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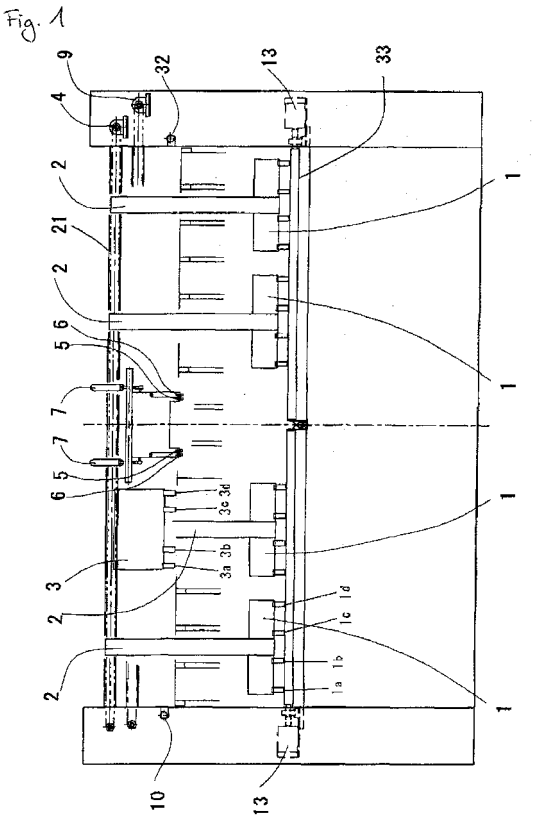
(54) METHOD AND DEVICE FOR EXTENDING AND CARRYING CLOTH

(57) [Purpose] To provide a device and a method for spreading and carrying cloth with higher treatment performance and higher quality than the prior art.

[Solving Means] The device for spreading and carrying the cloth comprises a inserting device carrying the cloth upward while grasping the cloth at both corner regions on one side thereof, a transverse chuck moving the cloth received from the inserting device to a center position along a first rail disposed to lie in the right-to-left direction, a delivery device receiving the cloth from the transverse chuck and delivering the cloth to an spreading device, the spreading device formed of a pair of chucks movable along a second rail disposed to lie in the right-to-left direction, receiving the cloth from the delivery device, and separating the pair of chucks away from each other to laterally extend the cloth, an air suction device spreading the laterally spread cloth in the vertical direction, a horizontally moving device receiving the cloth from the spreading device and delivering the cloth to a carrying device, and the carrying device receiving the cloth from the horizontally moving device and carrying the cloth to a next process.

Fig. 1



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Description

Technical Field

[0001] The present invention relates to a cloth spreading and carrying device and method for spreading cloth, such as cloth having a large area, and carrying the cloth in the spread state to a device in a next process, such as a press or a folder. Notice that the word "cloth" used in the present invention means rectangular cloth represented by sheets and towels.

Background art

[0002] When washing a large number of cloths, the washed cloths are successively subjected to dehydrating, drying, pressing and folding processes, for example, while the cloths are carried along a certain line. In the pressing process, particularly, the cloth has to be inserted into the line in a state properly spread in advance. However, the operation of spreading the large-sized cloths and inserting them into the line without disorders one by one is hard to perform and imposes a large physical load on a worker when manually performed.

To avoid such a problem, a known spreading and carrying device is proposed in which cloth is treated through the steps of grasping cloth by clamps at both corner regions thereof, moving the cloth upward by an ascending/descending means, re-grasping the cloth at both the corner regions thereof by other clamps to laterally spread the cloth, delivering the spread cloth to a conveyor for carrying it to a next process, and rotating the conveyor to carry the cloth to the next process (see, for example, Patent Document 1).

[0003] The device disclosed in Patent Document 1, however, has the problem as follows. Until the lowermost end of the cloth having been delivered from the spreading clamps onto the conveyor is moved out from a start end portion of the conveyor, a inserting device and an spreading device cannot be brought into the operation for moving the next cloth and they are kept in a standby state for the purpose of matching in delivery timing. Accordingly, there occurs a time lag from the timing at which the next cloth is grasped by the inserting device to the timing at which it is spread in front of the conveyor by the spreading device. The occurrence of such a time lag reduces the device treatment capability. Further, because the time lag is changed depending on the width of the cloth, the standby time is also changed and control becomes complicated.

In addition, when the cloth is delivered from the spreading clamps onto the conveyor, the cloth is sucked onto a conveyor belt by a suction force from a state where the cloth is hanged from the clamps while being held at both the corner regions thereof. Therefore, the hanging cloth comes into a slacked state at its upper side portion due to the gravity imposed on the cloth itself and the suction force, and is moved onto the conveyor from such a slacked state. This often raises the problem that the upper side portion of the cloth is disordered and the upper side of the cloth is not straightly positioned on the conveyor.

[0004] In view of the above-described situation, the inventor previously proposed a device for solving the problem of the time lag by employing a carrying device provided with a suction box which has a large number of suction small holes formed in an upper surface of the suction box, and for solving the problem of slacking of the cloth with the provision of a vacuum belt (Patent Document 2).

[0005] Patent Document 1: Japanese Patent Laid-Open Publication No. H6-71098

Patent Document 2: Japanese Patent Laid-Open Publication No. 2001-159067

Disclosure of the Invention

Problems to be Solved by the Invention

[0006] In this application, the inventor intends to solve the following problems with the view of improving the treatment performance and the quality of the device proposed in Patent Document 2.

The first problem is that because receiving-side chucks are used to perform not only a step of fetching the cloth, but also a step of spreading the cloth, the cloth cannot be received from other inserting-side chucks until the spreading step is completed, and therefore a longer waiting time is needed.

The second problem is that when the bottom of the cloth is sucked to supply the spread cloth in a state free from wrinkles to the carrying device, the upper side portion of the spread cloth comes down by the sucking action and gets out of the shape, thus resulting in a risk of deterioration of quality.

The third problem is a risk that if the cloth is not sufficiently sucked by the carrying device when it is delivered from the spreading device to the carrying device, the cloth is sometimes dislocated and is dropped in the worst case. It is conceivable to solve this problem by providing a device for retaining and fixing the upper side portion of the cloth after spreading it. However, because such a solution requires receiving-side chucks to receive the cloth in a position opposed to the plurality of inserting-side chucks, there is a difficulty in ensuring a space for installation of the retaining and fixing device.

The fourth problem is a risk that when the cloth is transferred from the delivery device to the carrying device, the upper side portion of the cloth is not completely transferred and is turned over if the difference speed between the delivery device and the carrying device is not sufficient.

[0007] An object of the present invention is to solve the above-described problems and to provide a device and a method for spreading and carrying cloth with higher treatment performance and higher quality. Means for

Solving the Problems

[0008] As means for achieving the above object, a method of the present invention has features stated in (1) to (6) given below.

(1) A method for spreading and carrying cloth, the method comprising the steps of carrying the cloth upward by a inserting device while grasping the cloth at both corner regions on one side thereof; receiving the cloth from the inserting device by a transverse chuck and carrying the cloth to a center position along a first rail disposed to lie in the right-to-left direction; receiving the cloth from the transverse chuck by a delivery device and delivering the cloth to an spreading device; laterally spreading the cloth received from the delivery device by the spreading device, which is formed of a pair of chucks movable along a second rail disposed to lie in the right-to-left direction, by separating the pair of chucks away from each other; spreading the laterally spread cloth in the vertical direction by an air suction device; receiving the cloth from the spreading device by the horizontally moving device and delivering the cloth to a carrying device; and carrying the cloth to a next process by the carrying device.

(2) In the method for spreading and carrying cloth stated in above (1), the horizontally moving device fixedly holds a hanging portion of the cloth by cooperation with an upper end fixing bar held in a forwardly moved position and receives the cloth from the spreading device while blowing air to an upper side portion of the cloth.

(3) In the method for spreading and carrying cloth stated in above (2), the air suction device spreads the cloth in the vertical direction when the horizontally moving device fixedly holds the hanging portion of the cloth.

(4) In the method for spreading and carrying cloth stated in any one of above (1) to (3), the delivery device has a pair of grasping portions each comprising an outer chuck and an inner chuck, the grasping portions receiving the cloth from the transverse chuck, and the delivery device delivers the cloth to the spreading device after swinging each outer chuck outward to stretch each of both the corner regions of the cloth over a certain width.

(5) In the method for spreading and carrying cloth stated in any one of above (1) to (4), the carrying device has a rotating speed at a position in which the cloth first comes into the carrying device to be slower than a rotating speed at a position in which the cloth is carried.

(6) In the method for spreading and carrying cloth stated in any one of above (1) to (5), after delivering the cloth to the delivery device, the transverse chuck is immediately moved to a position opposed to another inserting device.

[0009] As means for achieving the above object, the present invention provides a device having features given below. A device for spreading and carrying cloth, according to the present invention, comprises a inserting device carrying the cloth upward to a position higher than the height of a worker while grasping the cloth at both corner regions on one side thereof; a transverse chuck receiving the cloth from the inserting device and moving the cloth to a center position of a device frame along a first rail disposed to lie in the right-to-left direction; a delivery device receiving the cloth from the transverse chuck and delivering the cloth to an spreading device; the spreading device disposed at the center position of the device frame, receiving the cloth from the delivery device, and laterally spreading the cloth along a second rail disposed to lie in the right-to-left direction; an air suction device disposed substantially below the spreading device and spreading the laterally spread cloth in the vertical direction; a horizontally moving device receiving the cloth from the spreading device and delivering the cloth to a carrying device; and the carrying device receiving the cloth from the horizontally moving device and carrying the cloth to a next process.

[0010] The inserting device comprises a inserting chuck having a pair of grasping portions, and an ascending/descending slide cylinder capable of carrying the cloth upward to a position higher than the height of a worker. The grasping portions of the inserting chuck are each constituted by a pair of spring-biased clips. The cloth is inserted into the inserting device such that one pair of grippers of the inserting chuck holds one corner region of the cloth in a state where the cloth is stretched in a certain width, and the other pair of grippers of the inserting chuck holds the other corner region of the cloth on one same side thereof as the one corner region in a state where the cloth is stretched in a certain width. The inserting device is provided in plural to increase the treatment capability.

In the present invention, when the cloth is relayed in the order of the inserting chuck → the transverse chuck → the center chucks → the spreading chucks, the upper side portion of the cloth in an area used for such relayed delivery is required to be stretched by each pair of chucks. This is because, unless the delivery of the cloth is performed with the corner regions of the cloth kept in a stretched state, there is a risk that the cloth is delivered in a skewed state. Also, because the width of the cloth stretched by the chuck on the delivered side is reduced when the cloth is delivered from one chuck to another chuck, the width of each stretched corner region grasped by the inserting chuck is required to be designed to have such a size as ensuring that a sufficient width of the stretched corner region is given to the next chuck until reaching the final chuck.

[0011] The transverse chuck is movable to the right and the left along the first rail disposed to lie in the right-to-left direction of the device frame. The transverse chuck is moved to a position opposed to the inserting device

for receiving the cloth from the inserting chuck, and then carries the received cloth to a center position in the device frame. The transverse chuck has a pair of grasping portions which are disposed respectively at opposite corner regions on a lower side of the transverse chuck and are each constituted by a pair of clips. The grasping portions of the transverse chuck in each pair are spaced at a smaller width than each pair of the grasping portions of the inserting chuck such that, at the delivery of the cloth, the pair of the grasping portions of the transverse chuck come into between the corresponding pair of the grasping portions of the inserting chuck in a parallel relation.

In the known device, the chuck on the receiving side serves to perform not only the receiving step, but also the spreading step. In the present invention, the transverse chuck serves to perform only the receiving step, thus enabling the receiving step and the spreading step to be performed in parallel. The reason why four clips in total are disposed in the grasping portions of the transverse chuck is in enabling the opposite corner regions of the cloth to be kept in the stretched state when the cloth is delivered to the center chucks. The provision of the four clips in total has another advantage that the cloth is hard to shift out of place even when heavy cloth is laterally moved at a high speed.

[0012] The delivery device is positioned in the central area of the device frame and delivers the cloth held by the transverse chuck to the spreading chucks. The delivery device comprises a pair of arms pivotally mounted to the device frame, inner center chucks and outer center chucks disposed at fore ends of the arms, a pair of center chuck swinging cylinders for swinging and moving the arms from positions opposed to the transverse chuck to positions opposed to the spreading chucks, center chuck actuating cylinders for opening and closing the respective center chucks, and center chuck spacing cylinders for adjusting the degrees of respective openings of the inner center chucks and the outer center chucks. The inner center chucks generate stronger grasping forces and have larger-sized grasping claws than the outer center chucks.

When the outer center chucks are moved outward to space more away from each other, the outer center chucks grasp the cloth at its corner regions and stretch the opposite corner regions of the cloth over a certain width in cooperation with the inner center chucks. In order to avoid excessive forces from acting on the cloth at that time, the grasping forces of the outer center chucks are preferably set to be weaker than those of the inner center chucks. Additionally, in order to reduce driving forces of center chuck actuating cylinders, the grasping claws of the outer center chucks are preferably formed to be smaller than those of the inner center chucks.

In the present invention, when the cloth is relayed in the order of the inserting chuck → the transverse chuck → the center chucks → the spreading chucks, the grasped positions of the cloth are gradually shifted inward. However, because the corner regions of the cloth are grasped by spacing the outer center chucks more away from each other, the cloth can be delivered to the spreading chucks while being grasped at the corner regions thereof so that the cloth is fully spread from one end to the other end.

Further, with the provision of the delivery device, the transverse chuck can be moved to a position opposed to anther inserting device without waiting for the end of the spreading step of the cloth.

[0013] The spreading device comprises the spreading chucks in the form of a pair of grippers provided on the second rail which is arranged to lie in the right-to-left direction of the device frame, spreading chuck actuating cylinders for opening and closing the spreading chucks, and right and left spreading chuck sliding motors for moving the spreading chucks to the right and the left. By operating the spreading chuck sliding motors forward or backward, the right and left spreading chucks can be moved along the second rail in a direction spacing away from each other or a direction coming closer to each other. The upper end fixing bars are positioned just below the spreading device at the same height as the horizontally moving member in an opposed relation and have a gap formed in a central area between the bars, which allows passage of the cloth through it. When the cloth is delivered from the spreading chucks to the horizontally moving member, the cloth is held between the upper end fixing bars and the horizontally moving member.

Since the spreading device just performs a very simple operation of receiving the cloth and spreading it, complicated operation control is not required. Further, the step of receiving the cloth by the transverse chuck can be performed in parallel to the spreading step.

[0014] The air suction device is installed below the spreading device and comprises a vacuum box having a suction port formed at a top thereof, an air suction fan for sucking air in the vacuum box, and leading rollers disposed on the front side near the suction port of the vacuum box (above a front wall). The leading rollers are disposed on the front side near the suction port of the vacuum box (above a front wall). The air suction fan is operated when the upper side portion of the cloth is fixedly held by the upper end fixing bars and the horizontally moving member 11, the upper end fixing bars being positioned at the height in an opposed relation to the horizontally moving member just below the spreading chucks. Substantially at the same timing, the leading rollers are rotated in a feed direction at a high speed by leading roller motors such that a lower portion of the cloth is sucked into the vacuum box and the cloth is spread in the vertical direction.

In the present invention, since the upper side portion of the cloth is fixedly held when the cloth is sucked into the vacuum box, it is possible to eliminate the problem that the upper side portion of the cloth is excessively withdrawn downward by the suction and is deformed from the properly spread shape.

[0015] The horizontally moving device comprises the horizontally moving member moving above a transfer

conveyor toward and away from the upper end fixing bars, a vacuum motor causing a suction force to act in a suction box formed on the horizontally moving member, a horizontally moving member cylinder for horizontally moving the horizontally moving member, and right and left air blowers disposed adjacent respectively to the right and left upper end fixing bars and having a gap formed in a central area between the air blowers, which allows passage of the cloth grasped by the center chucks through it. The horizontally moving member has a length in the right-to-left direction corresponding to a maximum width of cloths to be treated, and the suction box having a large number of small holes is formed on an upper surface of the horizontally moving member at a front end portion thereof. By sucking air in the horizontally moving member with the operation of the vacuum motor, the upper side portion of the cloth can be attracted onto the upper surface of the horizontally moving member. When the horizontally moving member cylinder is in its contracted state, the horizontally moving member is positioned substantially just below the spreading chucks, and when the horizontally moving member cylinder is spread, the horizontally moving member is moved toward the inner or rear side at a high speed.

By delivering the cloth from the spreading chucks to the horizontally moving member while blowing air toward the upper side portion of the cloth in the state where the cloth is held between the upper end fixing bars and the horizontally moving member, drop or downward displacement of the cloth caused in the delivery step can be minimized.

[0016] The carrying device comprises the transfer conveyor constituted by a perforated belt having a large number of small holes formed therein, a peeling-off shaft disposed in front of the transfer conveyor and rotating at a speed lower than a horizontally moving speed of the horizontally moving member and a rotating speed of the transfer conveyor, an air suction passage provided below the transfer conveyor, and a discharge conveyor disposed in continuation with the transfer conveyor. A trailing end portion of the discharge conveyor is continued to a inserting conveyor on the press side.

The air suction passage is communicated with the vacuum box, and the switching damper enables a suction force to selectively act in any of the vacuum box and the air suction passage. When the cloth is carried, a negative pressure is caused to generate in the air suction passage so that the cloth having been supplied onto the transfer conveyor is held under the suction and is surely transported by the transfer conveyor.

By setting the rotating speed of the peeling-off shaft to be slower than the moving speed of the horizontally moving member, a sufficient frictional force is generated due to the speed difference between the moving speed of the horizontally moving member and the rotating speed of the peeling-off shaft. Therefore, the upper side portion of the cloth can be smoothly peeled off and transferred onto the carrying device without being turned over.

Further, since the rotating speed of the peeling-off shaft is set to be slower than the rotating speed of the transfer conveyor, a weak frictional force acts on the cloth when the cloth is transferred from the peeling-off shaft onto the transfer conveyor, and the cloth is carried in a state of being properly spread in the lengthwise direction. As a result, the cloth is hard to wrinkle and high quality is ensured.

In addition, since there is no need of slowing down the speed of the transfer conveyor in order to maintain the speed difference, the treatment efficiency is increased.

Effect of the Invention

[0017] According to the present invention, since the receiving-side chuck in the known device is separated into the transverse chuck and the spreading chucks, the receiving step by the transverse chuck and the spreading step by the spreading chucks can be performed in parallel. Hence the treatment efficiency can be increased.

[0018] Since the outer center chucks are moved outward more away from each other in the delivery device, the cloth can be surely grasped at the corner regions so that the cloth is fully spread from one end to the other end. Since the upper side portion of the cloth is fixedly held by the upper end fixing bars, there is no risk that the upper side portion of the cloth is excessively withdrawn downward by the suction and is deformed from the properly spread shape. Accordingly, a high-quality finished state can be always obtained. In particular, a more significant effect can be obtained when target cloth is large and heavy.

Further, since the cloth is fixedly held by the upper end fixing bars, the cloth can be avoided from displacing downward at the time when it is delivered from the spreading device to the horizontally moving device.

[0019] Since the peeling-off shaft is disposed in front of the transfer conveyor, a sufficient speed difference can be ensured between the horizontally moving member and the transfer conveyor. As a result, the upper side portion of the cloth can be avoided from turning over at the time when the cloth is delivered from the horizontally moving member to the transfer conveyor.

In addition, since there is no need of slowing down the speed of the transfer conveyor in order to maintain the speed difference, the treatment efficiency is increased.

Brief Description of the Invention

[0020]

Fig. 1 is a front view of a cloth spreading and carrying device.

Fig. 2 is a side sectional view of the cloth spreading and carrying device.

Fig. 3 is an explanatory view for explaining the operation when an up-button disposed in a inserting device is depressed.

Fig. 4 is an explanatory view for explaining the operation when cloth is delivered from transverse chucks to a delivery device.
Fig. 5 is an explanatory view for explaining the operation of a pre-step in which the cloth is delivered from the delivery device to an spreading device.
Fig. 6 is an explanatory view (1/2) for explaining the operation when the cloth is spread by the spreading device in the right-to-left direction.
Fig. 7 is an explanatory view (2/2) for explaining the operation when the cloth is spread by the spreading device in the right-to-left direction.
Fig. 8 is an explanatory view (1/2) for explaining the operation when the cloth is spread in the vertical direction and is delivered from the spreading device a horizontally moving member.
Fig. 9 is an explanatory view (2/2) for explaining the operation when the cloth is spread in the vertical direction and is delivered from the spreading device to the horizontally moving member.
Fig. 10 is an explanatory view (1/2) for explaining the operation when the cloth is delivered from the horizontally moving member to a carrying device.
Fig. 11 is an explanatory view (2/2) for explaining the operation when the cloth is delivered from the horizontally moving member to the carrying device.

Reference Numerals

[0021]

1 inserting chuck
2 ascending/descending slide cylinder
3 transverse chuck
4 transverse chuck sliding motor
5 inner center chuck
6 outer center chuck
7 center chuck swinging cylinder
8 spreading chuck
9 spreading chuck sliding motor
11 horizontally moving member
12 upper end fixing bar
13 leading roller motor
14 air blower
15 switching damper
16 suction fan
17 vacuum motor
18 transfer conveyor
19 peeling-off shaft
21 first rail
22 arm
23 second rail
24 vacuum box
25 air suction passage
26 center chuck actuating cylinder
27 center chuck spacing cylinder
28 spreading chuck actuating cylinder
29 transverse chuck opening/closing cylinder
31 suction box
32 horizontally moving member cylinder
33 leading roller
34 discharge conveyor
51 opening/closing bar
52 release plate
100 inserting device
200 delivery device
300 spreading device
400 air suction device
500 horizontally moving device
600 carrying device

Best Mode for Carrying out the Invention

[0022] The best mode for carrying out the invention will be described below with reference to the drawings. Note that, in the following description, the term "front-to-back direction" means a direction in which cloth as a treatment target is carried, and the term "right-to-left direction" means a direction perpendicular to the carrying direction of the cloth.

[0023] A device for spreading and carrying cloth according to the present invention comprises, as shown in Figs.1 and 2, a inserting device 100 carrying the cloth upward to a position higher than the height of a worker while grasping the cloth at both corner regions on one side thereof, a transverse chuck 3 receiving the cloth from the inserting device 100 and moving the received cloth to a center position in a device frame along a first rail 21 disposed to lie in the right-to-left direction, a delivery device 200 receiving the cloth from the transverse chuck 3 and delivering the cloth to an spreading device 300, the spreading device 300 receiving the cloth from the delivery device 200 at a center position of the device frame and spreading the cloth, an air suction device 400 installed substantially just below the spreading device 300, a horizontally moving device 500 receiving the spread cloth from the spreading device 300 and delivering the cloth to a carrying device 600, and the carrying device 600 receiving the cloth held by a horizontally moving member and carrying the cloth toward a press.

[0024] The inserting device 100 comprises a inserting chuck 1 having a pair of grasping portions, and an ascending/descending slide cylinder 2 capable of carrying the cloth upward to a position higher than the height of a worker. The grasping portions of the inserting chuck 1 are constituted by respective pairs of clips 1a - 1d which are spring biased. The cloth is inserted into the inserting device such that one pair of grippers 1 a, 1b of the inserting chuck 1 holds one corner region of the cloth in a state where the cloth is stretched in a certain width, and the other pair of grippers 1c, 1d of the inserting chuck 1 holds the other corner region of the cloth on one same side thereof as the one corner region in a state where the cloth is stretched in a certain width. A release plate 52 is disposed above the ascending/descending slide cylinder 2 such that the release plate 52 comes into abut-

ment against the clips 1a - 1 d to release the cloth at the time when the cloth is delivered.

In the cloth spreading and carrying device according to the present invention, four inserting devices 100 are disposed at the front side, thus allowing four workers to perform the operation of inserting the cloth in front of the respective inserting devices 100. When each worker depresses an up-button disposed on the inserting device 100 (or in an automatic mode), the ascending/descending slide cylinder 2 is operated to raise the inserting chuck 1. While one inserting chuck 1 is operated to deliver the cloth, the other inserting chucks 1 are kept on standby at positions lower than the height at which the cloth is delivered.

[0025] The transverse chuck 3 is movable to the right and the left along the first rail 21 disposed to lie in the right-to-left direction of the device frame. The transverse chuck 3 is moved to a position opposed to the inserting device 100 for receiving the cloth from the inserting chuck 1, and then carries the received cloth to a center position in the device frame. The transverse chuck 3 has a pair of grasping portions which are disposed respectively at opposite corner regions on a lower side of the transverse chuck 3 and are each constituted by a pair of clips. The grasping portions of the transverse chuck 3 in each pair are spaced at a smaller width than each pair of the grasping portions of the inserting chuck 1 such that, at the delivery of the cloth, the pairs of the grasping portions (clips 3a - 3d) of the transverse chuck 3 come into between the corresponding pairs of the grasping portions (clips 1a - 1d) of the inserting chuck 1 in a parallel relation. An opening/closing bar 51 operated by a transverse chuck opening/closing cylinder 29 is disposed in each of upper portions of the ascending/descending slide cylinders 2 and a central area of the device frame, and the grasping portions of the transverse chuck 3 can be opened and closed by operating the opening/closing bar 51.

[0026] The delivery device 200 is positioned in the central area of the device frame and delivers the cloth held by the transverse chuck 3 to spreading chucks 8. The delivery device 200 comprises a pair of arms 22 pivotally mounted to the device frame, inner center chucks 5 and outer center chucks 6 disposed at fore ends of the arms 22, a pair of center chuck swinging cylinders 7 for swinging and moving the arms 22 from positions opposed to the transverse chuck 3 to positions opposed to the spreading chucks 8, center chuck actuating cylinders 26 for opening and closing the respective center chucks, and center chuck spacing cylinders 27 (not shown) for adjusting the degrees of respective openings of the inner center chucks 5 and the outer center chucks 6. The inner center chucks 5 generate stronger grasping forces and have larger-sized grasping claws than the outer center chucks 6.

The inner center chucks 5 and the outer center chucks 6 can be opened and closed by the center chuck actuating cylinders 26. When the transverse chuck 3 is laterally moved to a position opposed to the center chucks 5, 6, the outer center chucks 5, 6 are swung by the center chuck swinging cylinders 7 toward the front side closer to the worker and center chuck actuating cylinders 20 are operated to grasp the cloth. Further, the grasping portions of the transverse chuck 3 are released by an opening/closing bar 51 which is operated by the transverse chuck opening/closing cylinder 29, whereby the cloth is delivered from the transverse chuck 3 to the center chucks 5, 6.

Upon receiving the cloth, the center chucks 5, 6 are returned to the original swung position by the center chuck swinging cylinders 7, and the outer center chucks 6 are moved by the center chuck spacing cylinders 27 to space from each other, thus bringing each of the opposite corner regions of the cloth into a stretched state over several centimeters. Then, the center chucks 5, 6 are further swung rearward by the center chuck swinging cylinders 7 such that the stretched opposite corner regions of the cloth are grasped by the spreading chucks 8 for the delivery of the cloth.

[0027] The spreading device 300 comprises the spreading chucks 8 in the form of a pair of grippers provided on a second rail 23 which is arranged to lie in the right-to-left direction of the device frame, spreading chuck actuating cylinders 28 for opening and closing the spreading chucks 8, and right and left spreading chuck sliding motors 9 for moving the spreading chucks 8 to the right and the left. By operating the spreading chuck sliding motors 9 forward or backward, the right and left spreading chucks 8 can be moved along the second rail 23 in a direction spacing away from each other or a direction coming closer to each other.

The spreading chucks 8 receive the cloth from the center chucks 5, 6 in the center position of the device frame and are moved along the second rail 23 in opposite directions, thereby spreading the cloth. More specifically, when the center chucks 5, 6 are moved to the positions opposed to the spreading chucks 8 while the right and left spreading chucks 8 are in a state close to each other, the spreading chucks 8 grasp the cloth with the operation of the spreading chuck actuating cylinders 28, and the center chucks 5, 6 are operated by the center chuck actuating cylinders 26 to release the cloth, whereby the cloth is delivered from the center chucks 5, 6 to the spreading chucks 8. Then, an upper side portion of the cloth can be spread by moving the spreading chucks 8 along the second rail 23 so as to space from each other in the right-to-left direction in the state of the spreading chucks 8 receiving the opposite corner regions of the cloth.

[0028] The air suction device 400 is installed below the spreading device 300 and comprises a vacuum box 24 having a suction port formed at a top thereof, an air suction fan 16 for sucking air in the vacuum box 24, and leading rollers 33 disposed on the front side near the suction port of the vacuum box 24 (above a front wall). The air suction fan 16 is operated when the upper side portion of the cloth is fixedly held by upper end fixing bars

12 and a horizontally moving member 11, the upper end fixing bars 12 being positioned at a height in an opposed relation to the horizontally moving device 500 just below the spreading device 300 and having a gap between them, which allows passage of the cloth through it. Substantially at the same timing, the leading rollers 33 are rotated in a feed direction at a high speed by leading roller motors 13 such that a lower portion of the cloth is sucked into the vacuum box 24 and the cloth is spread in the vertical direction.

Further, the suction of the cloth into the vacuum box 24 is performed for a very short time immediately after the upper side portion of the cloth has been stretched by the spreading chucks. For that operation, a passage between the air suction fan 16 and the vacuum box 24 is selectively communicated with each other or cut off by a vacuum switching damper 15.

[0029] The horizontally moving device 500 comprises a horizontally moving member 11 moving above a transfer conveyor 18 toward and away from the upper end fixing bars 12, a vacuum motor 17 causing a suction force to act in a suction box 31 formed on the horizontally moving member 11, a horizontally moving member cylinder 32 for horizontally moving the horizontally moving member 11, right and left upper end fixing bars 12 positioned just below the spreading chucks 8 at the same height as the horizontally moving member 11 in an opposed relation and having a gap formed in a central area between the bars 12, which allows passage of the cloth grasped by the center chucks 5, 6 through it, and right and left air blowers 14 disposed adjacent respectively to the right and left upper end fixing bars 12 and having a gap formed in a central area between the air blowers 14, which allows passage of the cloth grasped by the center chucks 5, 6 through it. The horizontally moving member 11 has a length in the right- to-left direction corresponding to a maximum width of cloths to be treated, and the suction box 31 having a large number of small holes is formed on an upper surface of the horizontally moving member 11 at a front end portion thereof. By sucking air in the horizontally moving member 11 with the operation of the vacuum motor 17, the upper side portion of the cloth can be attracted onto the upper surface of the horizontally moving member 11. When the horizontally moving member cylinder 32 is in its contracted state, the horizontally moving member 11 is positioned substantially just below the spreading chucks 8, and when the horizontally moving member cylinder 32 is spread, the horizontally moving member 11 is moved toward the inner or rear side at a high speed.

The cloth is delivered from the spreading chucks 8 to the horizontally moving member 11 by contracting the horizontally moving member cylinder 32 to hold the cloth between the upper end fixing bars 12 and the horizontally moving member 11, by releasing the spreading chucks 8, and by blowing air to the upper side portion of the cloth from the air blowers 14 such that the upper side portion of the cloth is transferred onto the horizontally moving member 11.

[0030] The carrying device 600 comprises the transfer conveyor 18 constituted by a perforated belt having a large number of small holes formed therein, a peeling-off shaft 19 disposed in front of the transfer conveyor and rotating at a speed lower than a horizontally moving speed of the horizontally moving member 11 and a rotating speed of the transfer conveyor 18, an air suction passage 25 provided below the transfer conveyor 18, and a discharge conveyor 34 disposed in continuation with the transfer conveyor 18. A trailing end portion of the discharge conveyor 34 is continued to an inserting conveyor (not shown) on the press side.

The air suction passage 25 is communicated with the vacuum box 24, and the switching damper 15 enables a suction force to selectively act in any of the vacuum box 24 and the air suction passage 25. When the cloth is carried, a negative pressure is caused to generate in the air suction passage 25 so that the cloth having been supplied onto the transfer conveyor 18 is held under the suction and is surely transported by the transfer conveyor 18. When the cloth is delivered from the horizontally moving member 11 to the transfer conveyor 18, the switching damper 15 is operated such that the suction force is changed over to act in the air suction passage 25 instead of the vacuum box 24. When the horizontally moving member 11 is moved rearward, the cloth first comes into contact with the peeling-off shaft 19. However, because the moving speed of the horizontally moving member 11 is higher than the rotating speed of the peeling-off shaft 19, there occurs a frictional force acting on a contact surface between the peeling-off shaft 19 and the cloth "a". Further, because the horizontally moving member 11 is moved rearward, the frictional force between the peeling-off shaft 19 and the cloth becomes larger than the suction force applied from the suction box 31 formed on the horizontally moving member 11. Accordingly, the upper side portion of the cloth is transferred from the horizontally moving member 11 onto an upper surface of the transfer conveyor 18 in a state where the upper side portion of the cloth is spread in the front-to-back direction. At that time, the upper side portion of the cloth comes into close contact with the upper surface of the transfer conveyor 18 by the action of the suction force applied from the air suction passage 25.

[0031] The operation of the cloth spreading and carrying device according to the present invention will be described below on the time series with reference to Figs. 3 through 11.

Fig. 3 shows the operation when the up-button disposed in the inserting device 100 located at a second position counting from the left in the front view is depressed by the worker. The inserting chuck 1 is ascended by the ascending/descending slide cylinder 2 while the cloth "a" is gripped by the grips 1a - 1 d. On that occasion, the transverse chuck 3 is horizontally moved by the transverse chuck sliding motor 4 to a position opposed to the inserting chuck 1 which is in the ascending step, and the

transverse chuck 3 is held in a standby state where the clips 3a-3d are opened. At the time when the inserting chuck 1 is ascended to the delivery position, the clips 3a, 3b are positioned between the clips 1 a, 1b and the clips 3c, 3d are positioned between the clips 1 c, 1 d, and the clips 1a - 1 d are released by coming into abutment against the release plate 52 which is in the ascended position. Further, the cloth is grasped by the clips 3a - 3d with the opening/closing bar 51 operated by the transverse chuck opening/closing cylinder 29. After the delivery of the cloth "a", the inserting chuck 1 is started to descend and the transverse chuck 3 is started to horizontally move toward the central area of the device frame after the lapse of a short time from the delivery.

[0032] Fig. 4 shows the operation when the cloth "a" is delivered from transverse chucks 3 to the delivery device 200. When the transverse chuck 3 grasping the cloth "a" is moved to the central area of the device frame, the center chucks 5, 6 are swung to the front side closer to the worker by the center chuck swinging cylinders 7. When the grasping claws of the pairs of the center chucks 5, 6 are positioned respectively between the clamps 3a, 3b and between the clamps 3c, 3d, the center chuck actuating cylinders 20 are operated to grasp the cloth and the grasping portions of the transverse chuck 3 are released by the opening/closing bar 51 which is operated by the transverse chuck opening/closing cylinder 29, whereby the cloth "a" is delivered from the transverse chuck 3 to the center chucks 5, 6. After the delivery of the cloth "a", the center chucks 5, 6 are swung for return to the original positions by the center chuck swinging cylinders 7.

The transverse chuck 3 having delivered the cloth is kept in a standby state in the central area of the device frame until the next cloth is started to ascend.

[0033] Fig. 5 shows the operation of a pre-step in which the cloth "a" is delivered from the delivery device 200 to the spreading device 300. The outer center chucks 6 are moved outward to further space from each other by the center chuck spacing cylinders 27 such that each of the opposite corner regions of the cloth "a" is brought into a stretched state over several centimeters. At that time, because the outer center chucks 6 generate weaker grasping forces and have the smaller-sized grasping claws than the inner center chucks 5, the outer center chucks 6 stretch the opposite corner regions of the cloth while sliding on them. Then, the center chucks 5, 6 are further swung rearward by the center chuck swinging cylinders 7 such that the stretched opposite corner regions of the cloth "a" are grasped by the spreading chucks 8 for delivery of the cloth to the spreading chucks 8. After the delivery of the cloth "a", the center chucks 5, 6 are swung for return to the original positions by the center chuck swinging cylinders 7.

In parallel to the above operation, upon detecting the upsignal for the inserting chuck 1 grasping the cloth b, the transverse chuck 3 is moved to the position opposed to the relevant inserting chuck 1.

[0034] Figs. 6 and 7 show the operation when the cloth "a" is spread by the spreading device 300 in the right-to-left direction. The spreading chucks 8 having received the cloth "a" are moved to the right and the left more apart from each other by the spreading chuck sliding motors 9 in a synchronous relation, thus spreading the cloth "a" in the right-to-left direction. Also, the horizontally moving member 11 is started to move forward by the horizontally moving member cylinder 32.

In parallel to the above operation, the transverse chuck 3 receives the next cloth b from the inserting chuck 1 and is horizontally moved to the central area of the device frame.

[0035] Figs. 8 and 9 show the operation when the cloth "a" is spread in the vertical direction and is delivered from the spreading device 300 to the horizontally moving member 11. After the cloth "a" has been completely spread in the right-to-left direction, the cloth "a" is held between the front end portion of the horizontally moving member 11 and the upper end fixing bars 12. Simultaneously, the leading rollers 33 are rotated at a high speed and the switching damper 15 is changed over so as to act the suction force through the vacuum box 24. Therefore, the cloth "a" hanging from the spreading chucks 8 is sucked into the vacuum box 24 and is spread by the actions of a downward flow of air and the dead weight of the cloth. Then, the switching damper 15 is changed over again to stop the suction force applied through the vacuum box 24, whereby air is now blown toward the upper side portion of the cloth "a" from the air blowers 14. In addition, the spreading chucks 8 are released, thus causing the upper side portion of the cloth "a" to be transferred onto the suction box 31 on the horizontally moving member 11 with the suction force acting in the suction box 31 by the operation of the vacuum motor 17.

In parallel to the above operation, the next cloth b is delivered from the transverse chuck 3 to the delivery device 200. The center chucks 5, 6 having received the cloth b are swung for return to the original positions by the center chuck swinging cylinders 7 and are kept in a standby state until the spreading chucks 8 are released.

[0036] Figs. 10 and 11 show the operation when the cloth "a" is delivered from the horizontally moving member 11 to the carrying device 600. When the horizontally moving member 11 is further moved rearward by the horizontally moving member cylinder 32, the cloth "a" first comes into contact with the peeling-off shaft 19. Because the rotating speed of the peeling-off shaft 19 is sufficiently slower than that of the horizontally moving member 11, there occurs a frictional force acting between them. In addition, because the horizontally moving member 11 is moved rearward, the frictional force is further increased so that the upper side portion of the cloth "a" is moved away from the suction box 31. At that time, the switching damper 15 is already in the changed-over state and the suction force applied from the air suction fan 16 acts in the air suction passage 25. Accordingly, the cloth "a" is transferred onto the upper surface of the transfer con-

veyor 18 due to both the sucking action through the air suction passage 25 and a natural drop of the cloth "a" caused by the dead weight thereof. Then, with the rotation of the transfer conveyor 18, the cloth "a" is carried onto the discharge conveyor 34 and is continuously carried onto the inserting conveyor (not shown) on the subsequent press side.

In parallel to the above operation, the cloth b is delivered from the center chucks 5, 6 to the spreading device 300 and is subjected to the spreading step by the spreading device 300.

Claims

1. A method for spreading and carrying cloth, the method comprising the steps of:

   carrying the cloth upward by a inserting device while grasping the cloth at both corner regions on one side thereof;
   receiving the cloth from the inserting device by a transverse chuck and carrying the cloth to a center position along a first rail disposed to lie in the right-to-left direction;
   receiving the cloth from the transverse chuck by a delivery device and delivering the cloth to an spreading device;
   laterally spreading the cloth received from the delivery device by the spreading device, which is formed of a pair of chucks movable along a second rail disposed to lie in the right-to-left direction, by separating the pair of chucks away from each other;
   spreading the laterally spread cloth in the vertical direction by an air suction device;
   receiving the cloth from the spreading device by the horizontally moving device and delivering the cloth to a carrying device; and
   carrying the cloth to a next process by the carrying device.

2. A method for spreading and carrying cloth according to Claim 1, wherein the horizontally moving device fixedly holds a hanging portion of the cloth by cooperation with an upper end fixing bar held in a forwardly moved position and receives the cloth from the spreading device while blowing air to an upper side portion of the cloth.

3. A method for spreading and carrying cloth according to Claim 2, wherein the air suction device spread the cloth in the vertical direction when the horizontally moving device fixedly holds the hanging portion of the cloth.

4. A method for spreading and carrying cloth according to any one of Claims 1 to 3, wherein the delivery device has a pair of grasping portions each comprising an outer chuck and an inner chuck, the grasping portions receiving the cloth from the transverse chuck, and the delivery device delivers the cloth to the spreading device after swinging each outer chuck outward to stretch each of both the corner regions of the cloth over a certain width.

5. A method for spreading and carrying cloth according to any one of Claims 1 to 4, wherein the carrying device has a rotating speed at a position in which the cloth first comes into the carrying device to be slower than a rotating speed at a position in which the cloth is carried.

6. A method for spreading and carrying cloth according to any one of Claims 1 to 5, wherein after delivering the cloth to the delivery device, the transverse chuck is immediately moved to a position opposed to another inserting device.

7. A device for spreading and carrying cloth, the device comprising:

   a inserting device carrying the cloth upward while grasping the cloth at both corner regions on one side thereof;
   a transverse chuck moving the cloth received from the inserting device to a center position along a first rail disposed to lie in the right-to-left direction;
   a delivery device receiving the cloth from the transverse chuck and delivering the cloth to an spreading device;
   the spreading device formed of a pair of chucks movable along a second rail disposed to lie in the right-to-left direction, receiving the cloth from the delivery device, and separating the pair of chucks away from each other to laterally extend the cloth;
   an air suction device spreading the laterally spread cloth in the vertical direction;
   a horizontally moving device receiving the cloth from the spreading device and delivering the cloth to a carrying device; and
   the carrying device receiving the cloth from the horizontally moving device and carrying the cloth to a next process.

8. A device for spreading and carrying cloth according to Claim 7, wherein the delivery device has a pair of grasping portions each comprising an outer chuck and an inner chuck, the grasping portions serving to grasp the cloth, and the delivery device swings each outer chuck outward to stretch each of both the corner regions of the cloth over a certain width.

9. A device for spreading and carrying cloth according

to Claim 7 or 8, wherein the horizontally moving device comprises a horizontally moving member moving toward and away from right and left upper end fixing bars which are disposed below the spreading device, a vacuum motor causing a suction force to act in a suction box formed on the horizontally moving member, a horizontally moving member cylinder for horizontally moving the horizontally moving member, right and left air blowers having a gap formed in a central area between the air blowers, which allows passage of the cloth therethrough, and
air is blown to an upper side portion of the cloth from the air blowers 14 in a state that the cloth is held between the upper end fixing bars 12 and the horizontally moving member 11.

10. A device for spreading and carrying cloth according to any one of Claims 7 to 9, wherein the air suction device comprises a vacuum box disposed below the spreading device and having a suction port formed at a top thereof, an air suction fan for sucking air in the vacuum box, and leading rollers disposed on the front side near the suction port of the vacuum box, and
the air suction device spreads the cloth in the vertical direction while the upper side portion of the cloth is held between the right and left upper end fixing bars disposed below the spreading device and the horizontally moving member.

11. A device for spreading and carrying cloth according to any one of Claims 7 to 10, wherein the carrying device comprises a transfer conveyor rotated to carry the cloth to the next process, and a peeling-off shaft disposed in front of the transfer conveyor, and a rotating speed of the carrying device is set to be lower than a horizontally moving speed of the horizontally moving member and a rotating speed of the transfer conveyor.

Fig. 1

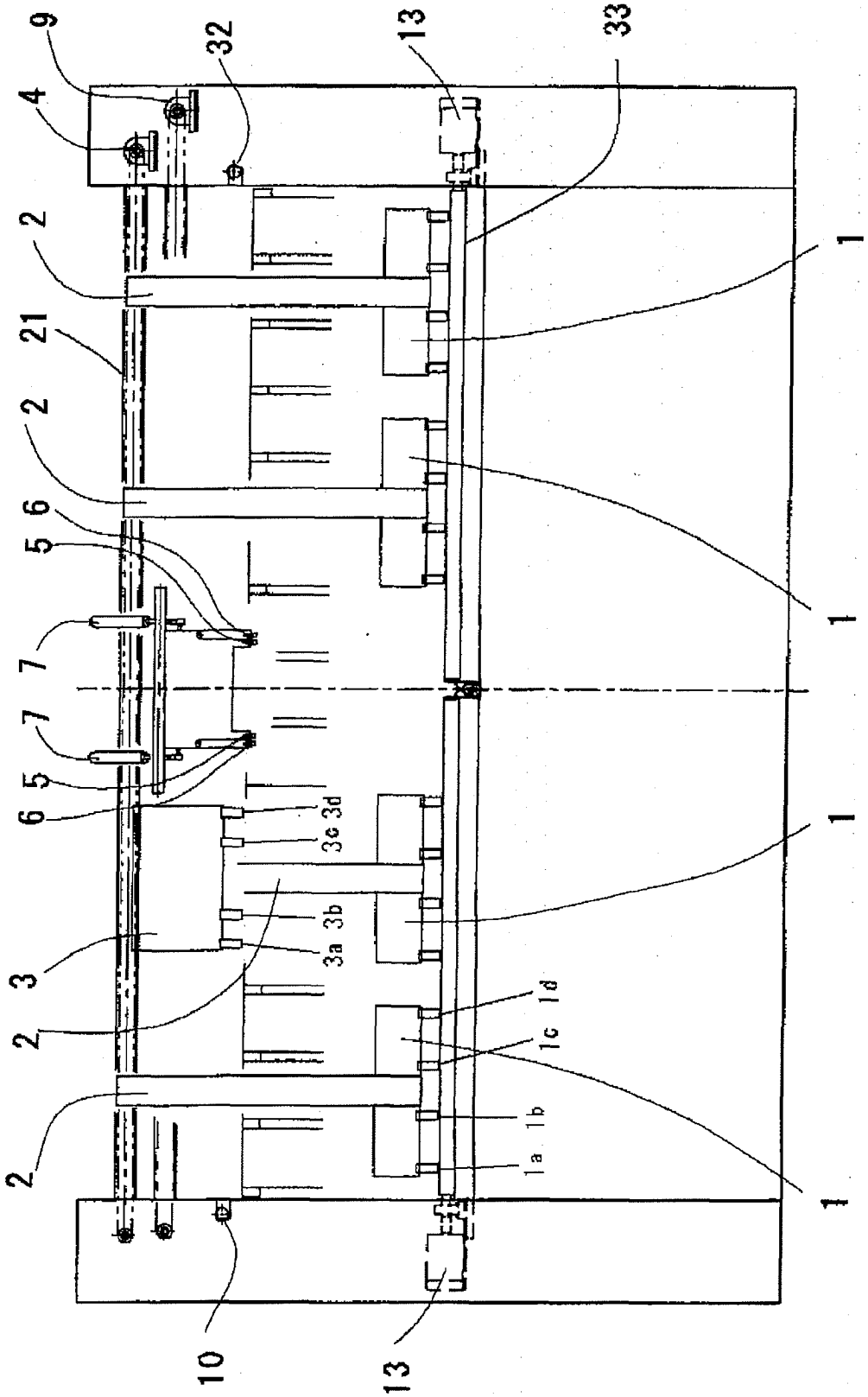


Fig. 2

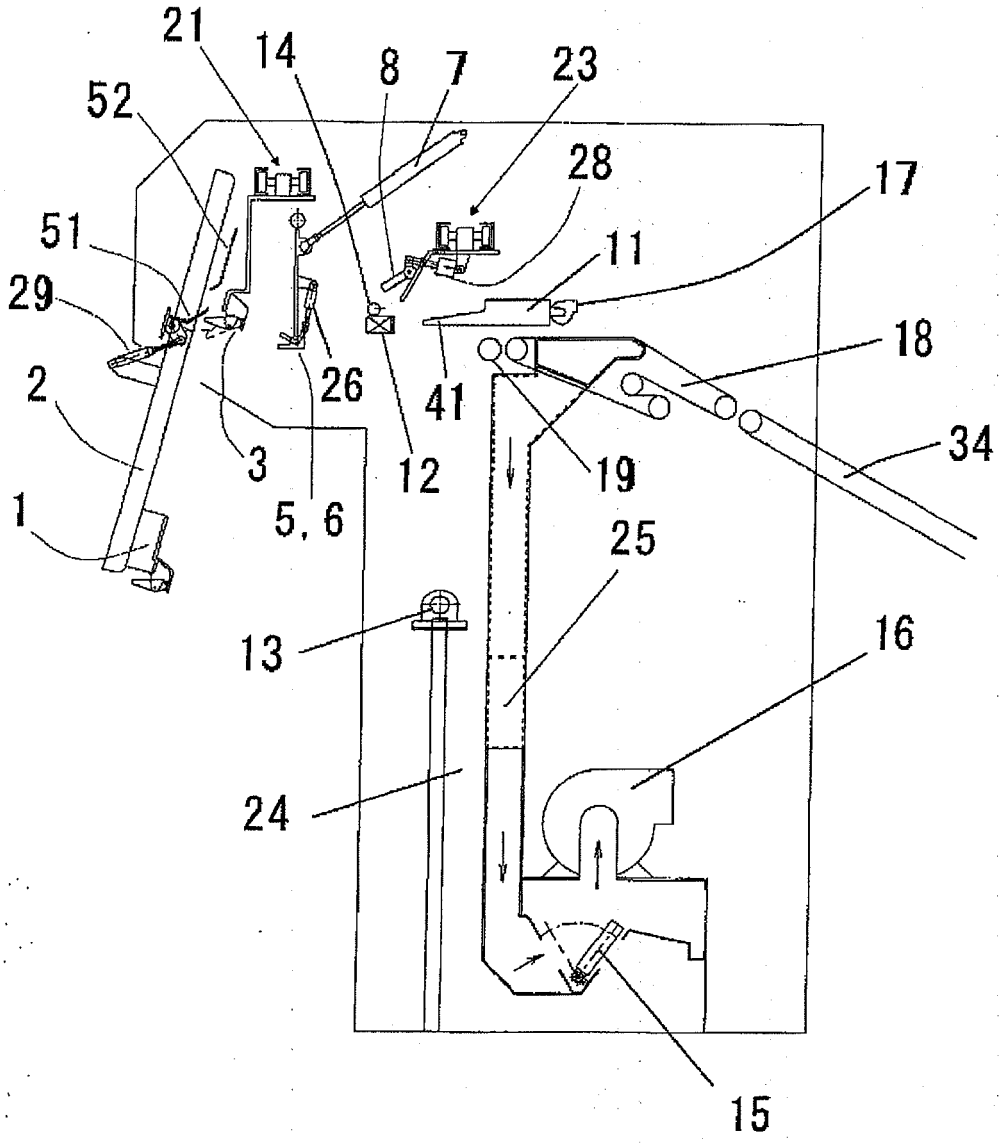


Fig. 3

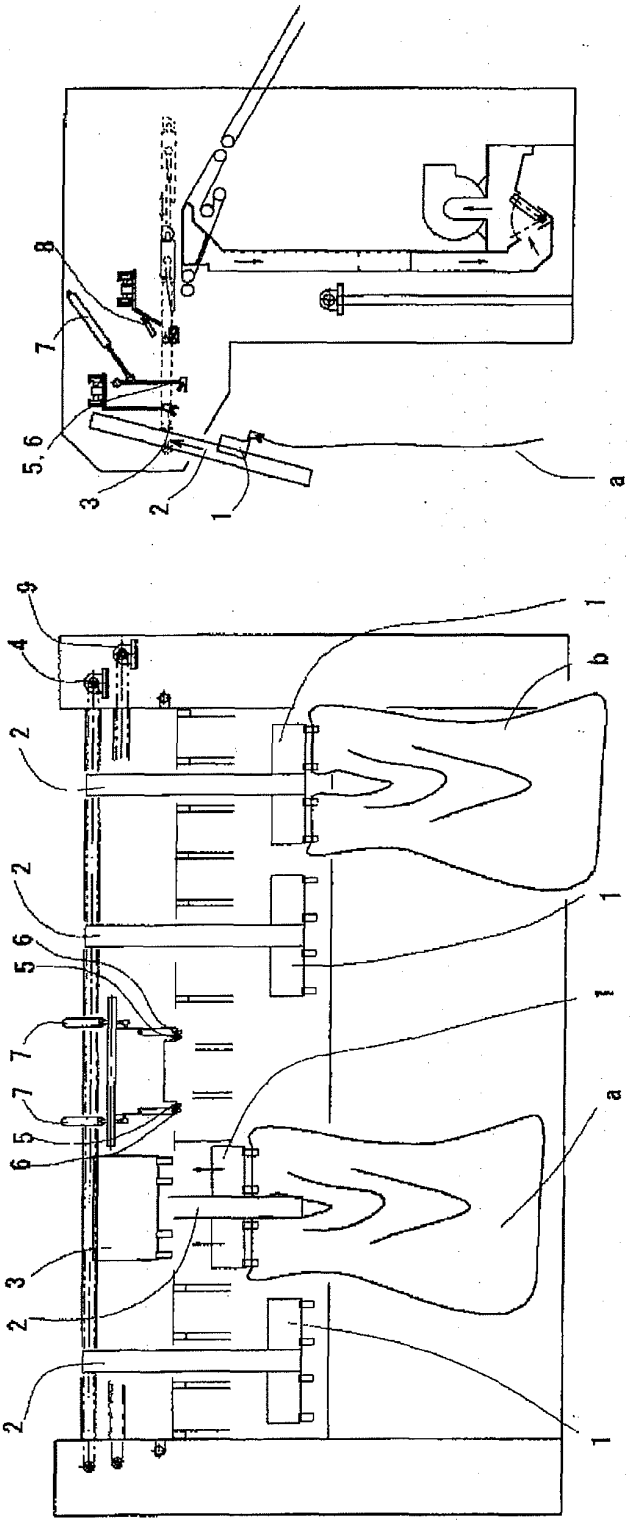


Fig. 4

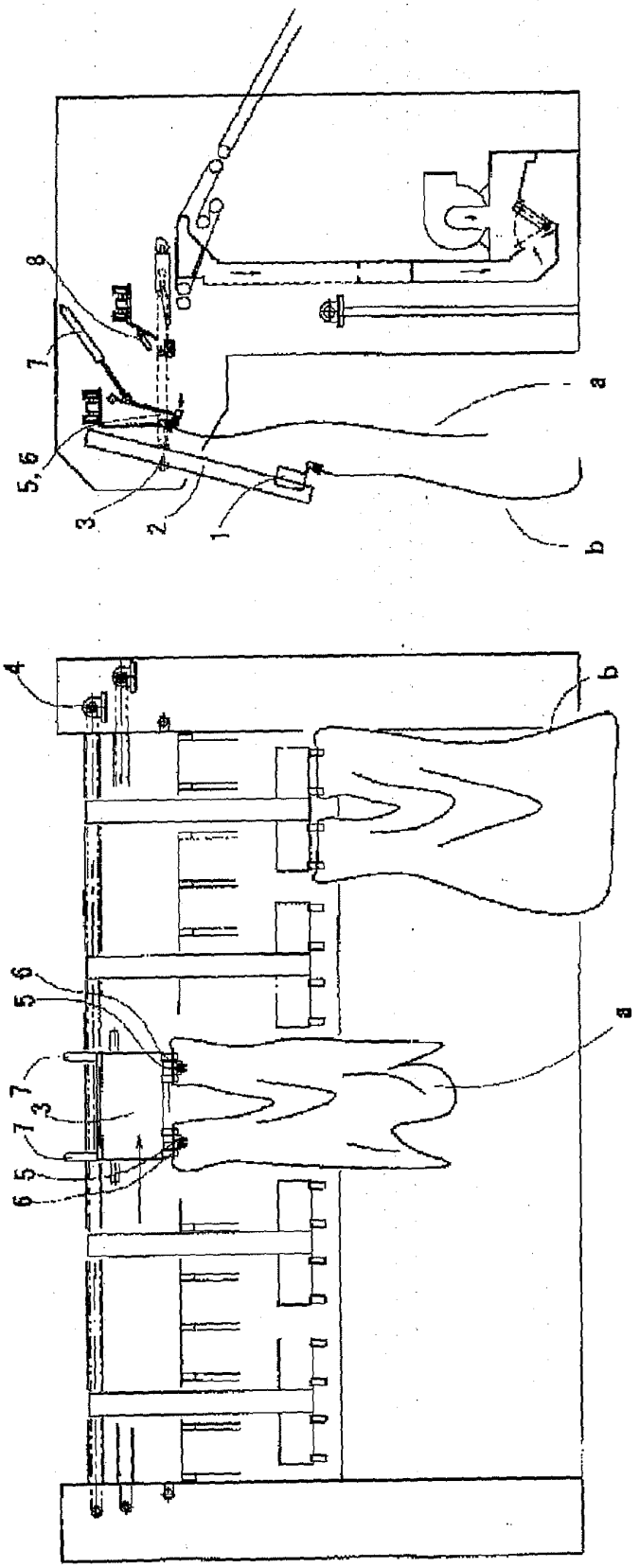


Fig. 6

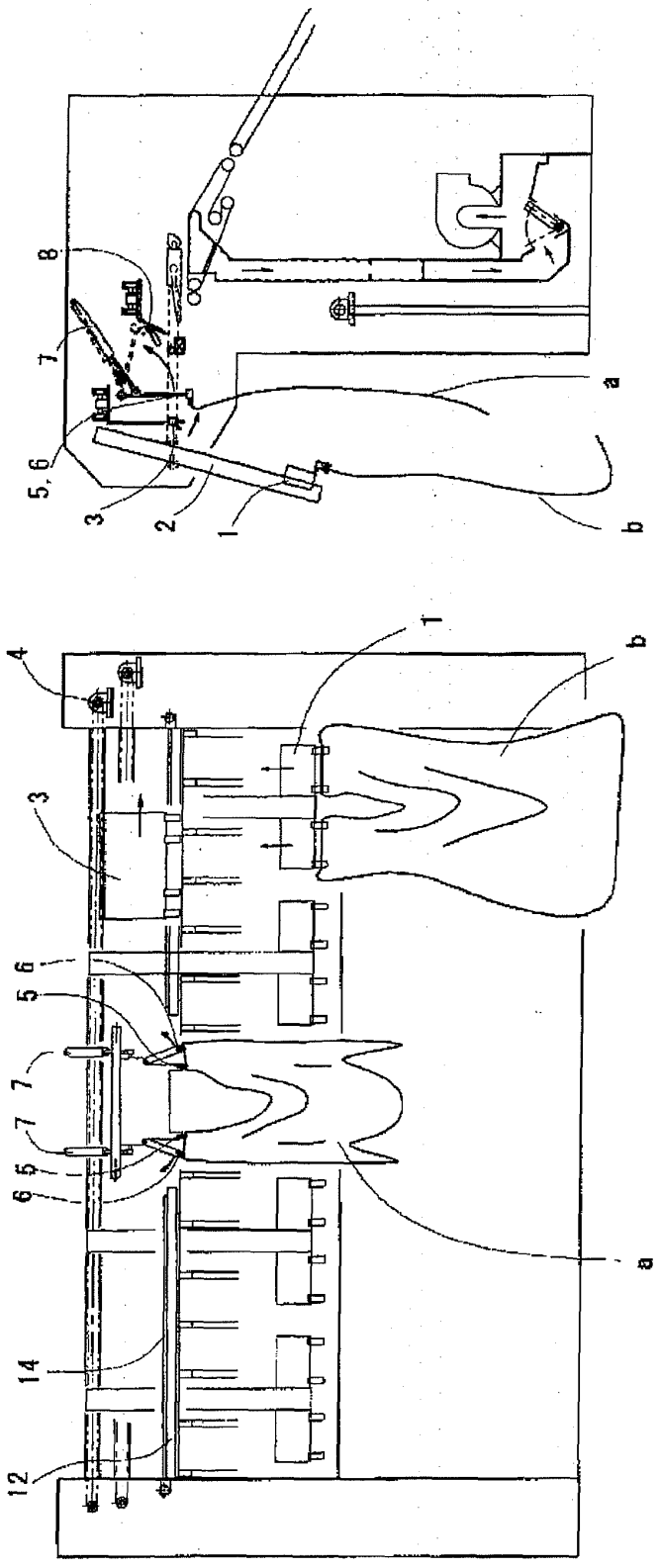


Fig. 6

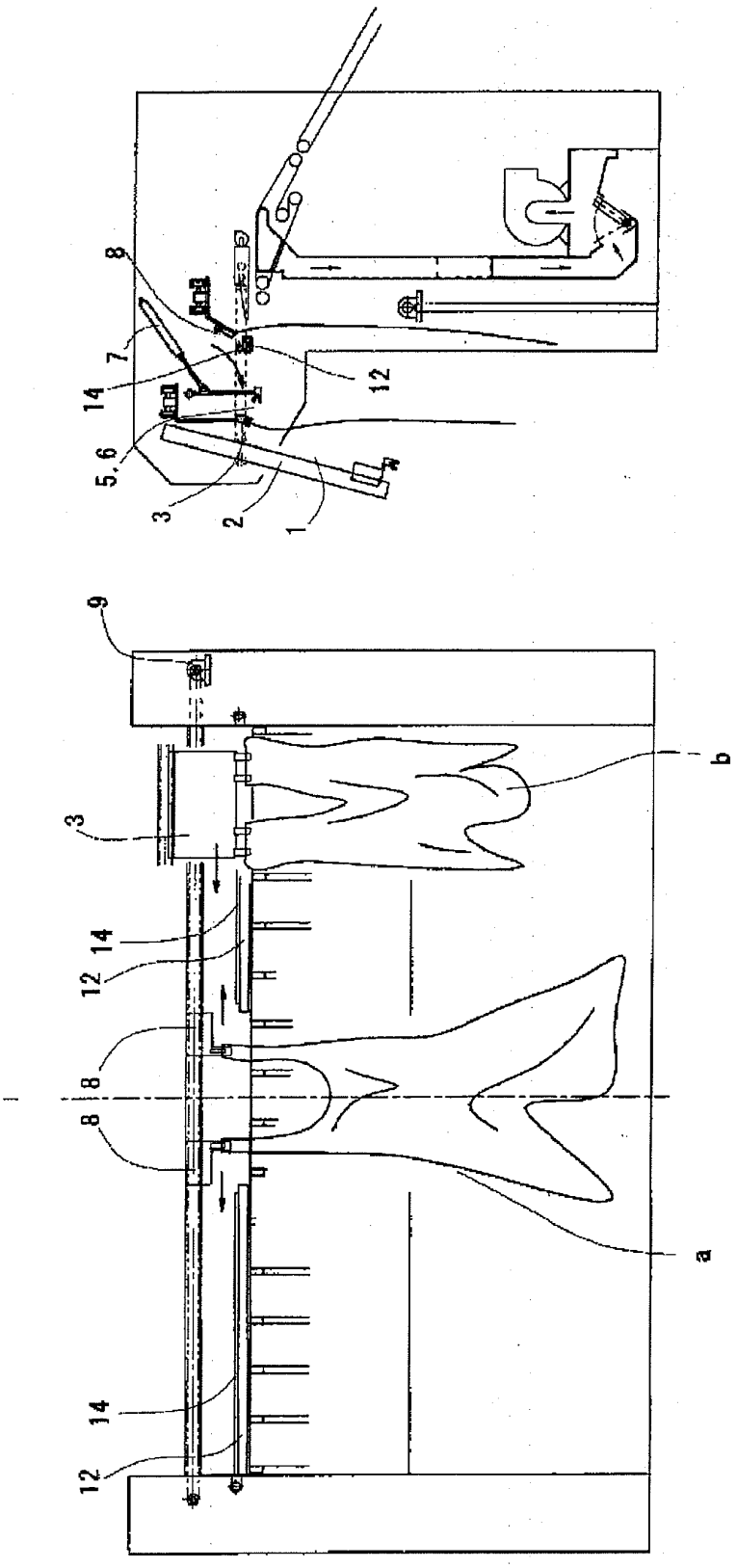


Fig. 7

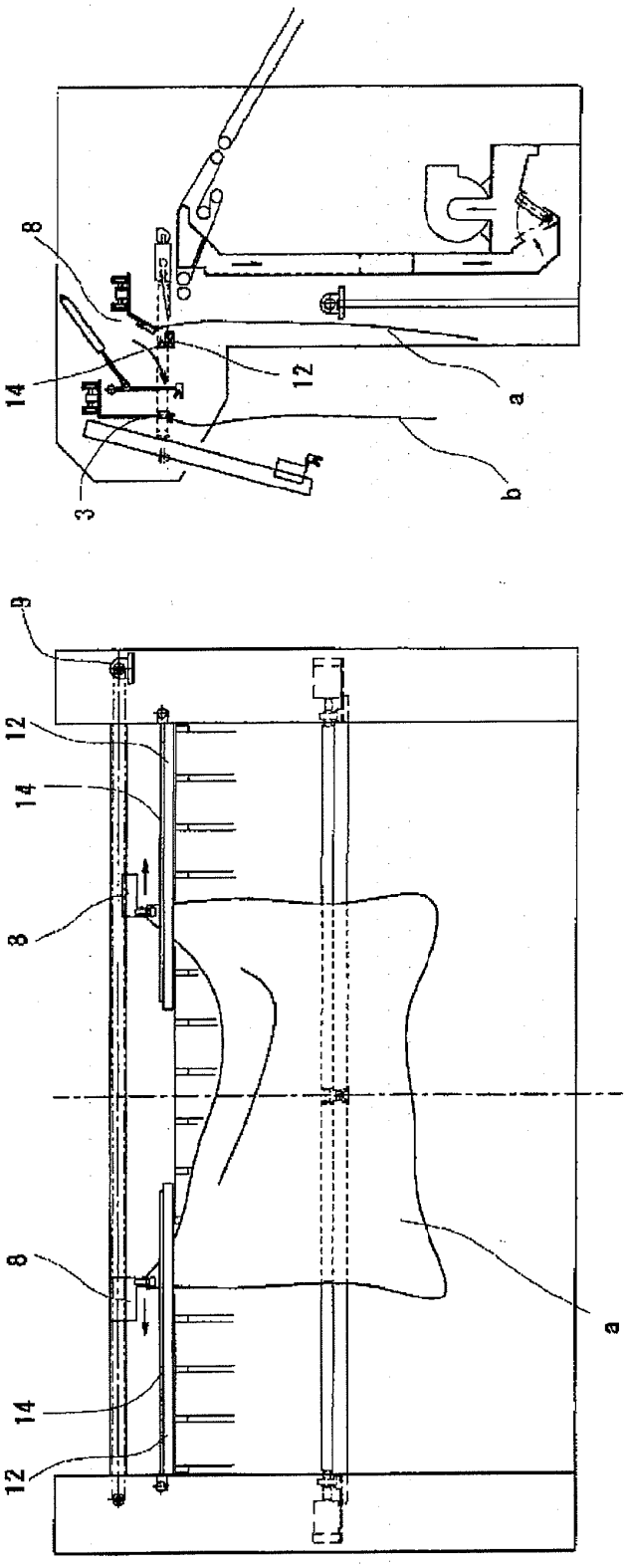


Fig. 8

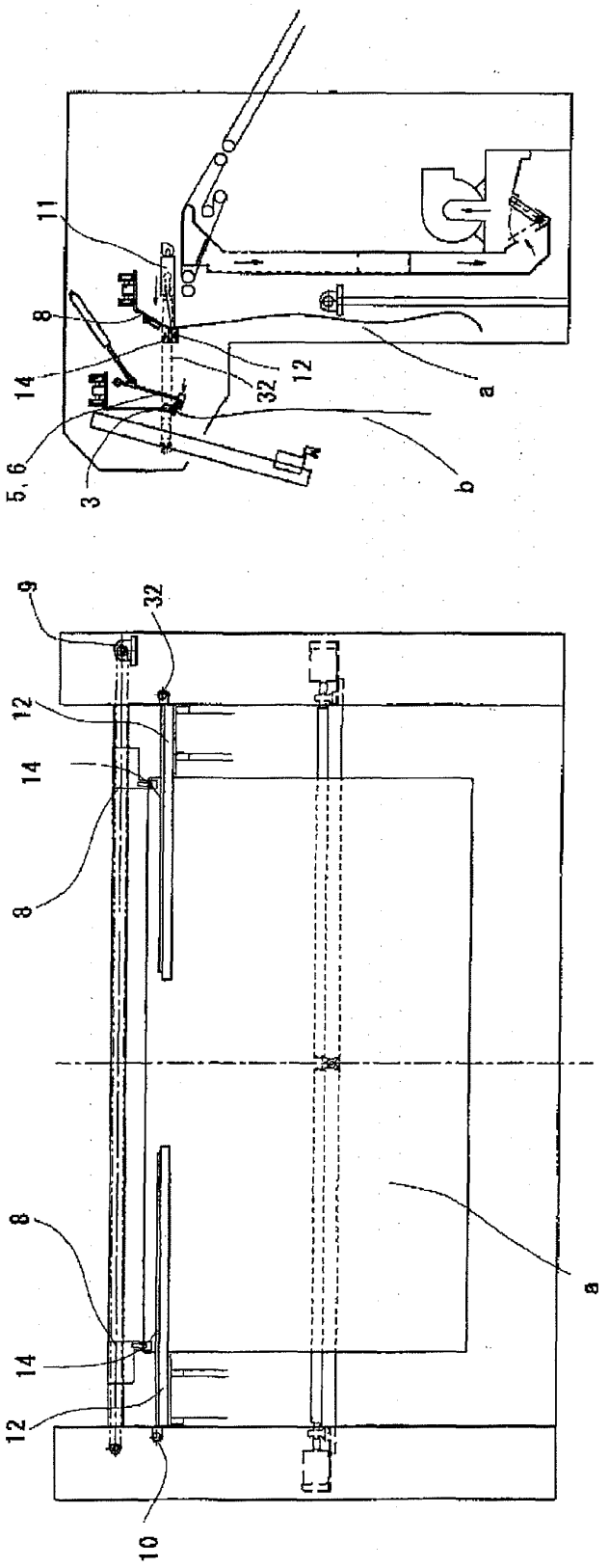


Fig. 9

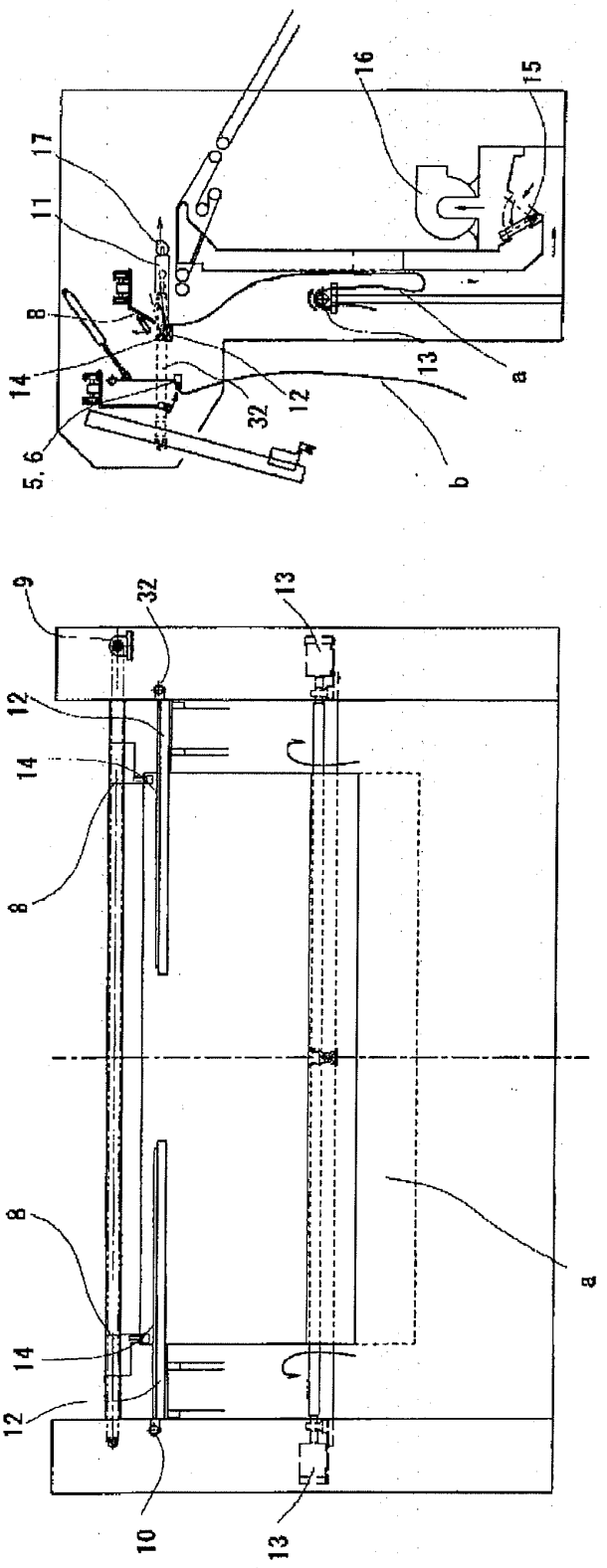


Fig. 10

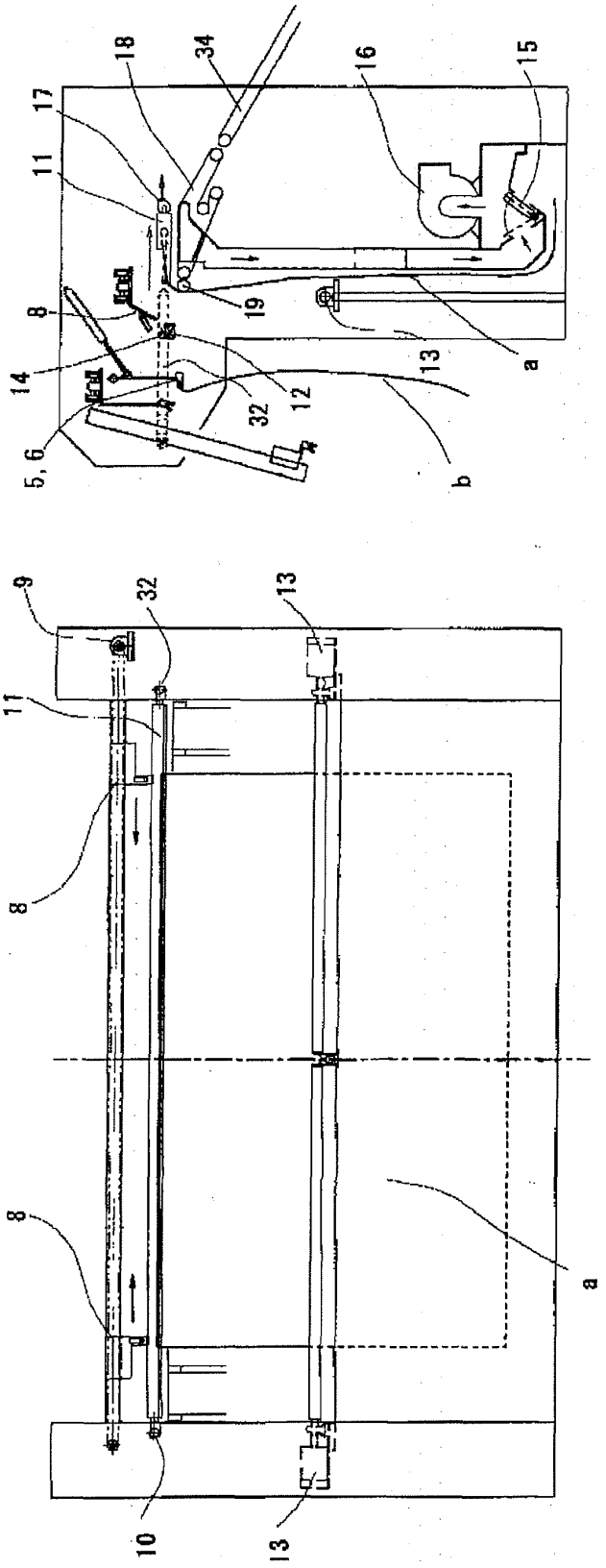
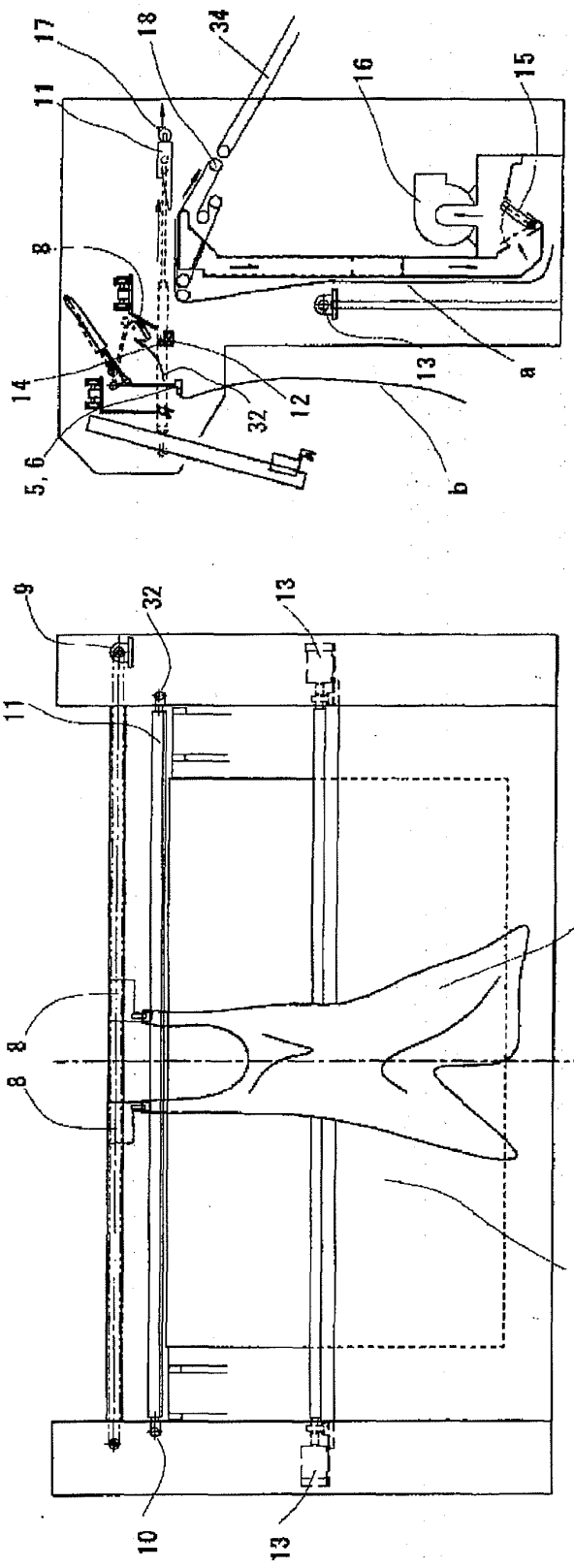


Fig. 11



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2005/018844

A. CLASSIFICATION OF SUBJECT MATTER
D06F67/04(2006.01), ***D06C3/00***(2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
D06F67/04(2006.01), ***D06C3/00***(2006.01)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2005
Kokai Jitsuyo Shinan Koho 1971-2005 Toroku Jitsuyo Shinan Koho 1994-2005

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2001-159067 A (Kabushiki Kaisha Tokai), 12 June, 2001 (12.06.01), Par. Nos. [0002] to [0003], [0017] to [0035] All drawings (Family: none)	1-11
A	JP 2004-162216 A (Kabushiki Kaisha Purekkusu), 10 June, 2004 (10.06.04), Par. Nos. [0003] to [0004], [0026] to [0036] All drawings (Family: none)	2-6,9-11

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
07 November, 2005 (07.11.05)	15 November, 2005 (15.11.05)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

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- JP H671098 A **[0005]**
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