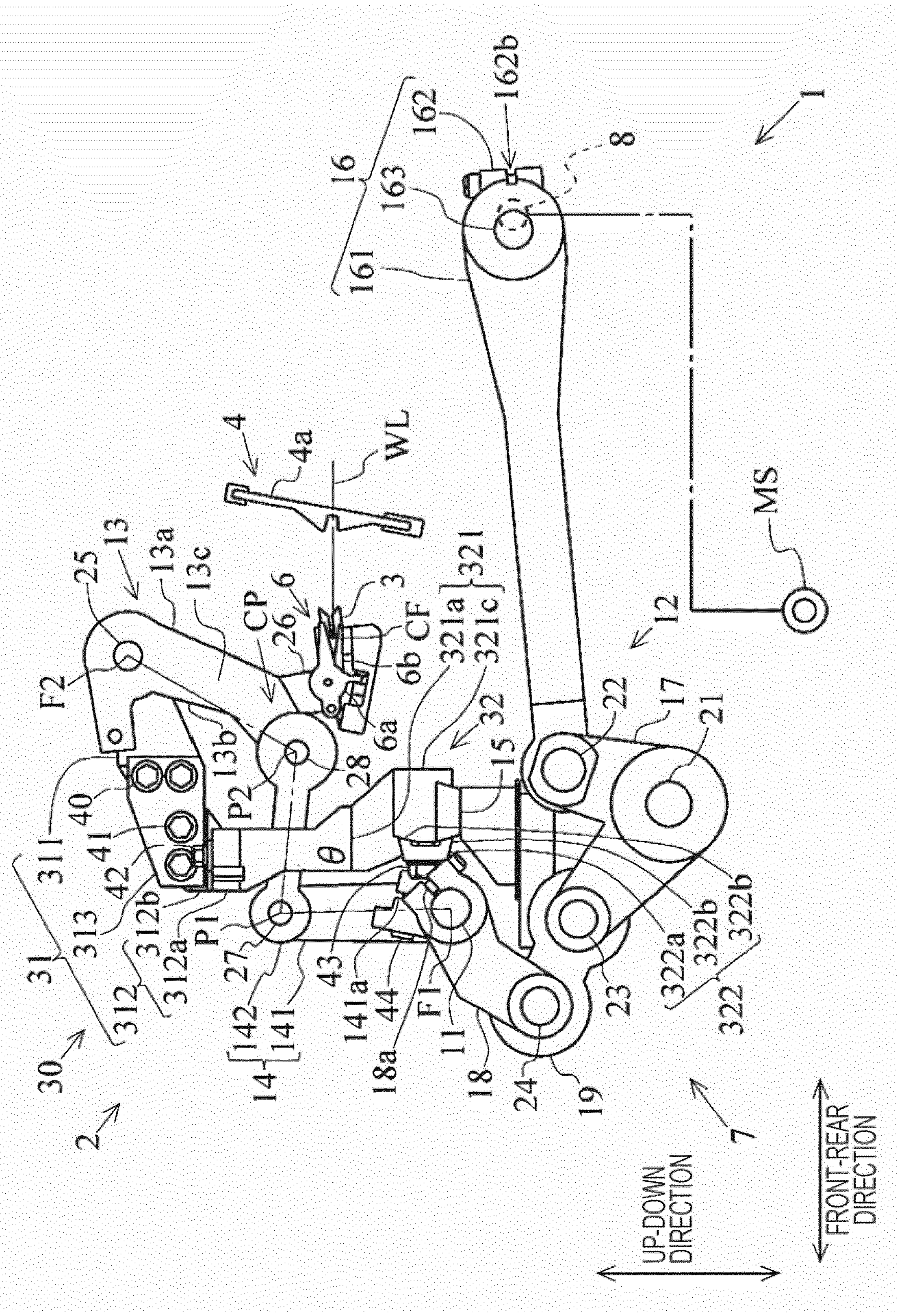

UP-DOWN DIRECTION
FRONT-REAR DIRECTION
WL
MS
CP
CF
θ
F1
F2
P1
P2
1
2
3
4
4a
6
6a
6b
7
8
11
12
13
13a
13b
13c
14
141
141a
142
15
16
161
162
162b
163
17
18
18a
19
21
22
23
24
25
26
27
28
30
31
311
312
312a
312b
313
32
321
321a
321c
322
322a
322b
40
41
42
43
44

FIG. 4

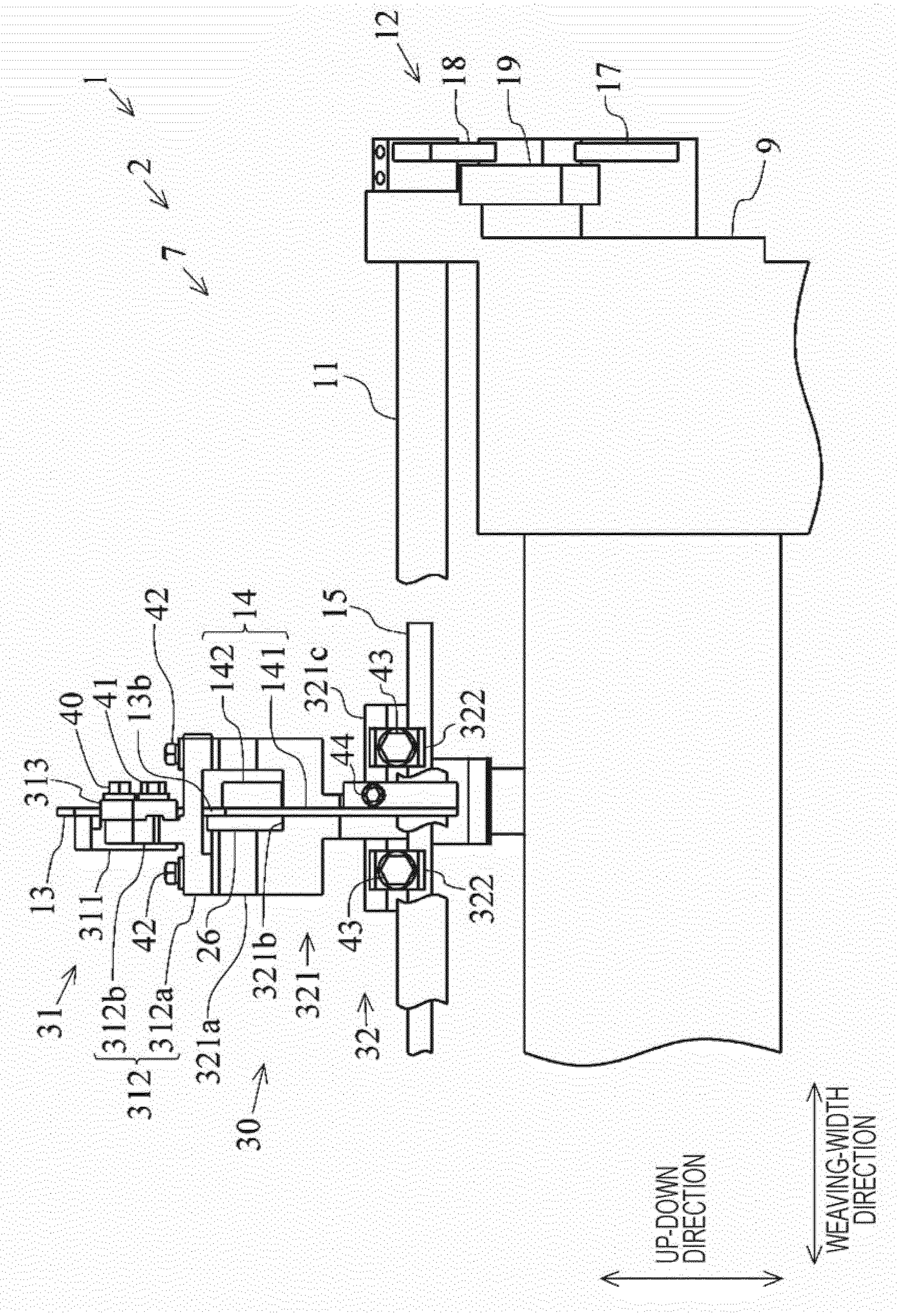

1
2
7
12
18
19
17
9
11
42
14
142
141
15
321c
43
322
44
40
41
13b
313
13
311
42
26
321b
43
322
31
312b
312a
312
321a
321
32
30
UP-DOWN DIRECTION
WEAVING-WIDTH DIRECTION

FIG. 5

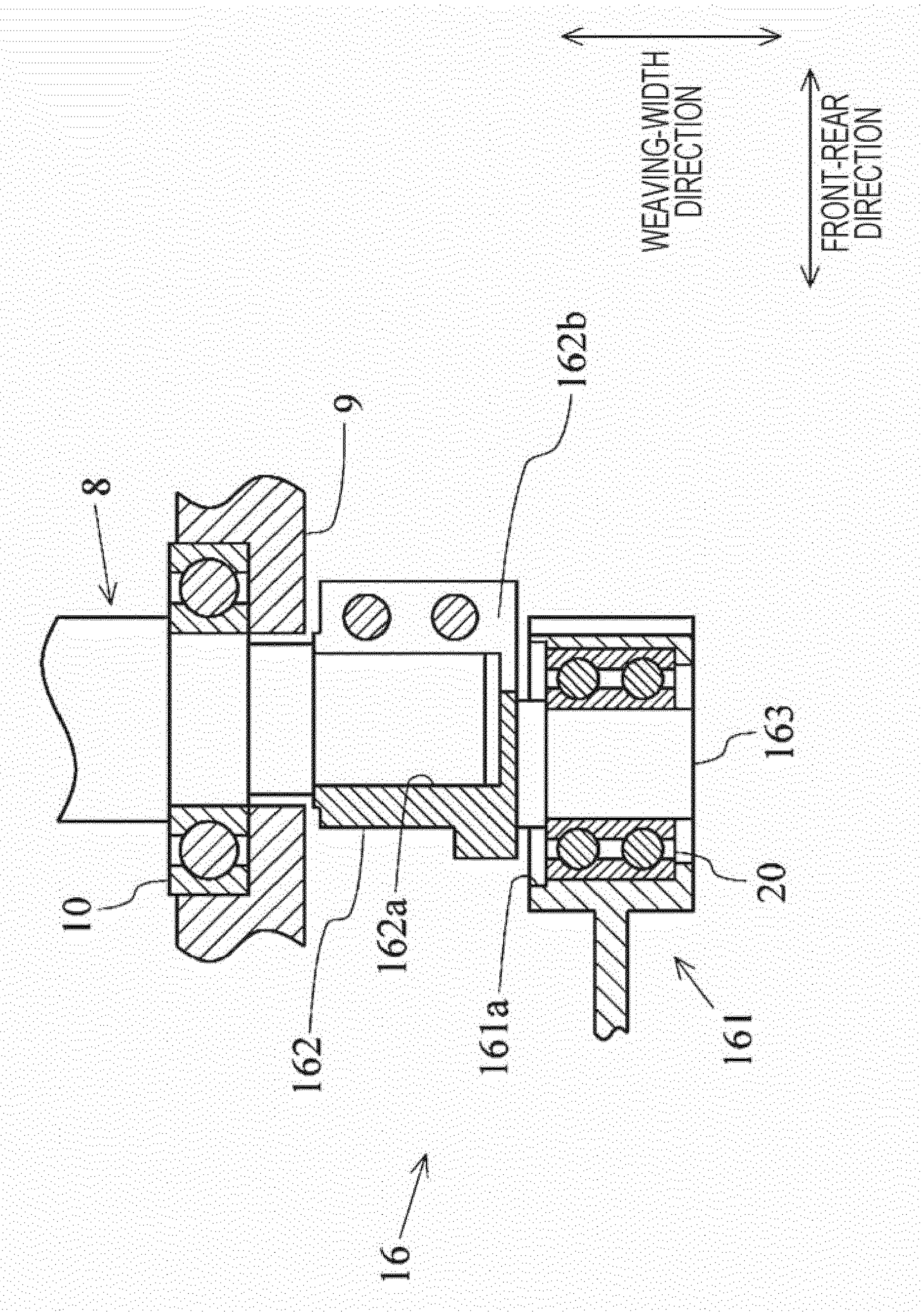

8
9
10
162b
163
20
162a
162
161a
161
16
WEAVING-WIDTH DIRECTION
FRONT-REAR DIRECTION

FIG. 6

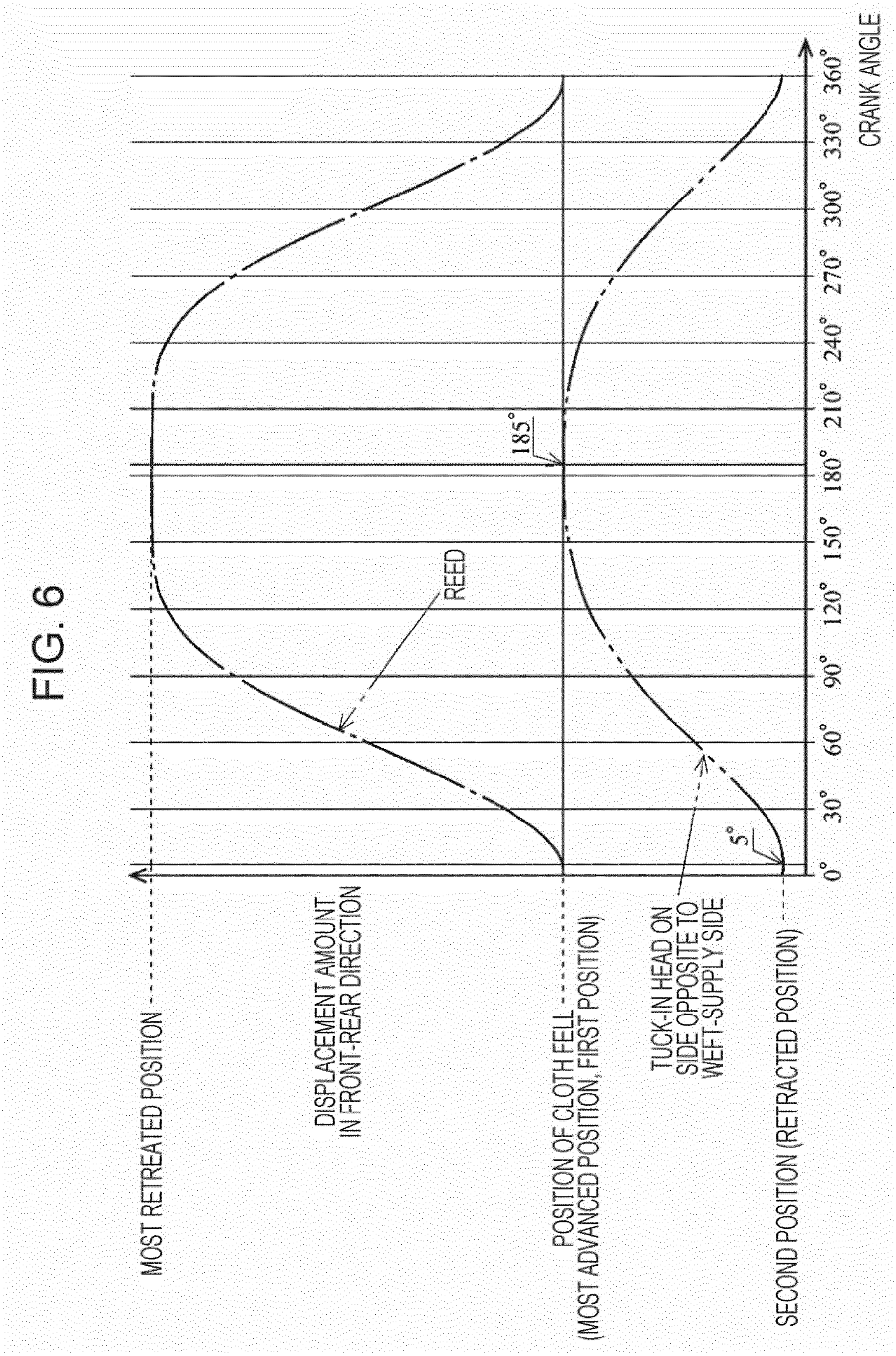
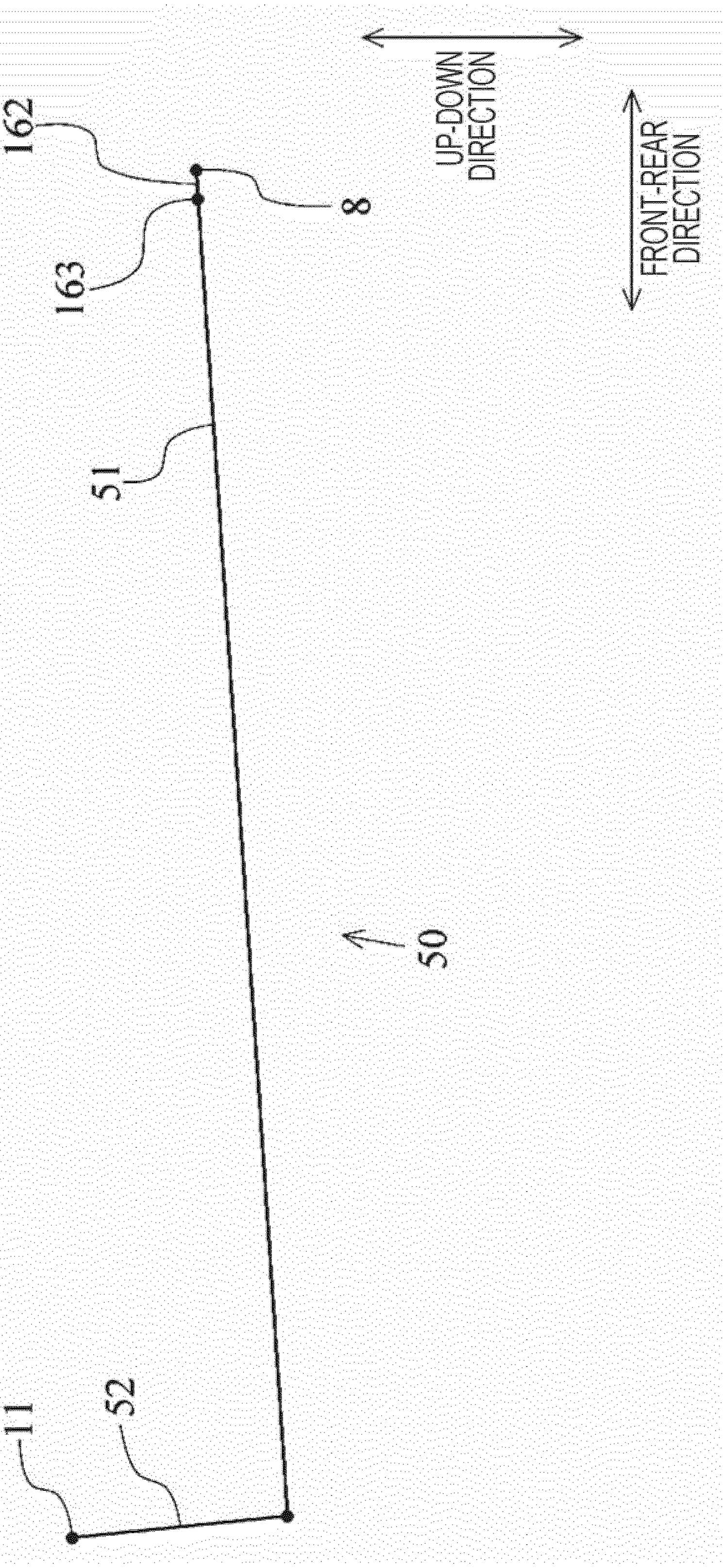

MOST RETREATED POSITION
DISPLACEMENT AMOUNT IN FRONT-REAR DIRECTION
POSITION OF CLOTH FELL (MOST ADVANCED POSITION, FIRST POSITION)
TUCK-IN HEAD ON SIDE OPPOSITE TO WEFT-SUPPLY SIDE
SECOND POSITION (RETRACTED POSITION)
REED
5°
185°
0°
30°
60°
90°
120°
150°
180°
210°
240°
270°
300°
330°
360°
CRANK ANGLE

FIG. 7



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EUROPEAN SEARCH REPORT

Application Number
EP 19 20 5302

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A,D	EP 0 534 429 A1 (SOMET SOC MEC TESSILE [IT]) 31 March 1993 (1993-03-31) * abstract * * claims 2,3 * * figures 1-9 * * column 1, line 1 - line 43 * * column 2, line 3 - column 4, line 27 * * column 4, line 36 - column 5, line 40 * * column 5, line 15 - line 24 * * column 9, line 23 - line 49 * * column 10, line 1 - line 33 * -----	1	INV. D03D47/48
A	EP 1 914 334 A1 (TSUDAKOMA IND CO LTD [JP]) 23 April 2008 (2008-04-23) * abstract * * claims 1,5 * * figures 1,2A,2B * * paragraphs [0001] - [0005], [0010], [0015] - [0017], [0030], [0034] * -----	1	
A	EP 1 314 807 A2 (TSUDAKOMA IND CO LTD [JP]) 28 May 2003 (2003-05-28) * abstract * * claims 1-5 * * figures 1-9 * * paragraphs [0001] - [0014], [0019] - [0021] * -----	1	TECHNICAL FIELDS SEARCHED (IPC) D03D

1

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	21 February 2020	Heinzelmann, Eric

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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21-02-2020

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		EP 0534429 A1	31-03-1993
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		JP 4132793 B2	13-08-2008
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