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(54) Cloth take-up device of multiple-width loom

Tuchaufnahmeverrichtung einer Webmaschine mit mehreren Breiten

Dispositif d'enroulement de tissu sur métier à multiples largeurs

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a cloth take-up device used in a multiple-width loom that weaves two or more cloths.

2. Description of the Related Art

[0002] Hitherto, in order to, for example, increase productivity and reduce weaving costs, wide cloth looms that weave two or more cloths at the same time have been available. In the technical field of looms, looms that perform such weaving operations are ordinarily called multiple-width looms (double-width looms when the number of cloths to be woven is two (that is, when the cloths to be woven are double-width cloths)).

[0003] An example of such multiple-width looms is disclosed in, for example, Japanese Unexamined Patent Application Publication No. 2001-329453 (Patent Literature 1 (PTL 1)). However, the loom that is specifically described in PTL 1 is a double-width loom. The multiple-width loom is described in detail using the double-width loom described in PTL 1 as an example. In such a double-width loom, a warp row whose number of warps is twice the number of warps for a cloth serving as a product (may hereunder be referred to as "product cloth") is set. However, the warp row is set with an interval between the warps at a center thereof in a weaving-width direction (that is, an interval between two warps that are adjacent to each other) being slightly larger than an interval between the warps at other portions in the weaving-width direction. Using such a warp row, a cloth having a width that is double the width of a product cloth (such a cloth is hereunder referred to as "weave cloth" to distinguish it from a product cloth) is woven. Wefts of the weave cloth are cut at a center in the weaving-width direction to produce two divided product cloths. The two product cloths that have been woven at the same time in this way are sent towards a cloth take-up device and are each taken up by a take-up roller of the cloth take-up device.

[0004] Although not disclosed in PTL 1, in existing general multiple-width looms, a plurality of product cloths that have been woven in the above-described way are taken up by a single take-up roller of the cloth take-up device with their positions being shifted in the weaving-width direction.

[0005] Therefore, in existing multiple-width looms, winding creases occur, in particular, in product cloths at a side opposite to a weft-insertion side in a weft-insertion direction as the product cloths are being taken up. The reasons are as follows.

[0006] In recent general looms, a take-up roller of a cloth take-up device is rotationally driven while a driving torque is adjusted in correspondence with a winding di-

ameter of product cloths that have been taken up, that is, a winding diameter of wound cloths. In a taking up process, the take-up roller is rotationally driven by a driving torque that is in correspondence with the winding diameter of the wound cloths at a particular point of time among points of time. This causes product cloths formed consecutively with the wound cloths to be taken up around the wound cloths while a tension (pull tension) that is in correspondence with the driving torque is applied to the product cloths by the wound cloths. Therefore, the tension of the product cloths themselves is in correspondence with a pull force that is applied from the wound cloths. The relationship between the tension (pull force) and the driving torque of the take-up roller is $F = T/D$, where F is the tension, T is the driving torque, and D is the winding diameter. In this case, since the pull force that is generated in correspondence with the driving torque of the take-up roller is constant along the weaving-width direction of the cloths, the tension of the cloths themselves is thought to be also constant along the weaving-width direction.

[0007] However, in multiple-width looms that are wide cloth looms that weave a weave cloth having a width that is a multiple number of times the width of a product cloth, even if the pull force is constant along the weaving-width direction, the tension of the product cloth at the weft-insertion side in the weft-insertion direction and tension of the product cloth at the side opposite to the weft-insertion side in the weft-insertion direction may differ from each other.

[0008] This is thought to be because the tensions of the wefts woven into a weave cloth are such that the tension at a weft-insertion-side portion and the tension at a portion opposite to the weft-insertion side differ from each other. That is, when the loom is a wide cloth loom, the wefts in one weft insertion naturally become long. Therefore, the tension of the wefts at the weft-insertion side during a beating operation and the tension of the wefts at the side opposite to the weft-insertion side during the beating operation may differ from each other (that is, the tension at the side opposite to the weft-insertion side may be lower). Since the wefts are woven with the tensions being different in this way, the tension of a portion of the weave cloth at the weft-insertion side and the tension of a portion of the weave cloth at the side opposite to the weft-insertion side also differ from each other. Therefore, the tension of the product cloth at the weft-insertion side after a dividing operation and the tension of the product cloth at the side opposite to the weft-insertion side after the dividing operation become different from each other. Consequently, when such product cloths subjected to different tensions are taken up by a single take-up roller as has been conventionally done, the winding diameter and the winding hardness in a taken-up state of each product cloth differ. This causes winding creases to occur in either of the product cloths.

US patent 876,407 forming the closest prior art from which the present invention starts discloses a multiple-

width loom as defined in the preamble of claim 1 attached. Moreover, CH patent 331470 discloses a beaming machine for winding yarn and fabric sheets.

SUMMARY OF THE INVENTION

[0009] Accordingly, in view of the problems regarding existing multiple-width looms such as that described above, it is an object of the present invention to make it possible to prevent winding creases from occurring in each cloth that is taken up by a take-up roller in a multiple-width loom that weaves a plurality of product cloths at the same time.

[0010] According to the present invention, there is provided a multiple-width loom as defined in claim 1 that weaves two or more cloths and that comprises a cloth take-up device. The cloth take-up device includes a plurality of take-up rollers which are provided in correspondence with the two or more cloths, respectively, the number of the plurality of take-up rollers being the same as the number of the two or more cloths, the plurality of take-up rollers being provided at a take-up side of the loom such that axes of the plurality of take-up rollers are oriented in a width direction of the loom; wherein the cloth take-up device further includes a plurality of driving mechanisms that are provided in correspondence with the plurality of take-up rollers, respectively, each driving mechanism including a rotating shaft that is rotationally driven by a driving device and a driving transmission unit that is provided in correspondence with the corresponding take-up roller and that transmits rotation of the rotating shaft to the corresponding take-up roller. In the cloth take-up device, the plurality of driving mechanisms are capable of independently adjusting driving torques of the respective take-up rollers.

[0011] Regarding the arrangement of each of the take-up rollers according to the present invention, the phrase "axes of the plurality of take-up rollers being oriented in a width direction of the loom" encompasses not only the case in which the take-up rollers are coaxially provided, but also the case in which the take-up rollers are provided so as to be shifted from each other in an up-down direction and a front-back direction (direction that is orthogonal to the width direction among horizontal directions). In other words, the arrangement of the take-up rollers at a take-up side of the loom is not limited as long as the axes are oriented in the width direction of the loom.

[0012] In the present invention, each driving mechanism may further include a driving motor serving as the driving device. In this case, in addition to the plurality of take-up rollers and the driving mechanisms that are provided in correspondence with the take-up rollers, respectively, the cloth take-up device may further include a winding-diameter sensor that detects a winding diameter of a wound cloth on at least one of the plurality of take-up rollers and a driving controlling device for the driving motors of the respective driving mechanisms. Further, the driving controlling device may include a setting unit that,

for independently controlling the driving torque of each driving motor, sets, for each driving motor, a set value of a control parameter regarding the driving torque of the driving motor that has been set in correspondence with the winding diameter. Here, the phrase "control parameter regarding a driving torque" encompasses not only the driving torque of each driving motor itself, but also, for example, a parameter corresponding to the driving torque, such as tension (pull force) that is applied to a cloth by the rotation of each take-up roller that is driven by the driving motor.

[0013] According to the present invention, in the multiple-width loom, the plurality of woven cloths are taken up by the independently provided take-up rollers, and the driving torque of each take-up roller can be adjusted to a torque in which the tension of the corresponding cloth itself resulting from a weaving operation is considered. Therefore, it is possible to prevent winding creases from occurring in each cloth when each cloth is being taken up.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014]

Fig. 1 is a perspective view of an exemplary loom to which a cloth take-up device according to the present invention is applied;

Fig. 2A shows an exemplary cloth take-up device as seen from a downstream side in a direction of movement of a cloth;

Fig. 2B is a plan view of the exemplary cloth take-up device;

Fig. 3A is a sectional view taken along line IIIA-III A in Fig. 2A;

Fig. 3B is a sectional view taken along line IIIB-IIIB in Fig. 2A;

Fig. 4A is a plan view for illustrating in detail a driving mechanism used in the exemplary cloth take-up device;

Fig. 4B is a sectional view taken along line IVB-IVB in Fig. 2A;

Fig. 5 is a block diagram of a control structure in the exemplary cloth take-up device;

Fig. 6 shows an example of a setting screen regarding each driving motor used in the exemplary cloth take-up device;

Fig. 7 is a side view of a portion of another example of each driving mechanism used in the cloth take-up device;

Fig. 8A is a side view of a different portion of each driving mechanism shown in Fig. 7; and

Fig. 8B is a plan view including a section taken along line VIIIB-VIIIB in Fig. 8A.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0015] As shown in Fig. 1, in an embodiment, a loom 1 to which a cloth take-up device 11 according to the

present invention is applied is a double-width loom. Therefore, a warp row 2a that is let off from a warp let-off device (not shown) includes warps 2 such that the number of warps 2 is twice the number of warps required for weaving each product cloth 7b. Regarding the warp let-off device, since the number of warps is large as mentioned above, for example, the following types may be used. Such examples include a type that lets off warps at the same time from a plurality of (such as two) warp beams and a type in which yarns are drawn out as warps from a creel on which weft supply packages are set (the number of weft packages being the same as the number of warps) and formed into a sheet, and the warps that are aligned in the form of the sheet are let off by a let-off mechanism including, for example, a let-off roller and provided at a body (weaving section) of the loom.

[0016] The warp row 2a is set at the loom 1 so that an interval between the warps 2 and 2 at a center in a weaving-width direction is slightly larger than an interval between the warps 2 and 2 at other portions in the weaving-width direction. The warps 2 at such a warp row 2a are shifted in an up-down direction by a heald frame 3, to form a warp shed. Wefts 4 having a length that corresponds to the width of the warp row 2a are inserted into the warp shed by a weft-insertion device (not shown), and the inserted wefts 4 are beaten with respect to a cloth fell 6 by a reed 5 and woven in the warp row 2a, so that a weave cloth 7a is formed. The weave cloth 7a that has been formed in this way is, at a side that is downstream from the cloth fell 6 in a cloth movement direction (hereunder simply referred to as "downstream side"), wound upon a surface roller 8 and a pair of press rollers 9 and 9 (provided so as to press-contact the surface roller 8) by being nipped by the surface roller 8 and the press rollers 9 and 9. By driving the surface roller 8 by a take-up motor (not shown), the weave cloth 7a is sent towards the cloth take-up device 11.

[0017] In the embodiment, the cloth take-up device 11 is a separate take-up device that exists independently of the body (weaving section) of the loom 1. Therefore, a first guide roller 10a for changing a cloth path direction towards the cloth take-up device 11 is provided. The weave cloth 7a is, at the downstream side (for example, at a location between the downstream-side press roller 9 and the first guide roller 10a), cut into two cloths, that is, a product cloth 7b and a product cloth 7b, by a cutting device (not shown). The cutting device is provided at a central position of the weave cloth 7a in a width direction of the loom 1, that is, at a position where the interval between the warps 2 in the warp row 2a described above is large). In the present application, the phrase "width direction of the loom" refers to a direction that is the same as a weft-insertion direction, and that is orthogonal to a warp direction. The width direction of the loom may hereunder be simply referred to as "width direction". Each product cloth 7b that has been formed by cutting the weave cloth 7a are wound upon the first guide roller 10a, has its path direction changed towards the cloth take-up

device 11, and is sent to the cloth take-up device 11.

[0018] As shown in Figs. 2 to 4B, the cloth take-up device 11 is disposed apart from the body of the loom 1 in the cloth movement direction with its width-direction position being aligned with the body of the loom 1. The cloth take-up device 11 includes a body frame 12, two take-up rollers 21 and 22, two driving mechanisms 23 and 23, and two winding-diameter sensors 21s and 22s. The take-up rollers 21 and 22 are installed in the body frame 12, and are associated with the two product cloths 7b and 7b, respectively. The driving mechanisms 23 and 23 independently drive the two take-up rollers (that is, the first take-up roller 21 and the second take-up roller 22), respectively. The winding-diameter sensor 21s detects the winding diameter of the product cloth (wound cloth) 7b that has been taken up by the take-up roller 21. The winding-diameter sensor 22s detects the winding diameter of the product cloth (wound cloth) 7b that has been taken up by the take-up roller 22. Fig. 2A shows only one of the two driving mechanisms 23 and 23. Fig. 3A is a sectional view taken along line IIIA-IIIA in Fig. 2A. Fig. 3B is a sectional view taken along line IIIB-IIIB in Fig. 2A. Figs. 4A and 4B illustrate the driving mechanisms 23 in detail. Fig. 4A is a plan view. Fig. 4B is a sectional view taken along line IVB-IVB in Fig. 2A.

[0019] In the illustrated embodiment, the body frame 12 is formed by connecting a pair of main side walls 13a and 13b with three beam members 14, 14, and 14. The main side walls 13a and 13b are spaced apart from each other in the width direction. The body frame 12 also has a first intermediate wall 15 and a second intermediate wall 16. The first intermediate wall 15 is provided at a location situated towards an inner side of the main side wall 13a in the width direction and supports the take-up rollers 21 and 22 at one end. As mentioned below, the second intermediate wall 16 is provided between the first intermediate wall 15 and the main side wall 13b in the width direction and supports the second take-up roller 22 at the other end.

[0020] As described above, in the embodiment, the cloth take-up device 11 includes the first take-up roller 21 and the second take-up roller 22, which are provided between the main side walls 13a and 13b of the body frame 12. In the embodiment, in the width direction, the first take-up roller 21 is used for taking up the product cloth 7b that is positioned at a side of the main side wall 13b, and the second take-up roller 22 is used for taking up the product cloth 7b that is positioned at a side of the main side wall 13a.

[0021] Both of the take-up rollers 21 and 22 are disposed at corresponding positions in a front-back direction. In the up-down direction, the take-up rollers 21 and 22 are disposed so that the first take-up roller 21 is disposed above and the second take-up roller 22 is disposed below an intermediate position of the main side wall 13a and an intermediate position of the main side wall 13b in the up-down direction. As described below, in the embodiment, the first take-up roller 21 and the second take-

up roller 22 are connected to the corresponding driving mechanisms 23 at one side (at the aforementioned one end) in the width direction, and are rotationally driven. Therefore, both of the take-up rollers 21 and 22 are supported by the first intermediate wall 15 at the aforementioned one end.

[0022] The first take-up roller 21 is supported by the main side wall 13b at the other end. That is, as described above, the first take-up roller 21 is used for taking up the product cloth 7b that is positioned at the side of the main side wall 13b (that is, on the right side in Fig. 2) in the width direction. Therefore, it is necessary to extend the first take-up roller 21 to the main side wall 13b. To achieve this, the first take-up roller 21 is supported by the main side wall 13b at the other end. Consequently, the first take-up roller 21 has a length extending from the position where it is supported by the first intermediate wall 15 to the position where it is supported by the main side wall 13b.

[0023] In contrast, the second take-up roller 22 is supported by the second intermediate wall 16 at the other end. That is, as described above, the second take-up roller 22 is used for taking up the product cloth 7b that is positioned at the side of the main side wall 13a (that is, on the left side in Fig. 2) in the width direction. Therefore, unlike the first take-up roller 21, it is not necessary to extend the second take-up roller 22 to the main side wall 13b. Accordingly, in order to, for example, facilitate handling, the length of the second take-up roller 22 is shorter than the length of the first take-up roller 21. Therefore, the second take-up roller 22 is supported at the other end by the second intermediate wall 16 that is provided at the aforementioned position in the width direction. The range of existence of the second take-up roller 22 in the width direction is set so that the center of the product cloth 7b that is positioned at the side of the main side wall 13a is aligned with the center of the second take-up roller 22 in a longitudinal direction thereof. Accordingly, the position of the second intermediate wall 16 in the width direction is set.

[0024] The first take-up roller 21 is supported by the intermediate wall 15 and the main side wall 13b by a pair of shafts 21a and 21a at respective ends of the first take-up roller 21. The second take-up roller 22 is supported by the intermediate wall 15 and the intermediate wall 16 by a pair of shafts 22a and 22a at respective ends of the second take-up roller 22.

[0025] Two supporting brackets 17 and 17 are secured to the first intermediate wall 15 at positions that correspond to the positions of the take-up rollers 21 and 22. Each supporting bracket 17 includes a plate-shaped base section 17a and a plate-shaped mounting section 17b that is formed so as to protrude from a lower surface of the base section 17a. However, each mounting section 17b is formed so as to extend in a direction orthogonal to the lower surface of the base section 17a and in a width direction of the base section 17a (that is, the front-back direction of the loom). Each supporting bracket 17

is secured to the first intermediate wall 15 with an end surface of the mounting section 17b being in contact with an inner-side surface of the first intermediate wall 15 in a width direction thereof. Through windows 15a having a width that allows the base sections 17a of the respective supporting brackets 17 to pass therethrough are formed in the first intermediate wall 15 in accordance with mounting positions of the respective supporting brackets 17. With the supporting brackets 17 being mounted on the first intermediate wall 15 as described above, the base sections 17a of the respective supporting brackets 17 extend through the respective through windows 15a. That is, the base sections 17a of the respective supporting brackets 17 are provided so as to protrude from both sides of the first intermediate wall 15 in the width direction.

[0026] In addition, a supporting mechanism 18a that supports the shaft 21a at the one end of the take-up roller 21 is provided so as to be placed on the upper surface of the base section 17a of the supporting bracket 17 provided in correspondence with the position of the supporting mechanism 18a; and a supporting mechanism 18b that supports the shaft 22a at the one end of the take-up roller 22 is provided so as to be placed on the upper surface of the base section 17a of the supporting bracket 17 provided in correspondence with the position of the supporting mechanism 18b. A supporting mechanism 18c is secured to an inner-side surface of the main side wall 13b in the width direction by, for example, a bracket 18h at a location that is in correspondence with the position of the first take-up roller 21. The supporting mechanism 18c supports the shaft 21a at the other end of the first take-up roller 21. Further, a supporting mechanism 18d is secured to a surface of the second intermediate wall 16 at a side of the main side wall 13a by, for example, a bracket 18i at a location that is in correspondence with the position of the second take-up roller 22. The supporting mechanism 18d supports the shaft 22a at the other end of the second take-up roller 22. In Fig. 3B, the brackets 18h and 18i are not shown.

[0027] The supporting mechanisms 18a to 18d are as shown in, for example, Fig. 3. In the illustrated embodiment, each of the supporting mechanisms 18a to 18d includes a roller support 18m and a clamp lever 18r. Each roller support 18m has an arc-shaped receiving section 18n that receives the corresponding one of the shaft 21a of the take-up roller 21 and the shaft 22a of the take-up roller 22. Each clamp lever 18r is used for maintaining the position of the corresponding one of the shaft 21a of the take-up roller 21 and the shaft 22a of the take-up roller 22 that has been received by the receiving section 18n of the corresponding roller support 18m. The shafts 21a at the respective ends of the take-up roller 21 are received by the receiving sections 18n of the roller supports 18m of the corresponding supporting mechanisms 18a and 18c; the shafts 22a at the respective ends of the take-up roller 22 are received by the receiving sections 18n of the roller supports 18m of the corresponding sup-

porting mechanisms 18b and 18d; and the positions of the take-up rollers 21 and 22 are maintained by the clamp levers 18r. By this, the take-up roller 21 is supported by the intermediate wall 15 and the main side wall 13b, and the take-up roller 22 is supported by the intermediate walls 15 and 16. Bearings 21b are fitted to and mounted on the shafts 21a at the respective ends of the take-up roller 21. Bearings 22b are fitted to and mounted on the shafts 22a at the respective ends of the take-up roller 22. The shafts 21a are supported by the supporting mechanisms 18a and 18c using the bearings 21b. The shafts 22a are supported by the supporting mechanisms 18b and 18d using the bearings 22b. Therefore, the take-up rollers 21 and 22 are rotatable while being supported as described above.

[0028] In the cloth take-up device 11, a second guide roller 10b and a third guide roller 10c that guide the product cloths 7b are provided so as to be installed between the first intermediate wall 15 and the main side wall 13b. In the front-back direction, the second guide roller 10b and the third guide roller 10c are provided at corresponding positions and closer to the body of the loom 1 than the first take-up roller 21 and the second take-up roller 22. Below the second take-up roller 22 in the up-down direction, the second guide roller 10b is disposed at the same height as the first guide roller 10a. Above the second guide roller 10b in the up-down direction, the third guide roller 10c is provided between the first take-up roller 21 and the second take-up roller 22. Each product cloth 7b that has been sent towards the cloth take-up device 11 via the first guide roller 10a at the body of the loom 1 is wound upon the second guide roller 10b and has its path direction changed towards the third guide roller 10c. Then, the product cloths 7b are wound upon the third guide roller 10c, and are guided towards the corresponding take-up rollers 21 and 22.

[0029] As shown in Fig. 4A, the driving mechanisms 23 provided in correspondence with the positions of the take-up rollers 21 and 22, respectively, each include one driving motor M as a driving device and a driving transmission mechanism 24 for transmitting rotation of an output shaft Ma of the corresponding driving motor M to the corresponding one of the take-up rollers 21 and 22. In Fig. 4B, the driving motor corresponding to the first take-up roller 21 is represented by symbol M1 and the output shaft of the driving motor M1 is represented by symbol M1a; and the driving motor corresponding to the second take-up roller 22 is represented by symbol M2 and the output shaft of the driving motor M2 is represented by symbol M2a, to distinguish between the driving motors and between the output shafts. However, unless it is necessary to distinguish between them, in the description below, referring to Fig. 4A, the driving motors are represented by the same symbol M, and the output shafts of the driving motors M are represented by the same symbol Ma, and described. Excluding the arrangement in the up-down direction, the driving mechanisms 23 have basically the same structure. Therefore, only one of the driving

mechanisms (not specified) is described below.

[0030] The motor M is a servo motor or a torque motor whose torque is controllable. The driving motor M is provided such that, at a location between the main side wall 13a and the first intermediate wall 15 in the width direction, the direction of the output shaft Ma is in the width direction, and the output shaft Ma faces the main side wall 13a. In the embodiment, as illustrated, the driving motor M is provided at substantially the same height as the corresponding one of the take-up rollers 21 and 22 in the up-down direction. In addition, in the above-described arrangement, the motor M is supported between the main side wall 13a and the first intermediate wall 15 using a support beam 19a and a bracket 19b.

[0031] More specifically, the support beam 19a that is rectangular in cross section is provided between the main side wall 13a and the first intermediate wall 15 so as to be positioned at a side opposite to the take-up roller with respect to the driving motor M in the front-back direction at the same height as the driving motor M disposed in the above-described way. The bracket 19b including two plate-shaped portions 19c and 19d that are combined into an L shape and integrated to each other is secured to the support beam 19a. The bracket 19b is secured to the support beam 19a such that an end surface of one of the two plate-shaped portions 19c and 19d (that is, the plate-shaped portion 19c) contacts a take-up-roller-side side surface of the support beam 19a and such that the other plate-shaped portion 19d extends towards the take-up roller from the support beam 19a in the front-back direction. In addition, the driving motor M is secured to the plate-shaped portion 19d of the bracket 19b.

[0032] The driving transmission mechanism 24 includes a motor pulley 25, which is mounted so as to be incapable of rotating relative to the output shaft Ma of the driving motor M; a first driven shaft 26 and a second driven shaft 27, which extend between the main side wall 13a and the first intermediate wall 15 and which are rotatably supported; and a gear train 30 including a plurality of gears for transmitting rotation of the motor pulley 25 (the output shaft Ma of the driving motor M) to the second driven shaft 27.

[0033] The first driven shaft 26 is installed between the main side wall 13a and the first intermediate wall 15 with an axis 26L extending in the width direction at a position that is situated slightly below the driving motor M in the up-down direction and that is substantially intermediate between the driving motor M and the corresponding one of the take-up rollers 21 and 22 in the front-back direction. The first driven shaft 26 is rotatably supported by bearings 26b at both end portions thereof. The bearings 26b are provided at an inner-side surface of the main side wall 13a in the width direction and a main-side-wall-13a-side surface of the first intermediate wall 15, respectively. The bearings 26b are provided at inner sides of bearings 26a.

[0034] At a position where an axis 27L is aligned with an axis 21L of the take-up roller 21 or an axis 22L of the

take-up roller 22 as seen in the width direction, one end portion of the second driven shaft 27 is supported at the main side wall 13a, and an intermediate portion of the second driven shaft 27 is rotatably supported by the supporting bracket 17. More specifically, the one end portion of the second driven shaft 27 is rotatably supported by a bearing 27b that is provided at the inner-side surface of the main side wall 13a in the width direction and that is provided at the inner side of a bearing 27a. The intermediate portion of the second driven shaft 27 is rotatably supported by a bearing member 28 that is provided on the supporting bracket 17 and that is provided at an inner side of a bearing 28a. More specifically, the bearing member 28 that is provided at the inner side of the bearing 28a is mounted on the upper surface of a portion of the base 17a of the supporting bracket 17 that protrudes towards the main side wall 13a from the first intermediate wall 15. The intermediate portion of the second driven shaft 27 is rotatably supported by the bearing member 28.

[0035] The second driven shaft 27 has a length that is longer than the distance between the main side wall 13a and the first intermediate wall 15. Therefore, in a state in which one end of the second driven shaft 27 is supported by the main side wall 13a as described above, the second driven shaft 27 extends through the through window 15a of the first intermediate wall 15 and protrudes towards the corresponding take-up roller from the first intermediate wall 15. An end of a portion of the second driven shaft 27 that protrudes towards the corresponding take-up roller from the first intermediate wall 15 is connected to the corresponding one of the shaft portion 21a (at the one end) of the take-up roller 21 and the shaft portion 22a (at the one end) of the take-up roller 22 by, for example, a coupling mechanism (not shown). However, for example, the coupling mechanism has a structure that allows the second driven shaft 27 to be disconnected from the corresponding one of the shaft portion 21a of the take-up roller 21 (at the one end) and the shaft portion 22a (at the one end) of the take-up roller 22.

[0036] The gear train 30 includes a first gear 30a and a second gear 30b, which are mounted so as to be incapable of rotating relative to the first driven shaft 26, and a third gear 30c, which is mounted so as to be incapable of rotating relative to the second driven shaft 27. The first gear 30a is a gear having a diameter that is larger than that of the motor pulley 25, is secured to the first driven shaft 26 at a position corresponding to that of the motor pulley 25 in an axial direction (width direction) of the first driven shaft 26, and is provided so as to engage with the motor pulley 25. The second gear 30b is a gear having a diameter that is smaller than that of the first gear 30a and that is larger than that of the motor pulley 25, and is secured to the first driven shaft 26 at a side that is closer to the first intermediate wall 15 than the first gear 30a in the axial direction of the first driven shaft 26. The third gear 30c is a gear having a diameter that is the same as that of the first gear 30a, is secured to the second driven shaft 27 at a position corresponding to that of the second

gear 30b in an axial direction (width direction) of the second driven shaft 27, and is provided so as to engage with the second gear 30b.

[0037] By virtue of the structure of the driving transmission mechanism 24 described above, rotation of the output shaft Ma of the driving motor M is transmitted to the first driven shaft 26 via the motor pulley 25 and the first gear 30a, so that the first driven shaft 26 is rotationally driven by the driving motor M serving as a driving device. Consequently, the first driven shaft 26 corresponds to what is called a "rotating shaft" in the driving mechanism 23 in the present invention. Rotation of the first driven shaft 26 serving as the rotating shaft is transmitted to the corresponding one of the take-up roller 21 and the take-up roller 22 via the second gear 30b, the third gear 30c, and the second driven shaft 27. Thus, a combination of the second gear 30b, the third gear 30c, and the second driven shaft 27 corresponds to what is called "driving transmission unit" in the driving mechanism 23 in the present invention. By these structural components, the rotation of the output shaft Ma of the driving motor M is transmitted to the corresponding one of take-up rollers 21 and 22 via the rotating shaft and the driving transmission unit. This causes the corresponding one of the take-up rollers 21 and 22 to be rotationally driven.

[0038] In the exemplary embodiment, the winding-diameter sensors are provided in correspondence with the take-up rollers 21 and 22, respectively. In other words, as shown in Figs. 3A and 3B, the cloth take-up device 11 according to the embodiment includes two winding-diameter sensors 21s and 22s that detect the winding diameters of the two take-up rollers 21 and 22, respectively. The winding-diameter sensors 21s and 22s are disposed at locations that are behind (towards the guide rollers) and below the corresponding take-up rollers 21 and 22, and are provided such that the axes of the take-up rollers 21 and 22 are directed by, for example, support stays 22x. More specifically, the winding-diameter sensor 21s for the first take-up roller 21 is supported by, for example, the support stay (not shown) mounted on a main-side-wall-13b-side surface of the second intermediate wall 16. The winding-diameter sensor 22s for the second take-up roller 22 is supported by the beam members 14 using the support stay 22x at a position that is towards the second intermediate wall 16 between the second intermediate wall 16 and the first intermediate wall 15 in the width direction.

[0039] As shown in Figs. 5 and 6, in the embodiment, a driving controlling device 31 for controlling drivings of the respective driving motors M1 and M2 is provided in common for both of the driving motors M1 and M2. In other words, the cloth take-up device 11 according to the embodiment includes one common driving controlling device 31 for the two driving motors M1 and M2. The driving motors M1 and M2 are controlled by the common driving controlling device 31. The driving controlling device 31 includes a cloth winding driving controlling unit 32 and a storage unit 33 serving as a setting unit. The

cloth winding driving controlling unit 32 and the storage unit 33 are connected to each other, so that exchange of signals can be performed therebetween.

[0040] An input port of the cloth winding driving controlling unit 32 is connected to a loom controlling device 35. An encoder EN that detects rotation of a main shaft 34 of the loom 1 is connected to the loom controlling device 35. The loom controlling device 35 detects the rotation speed of the main shaft 34 on the basis of a signal from the encoder EN. The loom controlling device 35 outputs to the cloth winding driving controlling unit 32 a rotation speed signal r indicating the detected rotation speed of the main shaft 34. Input ports of the cloth winding driving controlling unit 32 are connected to the winding-diameter sensors 21s and 22s. Winding-diameter signals $d1$ and $d2$ corresponding to the winding diameters of the cloths that are taken up by the respective take-up rollers are input from the winding-diameter sensors 21s and 22s.

[0041] On the basis of the winding-diameter signals $d1$ and $d2$, the cloth winding driving controlling unit 32 detects the winding diameters of cloths taken up by the respective take-up rollers 21 and 22. Further, an output port of the cloth winding driving controlling unit 32 is connected to an input setting unit 36 (described below). The other output ports of the cloth winding driving controlling unit 32 are connected to drivers 29a and 29b for driving the respective driving motors M1 and M2. However, the drivers 29a and 29b are provided in correspondence with the driving motors M1 and M2, respectively, and the cloth winding driving controlling unit 32 independently outputs drive command signals $t1$ and $t2$ for driving the driving motors M1 and M2 corresponding to the respective drivers 29a and 29b to the drivers 29a and 29b, respectively.

[0042] The storage unit 33 is connected to the cloth winding driving controlling unit 32 as mentioned above. An input port of the storage unit 33 is connected to the input setting unit 36. In the embodiment, the input setting unit 36 includes a touch-panel display screen (setting screen 36a). The setting screen 36a is used for inputting and setting, for example, set values, and is used as a display unit for displaying, for example, the set values. The input setting unit 36 performs various setting operations of the loom 1 and sets, for example, control parameters regarding driving torques for controlling the respective driving motors M1 and M2 at the cloth take-up device 11.

[0043] Fig. 6 shows an example of the setting screen 36a of the input setting unit 36 for inputting and setting the control parameters regarding driving torques of the respective driving motors M1 and M2 (hereunder simply referred to as "control parameters"). In the illustrated example, the indication <driving motor 1> refers to the driving motor M1 for driving the first take-up roller 21, and the indication <driving motor 2> refers to the driving motor M2 for driving the second take-up roller 22. In the setting screen 36a, 85 mm, which is a winding diameter when winding is started ($\cong$ take-up roller diameter), is defined as a starting point for each of the driving motors M1 and

M2; and a control parameter can be input and set for each predetermined winding diameter (such as 105 mm, 125 mm, 250 mm).

[0044] In the illustrated example, control parameters are set as tensions (cloth tensions (unit: N) that are applied to the product cloths 7b. However, the term "cloth tensions" here refers to pull forces that wound cloths apply to the product cloths 7b when the product cloths 7b are taken up upon wound cloths that have been taken by the take-up rollers. The relationship between the cloth tension and the driving torque of each of the driving motors M1 and M2 is $F = T/D$, where the cloth tension is F , the driving torque is T , and the winding diameter is D . However, the control parameters that are input and set are not limited to the cloth tensions illustrated above. The control parameters may also be driving torques of the respective driving motors M1 and M2.

[0045] When the input setting unit 36 sets control parameters for the winding diameters of the respective driving motors M1 and M2, set values thereof are output to the storage unit 33. The storage unit 33 stores the set values of the control parameters for the winding diameters of the respective driving motors M1 and M2 (hereunder may simply be referred to as set values (the set values)) so as to be associated with the winding diameters of the respective driving motors M1 and M2.

[0046] During the operation of the loom 1, on the basis of the winding-diameter signals $d1$ and $d2$ from the respective winding-diameter sensors 21s and 22s and the set values of the control parameters that have been set in the storage unit 33, the cloth winding driving controlling unit 32 of the driving controlling device 31 outputs the drive command signals $t1$ and $t2$ corresponding to the winding diameters to the driver 29a of the driving motor M1 and the driver 29b of the driving motor M2, respectively. More specifically, during the operation of the cloth winding driving controlling unit 32, on the basis of the signals from the winding-diameter sensors 21s and 22s, the cloth winding driving controlling unit 32 independently detects the winding diameters of the wound cloths that have been taken up by the respective take-up rollers. At an operation start time of the loom 1 (winding start time), each winding diameter is an initial value (85 mm in the illustrated example).

[0047] On the basis of the detected winding diameters, the set values that have been set in the storage unit 33, and the rotation speed of the main shaft 34 based on the rotation speed signal r from the loom controlling device 35, the cloth winding driving controlling unit 32 outputs to the driver 29a of the driving motor M1 and the driver 29b of the driving motor M2 the respective drive command signals $t1$ and $t2$ for driving the respective driving motors M1 and M2 so as to drive the respective take-up rollers 21 and 22 at rotation speeds in correspondence with the rotation speed of the main shaft 34 and with driving torques corresponding to the set values. However, the drive command signal $t1$ that is output to the driver 29a of the driving motor M1 corresponding to the first

take-up roller 21 is based on the set value that has been input and set in a <driving motor 1> setting section in the setting screen 36a shown in Fig. 6. The drive command signal t2 that has been output to the driver 29b of the driving motor M2 corresponding to the second take-up roller 22 is based on the set value that has been input and set in a <driving motor 2> setting section in the setting screen 36a shown in Fig. 6.

[0048] In the example shown in Fig. 6, the control parameters (cloth tensions) are set for the respective preset winding diameters. The cloth winding driving controlling unit 32 determines control parameters for winding diameters between preset winding diameters (such as between 85 mm and 105 mm) by, for example, linear interpolation, and outputs the drive command signals t1 and t2 on the basis of the determined control parameters. The drivers 29a and 29b drive the respective driving motors M1 and M2 in accordance with the respective drive command signals t1 and t2. This causes the take-up rollers (driving motors M1 and M2) to be rotationally driven at rotation speeds in correspondence with the rotation speed of the main shaft 34 and with driving torques in correspondence with the set values.

[0049] According to the cloth take-up device 11 according to the embodiment described above, the two product cloths 7b and 7b that have been produced by cutting the woven weave cloth 7a at the body of the loom 1 are independently taken up by the take-up rollers 21 and 22 provided in correspondence with the respective product cloths 7b and 7b. Moreover, the take-up rollers 21 and 22 that take up the corresponding product cloths 7b are independently rotationally driven by the dedicated driving motors M1 and M2 whose torques are controlled. Further, the control parameters serving as the basis of the drive commands sent to the respective drive motors M1 and M2 are independently set with respect to the respective driving motors M1 and M2. In other words, the driving torques of the take-up rollers 21 and 22 (driving motors M1 and M2) are independently settable (adjustable) for the respective take-up rollers.

[0050] Therefore, even if the tensions of the respective product cloths 7b differ from each other as a result of the weaving operation, the control parameters regarding the driving torques for driving the respective driving motors M1 and M2, which are driving sources of the take-up rollers 21 and 22, for taking up the respective product cloths 7b, are set considering the tension states of the product cloths 7b resulting from the weaving operation. By this, the take-up rollers 21 and 22 are rotationally driven with driving torques in which the tension states of the corresponding product cloths 7b have been considered. Rotationally driving the take-up rollers 21 and 22 with such driving torques causes the product cloths 7b to be taken up upon wound cloths by pull forces that are in correspondence with the respective tension states. Therefore, winding creases are prevented from occurring during the take-up operation.

[0051] The present invention is not limited to the em-

bodiment described above. The embodiment may be carried out by being modified as follows.

[0052] In the case in which dedicated driving motors serving as driving devices (driving sources) that drive the take-up rollers are used and in which the drivings of the driving motors are controlled on the basis of the winding diameters of wound cloths that are detected by the respective winding-diameter sensors as in the embodiment, two winding-diameter sensors 21s and 22s are provided in correspondence with the take-up rollers 21 and 22, respectively, and the winding diameters of the respective wound cloths that have been taken up by the respective take-up rollers 21 and 22 are detected. However, when the winding diameters are to be detected, it is not necessary to detect the winding diameters of both of the wound cloths. It is possible to use one winding-diameter sensor, detect only the winding diameter of the wound cloth taken up by one of the take-up rollers, and control the drivings of the driving motors M1 and M2 on the basis of the detected value. That is, in order to prevent winding creases from occurring when taking up the cloths, by controlling the driving torques of the respective driving motors M1 and M2 in correspondence with the tension states of the respective product cloths 7b, the product cloths 7b are taken up by the take-up rollers (upon the wound cloths) with similar tensions. As a result, the winding diameters of the wound cloths that have been taken up by the respective take-up rollers 21 and 22 are substantially the same. Therefore, even if the drivings of both of the driving motors M1 and M2 are controlled on the basis of the winding diameter of one of the wound cloths, there are virtually no problems.

[0053] In the embodiment, the side of the take-up roller 21 at which the corresponding driving mechanism 23 is disposed and the side of the take-up roller 22 at which the corresponding driving mechanism 23 is disposed are the same in the width direction, and the length of the first take-up roller 21 and the length of the second take-up roller 22 differ from each other. The first take-up roller 21 that takes up the product cloth 7b at the far side of the driving mechanism 23 (that is, at the main-side-wall-13b side) is such that the other end is supported by the main side wall 13b, and extends over a range including the second take-up roller 22. The second take-up roller 22 that takes up the product cloth 7b at the side of the main side wall 13a is such that the other end is supported by the second intermediate wall 16, and is provided such that its center in the longitudinal direction is aligned with the center of the product cloth 7b at the side of the main side wall 13a in the width direction. This structure may be modified as in (1) and (2) below.

(1) The driving mechanism 23 for driving the first take-up roller 21 may be disposed at and connected to the other end of the first take-up roller 21. In this structure, it is not necessary for the one end of the first take-up roller 21 to extend to the main side wall 13a. Therefore, for example, the one end of the first

take-up roller 21 may be supported by the second intermediate wall 16. That is, it is possible for the second intermediate wall 16 to be disposed between the two product cloths 7b and 7b in the width direction and to extend to a location above the first take-up roller 21 in the up-down direction; and for the first take-up roller 21 to be supported by the second intermediate wall 16 and the main side wall 13b. However, in this structure, in order to reduce the interval between the two product cloths 7b and 7b, it is desirable to form through holes in the second intermediate wall 16 in correspondence with the position of the first take-up roller 21 and the position of the second take-up roller 22, pass the one end of the first take-up roller 21 through the second intermediate wall 16 and support the first take-up roller 21 by a main-side-wall-13a-side surface of the second intermediate wall 16, and pass the other end of the second take-up roller 22 through the second intermediate wall 16 and support the second take-up roller 22 by a main-sidewall-13b-side surface of the second intermediate wall 16.

(2) Similarly to the first take-up roller 21 according to the embodiment, the second take-up roller 22 may have a length that allows the other end thereof to be supported by the main side wall 13b. In the case where the first take-up roller 21 is formed as in the above-described embodiment, by forming the second take-up roller 22 in this way, the second intermediate wall 16 becomes unnecessary. That is, both of the take-up rollers 21 and 22 are supported by the first intermediate wall 15 and the main side wall 13b. When the take-up rollers 21 and 22 are supported by the first intermediate wall 15 and the main side wall 13b, the driving mechanisms 23 may be disposed at either the one end or the other end of the respective take-up rollers 21 and 22.

[0054] Although, in the embodiment, the driving mechanisms 23 include the respective dedicated driving motors M1 and M2 provided in correspondence with the respective take-up rollers 21 and 22, it is possible to form a structure in which the take-up rollers 21 and 22 are rotationally driven by a single driving motor that is provided separately from the driving mechanisms 23 and that is common to both of the driving mechanisms 23. That is, in the cloth take-up device according to the present invention, instead of providing a structure in which the driving mechanisms 23 include respective driving devices (driving motors) as in the embodiment, a driving source that is provided separately from the driving mechanisms 23 or the cloth take-up device 11 may be used as a driving source. However, in such a structure, in order for rotary torque of the output shaft of the driving motor to be transmitted to the corresponding take-up roller, each driving mechanism 23 needs to be capable of adjusting the rotary torque with respect to the corresponding take-up roller separately from the other driving

mechanism 23. As such driving mechanisms 23, for example, cloth-winding torque adjusting devices 23a shown in Figs. 7 to 8B may be used. However, the example shown in Figs. 7 to 8B is an example in which the driving mechanisms 23 of the cloth take-up device 11 in the embodiment are modified to the cloth-winding torque adjusting devices 23a. Fig. 8B is a plan view of the entire cloth-winding torque adjusting device 23a so as to include a section taken along line VIIIB-VIIIB in Fig. 8A.

[0055] As shown in Fig. 7, the cloth-winding torque adjusting devices 23a are provided at the first take-up roller 21 and the second take-up roller 22, respectively. Each cloth-winding torque adjusting device 23a includes a first supporting shaft 59, which is rotatably supported by the body frame 12; a winding-diameter following lever 67, whose one end is secured to the first supporting shaft 59 and whose other end is disposed at an outer peripheral side of the corresponding take-up roller; and a roller 67a, which is rotatably supported by the other end of the winding-diameter following lever 67 and which contacts a wound cloth that has been taken up by the corresponding take-up roller.

[0056] More specifically, as shown in Fig. 7, the first supporting shaft 59 that supports the winding-diameter following lever 67 corresponding to the first take-up roller 21 is provided at the main side wall 13b so as to protrude from an inner side surface of the main side wall 13b at a location that is behind (towards the guide rollers) and below the first take-up roller 21. The first supporting shaft 59 that supports the winding-diameter following lever 67 corresponding to the second take-up roller 22 is provided at the second intermediate wall 16 so as to protrude towards the first intermediate wall 15 at a location that is behind (towards the guide rollers) and below the second take-up roller 22. The first supporting shafts 59 are rotatably supported by the main side wall 13b and the second intermediate wall 16, respectively, via corresponding bearings.

[0057] The winding-diameter following levers 67 for the corresponding first take-up roller 21 and second take-up roller 22 each have a split-clamp structure at one end thereof. By a split-clamp operation using each split-clamp structure, each of the winding-diameter following levers 67 is mounted so as to be incapable of rotating relative to the corresponding first supporting shaft 59. The other end of each winding-diameter following lever 67 rotatably supports the corresponding roller 67a. Each winding-diameter following lever 67 is provided so as to extend towards the corresponding take-up roller from the corresponding first supporting shaft 59. Each roller 67a supported at the other end is formed so as to contact a wound cloth that has been taken up by the take-up roller for the corresponding winding-diameter following lever 67.

[0058] Therefore, when the winding diameters of the wound cloths taken up by the respective take-up rollers 21 and 22 change (increase), the rollers 67a that contact the respective wound cloths are displaced, as a result of which the winding-diameter following levers 67 rotate

around the respective first supporting shafts 59 as fulcra, so that the respective first supporting shafts 59 also rotate. In this way, each cloth-winding torque adjusting device 23a includes the first supporting shaft 59, the winding-diameter following lever 67, whose one end is secured to the first supporting shaft 59, and a portion that follows the amount of change in the winding diameter of the corresponding one of the take-up roller 21 and take-up roller 22 by the corresponding roller 67a that supports the other end of the winding-diameter following lever 67. Since the cloth-winding torque adjusting devices 23a have the same structure, the cloth-winding torque adjusting device 23a corresponding to the first take-up roller 21 is hereunder further described.

[0059] In addition to the first supporting shaft 59, the winding-diameter following lever 67, and the roller 67a, the cloth-winding torque adjusting device 23a includes a connecting shaft 41, a sprocket 42, and friction transmitting means 43. The connecting shaft 41 is connected to the shaft 21a of the first take-up roller 21. The sprocket 42 is supported so as to be rotatable with respect to the main side wall 13b (the second intermediate wall 16 for the second take-up roller 22) at the body frame 12 that supports the first supporting shaft 59, and is rotationally driven by the driving motor (not shown) serving as a driving device. The friction transmitting means 43 is connected to the sprocket 42 and transmits rotation of the sprocket 42 to the connecting shaft 41.

[0060] The sprocket 42 is supported at the main side wall 13b by a bearing 42x with its rotation axis coinciding with an axis of the take-up roller 21. The connecting shaft 41 is connected and secured to the shaft 21a of the first take-up roller 21 while their axes coincide with each other. Therefore, the sprocket 42 and the connecting shaft 41 are concentrically arranged. A through hole 42h having a diameter that is larger than the diameter of the connecting shaft 41 is formed in a central portion of the sprocket 42. The connecting shaft 41 extends through the through hole 42h towards the side opposite to the take-up roller. More specifically, the sprocket 42 includes a disc-shaped sprocket body 42a and a shaft 42b. The sprocket body 42a is disposed at a side of the inner side surface of the main side wall 13b (towards the take-up roller 21), and has a plurality of teeth along its outer peripheral edge portion. The shaft 42b protrudes from a central portion of the sprocket body 42a towards the side opposite to the take-up roller. The through hole 42h is formed in a central portion of the shaft 42b and a central portion of the sprocket body 42a, the sprocket body 42a and the shaft 42b being concentrically disposed. The sprocket 42 is supported by the main side wall 13b using the bearing 42x at the shaft 42b. The connecting shaft 41 extends through the through hole 42h.

[0061] The friction transmitting means 43 is disposed at an outer-side surface of the main side wall 13b. The friction transmitting means 43 includes a disc case 44, a friction transmitting unit 45, and a pressing-force generating unit 51. The disc case 44 is connected to the sprock-

et 42 so as to be incapable of rotating relative to the sprocket 42 at a location where the disc case 44 is concentrically disposed with respect to the sprocket 42. The friction transmitting unit 45 connects the disc case 44 and the connecting shaft 41 to each other. The pressing-force generating unit 51 causes a press force to act upon the friction transmitting unit 45. The disc case 44 is a hollow cylindrical member. The disc case 44 includes a connecting section 44a used for connection with the shaft 42b of the sprocket 42 and has a through hole 44h whose diameter is the same as that of the through hole 42h of the sprocket 42. The friction transmitting unit 45 is internally provided in the hollow of the disc case 44.

[0062] The friction transmitting unit 45 includes a pair of supporting pins 46 and 46 and a plurality of disc-shaped rotating plates 47 (two in the illustrated example). The pair of supporting pins 46 and 46 extend parallel to a rotation axis of the disc case 44 from an inner-side surface of the connecting section 44a of the disc case 44, and are mounted on the connecting section 44a of the disc case 44 at positions where they are symmetrically disposed on respective sides of the rotation axis of the disc case 44. The rotating plates 47 are coaxially disposed with respect to the disc case 44 so as to be incapable of rotating with respect to the disc case 44 when the pair of supporting pins 46 and 46 extend through and engage with the rotating plates 47 in the hollow of the disc case 44. The rotating plates 47 are not secured to the supporting pins 46, as a result of which they are displaceable in the direction of the rotation axis of the disc case 44. Through holes 47h having a diameter that is larger than that of the connecting shaft 41 are formed in central portions of the respective rotating plates 47. The connecting shaft 41 is inserted through the through holes 47h.

[0063] The friction transmitting unit 45 further includes a plurality of disc-shaped driven plates 48 (two in the illustrated example) and a plurality of disc-shaped friction plates 49. The driven plates 48 are provided between adjacent rotating plates 47 and 47 or between the rotating plate 47 and an inner-side surface of the connecting section 44a of the disc case 44. The friction plates 49 are provided between the corresponding rotating plates 47 and the corresponding driven plates 48 or between the corresponding driven plate 48 and the inner-side surface of the connecting section 44a of the disc case 44. The connecting shaft 41 is fitted and inserted into a central portion of each driven plate 48. As a result, each driven plate 48 is mounted so as to be displaceable with respect to the connecting shaft 41 in an axial direction and so as to be incapable of rotating relative to the connecting shaft 41 in the axial direction. However, the diameter of each driven plate 48 is smaller than that of each rotating plate 47, and the pair of supporting pins 46 and 46 are positioned apart from each other at the outer side of the driven plates 48. The friction plates 49 are ring-shaped members having the same diameter as the driven plates 48 and including respective through holes 49h that are

formed at inner sides thereof and that are larger than the through holes 47h of the rotating plates 47. The driven plates 48 each include steps 48a on two sides thereof as a result of forming the wall thicknesses of portions of the driving plates 48 opposing the friction plates 49 (provided at outer peripheral sides of the driven plates 48) to small wall thicknesses. Two friction plates 49 that are adjacent to the corresponding driven plate 48 engage the steps 48a of the corresponding driven plate 48. Therefore, the friction plates 49 are incapable of rotating relative to the corresponding one of the driven plates 48, mounted on the connecting shaft 41, in a radial direction.

[0064] When the friction transmitting unit 45 receives pressing force in a rotation axis direction of the disc case 44 by the operation of the press-force generating unit 51, the driven plates 48 are clamped by the disc case 44 and the rotating plates 47, which are supported by the disc case 44, using the friction plates 49. The clamping causes friction force (friction resistance) to be generated between the rotating plates 47 and the friction plates 49 and between the friction plates 49 and the driven plates 48, so that rotation of the disc case 44 (sprocket 42) is transmitted to the connecting shaft 41, connected to the first take-up roller 21, via the driven plates 48. By adjusting the pressing force provided by the pressing-force generating unit 51, rotary torque (driving torque) that is applied to the first take-up roller 21 is adjusted.

[0065] The pressing-force generating unit 51 includes a pressing plate 52, a pressing-force setting unit 64, and a pressing-force adjusting unit 53. The pressing plate 52 is fitted and inserted into the connecting shaft 41 at an outer side of the outermost rotating plate 47 (at the side opposite to the take-up roller) in the friction transmitting unit 45 in the width direction. The pressing-force setting unit 64 is related to the pressing force in an initial state. The pressing-force adjusting unit 53 adjusts the pressing force as the winding diameter of the take-up roller 21 (wound cloth) increases due to progress in a weaving operation.

[0066] Similarly to, for example, the driven plates 48 at the aforementioned friction transmitting unit 45, the pressing plate 53 is a disc-shaped member. Similarly to the driven plates 48, the pressing plate 53 is provided so as to be displaceable with respect to the connecting shaft 41 in an axial direction and so as to be incapable of rotating relative to the connecting shaft 41 in the axial direction.

[0067] The pressing-force setting unit 64 includes a compression spring 65 and an adjusting nut 66. The compression spring 65 is concentrically inserted and fitted with respect to the connecting shaft 41 at the outer side of the pressing plate 52 in the width direction. The adjusting nut 66 allows the compression spring 65 to be interposed between it and the pressing plate 52 and is screwed onto an externally threaded portion 41a formed at an outer-side end portion of the connecting shaft 41 in the width direction. Therefore, the pressing-force setting unit 64 causes an urging force (pressing force) gen-

erated by the compression spring 65 to act upon the friction transmitting unit 45 via the pressing plate 52. In addition, when the screwing amount of the adjusting nut 66 with respect to the externally threaded portion 41a of the connecting shaft 41 is changed and the distance between the pressing plate 52 and the adjusting nut 66 (that is, the compression amount of the compression spring 65) is adjusted, the pressing force acting upon the friction transmitting unit 45 due to the urging force generated by the compression spring 65 is changed.

[0068] The pressing-force adjusting unit 53 includes a pressure lever 54 and a driven lever 57. One end of the pressure lever 54 contacts the pressing plate 52, and an intermediate portion of the pressure lever 54 is supported so as to be rotatable with respect to the main side wall 13b. One end of the driven lever 57 is supported so as to be rotatable with respect to the main side wall 13b. The other end of the driven lever 57 contacts the pressure lever 54 at a location that is closer to a side opposite to the pressing plate than a rotation center and urges the pressure lever 54 towards the side opposite to the take-up roller.

[0069] More specifically, the pressure lever 54 is a member in which one end is formed into two branches so as to include a pair of arms 54b and 54b, and in which a flat contact surface 54a is provided. The contact surface 54a extends in a longitudinal direction at a location that is closer to the other end than an intermediate portion of the pressure lever 54, and receives urging force provided by the driven lever 57. The pressure lever 54 is provided so as to extend in the front-back direction and so that its intermediate portion is rotatably supported by a second supporting shaft 55. The second supporting shaft 55 is rotatably supported by a bracket (not shown) mounted on the main side wall 13b. One end portion (at the branched side) of the pressure lever 54 that is supported is disposed so as to be positioned near the center of the pressing plate 52 in the front-back direction.

[0070] In accordance with the rotation of the driven lever 57 (described later), the pressure lever 54 is formed into a substantially arc shape when the contact surface 54a is viewed in the width direction (axial direction of the first take-up roller 21). Further, pressure rollers 56 are rotatably mounted, one on one end of one of the arms 54b and the other on one end of the other arm 54b of the pressure lever 54 at the branched side. Therefore, by causing the contact surface 54a of the pressure lever 54 to receive urging force acting towards the side opposite to the take-up roller from the driven lever 57, the pressure lever 54 rotates around the second supporting shaft 55, and the pressure rollers 56, mounted on the pressure lever 54, cause pressing force acting towards the take-up roller to act upon the pressing plate 52.

[0071] The driven lever 57 includes a supporting lever 58, a contact lever 62, and an urging-force setting unit 71. One end of the supporting lever 58 is supported so as to be rotatable with respect to the main side wall 13b. An intermediate portion of the contact lever 62 is sup-

ported by the other end of the supporting lever 58, and one end thereof contacts the pressure lever 54. The urging-force setting unit 71 urges the one end of the contact lever 62 with respect to the pressure lever 54.

[0072] More specifically, the one end of the supporting lever 58 is supported so that the supporting lever 58 is rotatable with respect to the main side wall 13b via the first supporting shaft 59. The first supporting shaft 59 is supported so as to be rotatable with respect to the main side wall 13b via a bearing 61 in such a manner that its axis is parallel to the axis of the first take-up roller 21. In addition, the first supporting shaft 59 is provided so as to protrude from an inner-side-surface side to an outer-side-surface side of the main side wall 13b where the winding-diameter following lever 67 is disposed. Further, the supporting lever 58 is secured so as to be incapable of rotating relative to a portion of the first supporting shaft 59 protruding towards the outer-side-surface side from the main side wall 13b. Therefore, in the illustrated example, the supporting lever 58 and the winding-diameter following lever 67 are both supported by and connected to the first supporting shaft 59, and the supporting lever 58 is rotated by an amount that is the same as the amount of rotation of the winding-diameter following lever 67.

[0073] The supporting lever 58 is disposed so as to be positioned between the main side wall 13b and the contact surface 54a of the pressure lever 54 in an axial direction of the first supporting shaft 59. Further, the other end of the supporting lever 58 supports a third supporting shaft 63. More specifically, a pair of bearings 58a and 58a that protrude towards the outer side in the width direction and that are disposed apart from each other in the front-back direction are provided at the other end of the supporting lever 58. The third supporting shaft 63 is rotatably supported by the pair of shafts 58a and 58a such that the axis of the third supporting shaft 63 is orthogonal to a longitudinal direction of the supporting lever 58.

[0074] The intermediate portion of the contact lever 62 is supported so as to be rotatable with respect to the supporting lever 58 via the third supporting shaft 63 in such a manner that a longitudinal direction of the contact lever 62 is the same as the longitudinal direction of the supporting lever 58. In addition, the contact lever 62 is provided so that the one end thereof protrudes from the other end of the supporting lever 58. A roller 62c is rotatably mounted on the one end of the contact lever 62. The contact lever 62 in the axial direction of the first supporting shaft 59 is disposed so that the roller 62c is positioned between the main side wall 13b and the contact surface 54a of the pressure lever 54. Further, longitudinal-direction dimensions of the supporting lever 58 and the contact lever 62 are set so that the roller 62c contacts the pressure lever 54 with the supporting lever 58 being supported by the first supporting shaft 59. Therefore, the driven lever 57 is capable of contacting the contact surface 54a of the pressure lever 54 using the roller 62c. When the urging-force setting unit 71 causes urging force

acting towards the main side wall 13b to act upon the other end of the contact lever 62, the contact lever 62 rotates around the third supporting shaft 63, and the roller 62c is pressed against the contact surface 54a of the pressure lever 54.

[0075] The urging-force setting unit 71 includes a guide shaft 72, an adjusting nut 73, and a compression spring 74. The guide shaft 72 is provided so as to protrude towards the outer side with respect to the supporting lever 58, and extends through the contact lever 62. The adjusting nut 73 is screwed onto an externally threaded portion 72a formed at an outer-side end portion of the guide shaft 72. The compression spring 74 is concentrically inserted with respect to the guide shaft 72, and is interposed between the contact lever 62 and the adjusting nut 73. The guide shaft 72 is provided so as to extend through a through hole (not shown) formed in the other end of the contact lever 62. The diameter of the through hole (that is, the diameter of the contact lever 62 in the longitudinal direction) is larger than the diameter of the guide shaft 72. Rotation of the contact lever 62 around the third supporting shaft 63 is restricted by the guide shaft 72. According to the urging-force setting unit 71 having such a structure, the compression spring 74 causes the urging force to act upon the other end of the contact lever 62, and the screwing amount of the adjusting nut 73 with respect to the externally threaded portion 72a of the guide shaft 72 is changed, to adjust the distance between the contact lever 62 and the adjusting nut 73 (that is, the compression amount of the compression spring 74). Therefore, the urging force that is applied to the contact lever 62 by the compression spring 74 is changed.

[0076] According to the pressing-force adjusting unit 53 having the above-described structure, since the driven lever 57 causes the urging force generated by the compression spring 74 to act upon the contact surface 54a of the pressure lever 54 via the roller 62c, the pressure lever 54 receives a pressing force acting towards the outer side from the rotation center (that is, the second supporting shaft 55) at the side opposite to the friction transmitting unit. As a result, the pressure lever 54 causes the pressing force to act upon the friction transmitting unit 45 via the pressing plate 52 using the pressure rollers 56. Therefore, in the friction transmitting means 43, the friction transmitting unit 45 is in a state in which it receives the pressing force resulting from the operation of the pressing-force setting unit 64 and the operation of the pressing-force adjusting unit 53 via the pressing plate 52 of the pressing-force generating unit 51.

[0077] In the pressing-force adjusting unit 53, as the winding diameter of the first take-up roller 21 changes, the winding-diameter following lever 67 rotates, and the first supporting shaft 59 and the driven lever 57 rotate by an amount that is the same as the amount of rotation of the winding-diameter following lever 67, so that the position of contact of the roller 62c at the driven lever 57 with respect to the contact surface 54a of the pressure lever 54 changes, that is, the position on the contact sur-

face 54a of the pressure lever 54 upon which the pressing force of the driven lever 57 acts changes. Therefore, the pressing force that is caused to act upon the friction transmitting unit 45 by the pressure lever 54 via the pressure rollers 56 changes. That is, since the distance from the rotation center of the pressure lever 54 (fulcrum) to the position of the pressure rollers 56 (points where force acts) is constant, when, as mentioned above, the position on the contact surface 54a of the pressure lever 54 where the pressing force is applied (point where force is applied) changes (the distance from the fulcrum to the point where force is applied changes), by the principle of the lever, the pressing force that is caused to act upon the friction transmitting unit 45 by the pressure rollers 56 is increased. For example, a position S and a position E shown in Fig. 8A are such that the pressing force that is caused to act upon the friction transmitting unit 45 by the pressure rollers 56 is greater when the roller 62c contacts the pressure lever 54 at the position E than when the roller 62c contacts the pressure lever 54 at the position S. That is, as the position where the roller 62c at the driven lever 57 contacts the contact surface 54a of the pressure lever 54 moves away from the rotation center of the pressure lever 54, the pressing force that is caused to act upon the friction transmitting unit 45 by the pressure rollers 56 is increased in proportion to this distance.

[0078] As mentioned above, when the pressing force that is caused to act upon the friction transmitting unit 45 by the pressing-force generating unit 51 (pressing-force adjusting unit 53) is changed, rotary torque (driving torque of the take-up roller) that acts upon the first take-up roller 21 changes in proportion to the change in the pressing force. The change in the position of contact of the roller 62c at the driven lever 57 with respect to the contact surface 54a of the pressure lever 54 such as that described above occurs by the rotation of the driven lever 57 (supporting lever 58) around the axis of the first supporting shaft 59. The rotation of the driven lever 57 is caused by the rotation of the first supporting shaft 59.

[0079] By virtue of the above-described structure serving as the structure of the driving mechanism (cloth-winding torque adjusting device 23a), when the driving motor rotates, the shaft 42b of the sprocket 42 is rotationally driven. Therefore, "the shaft 42b of the sprocket 42" corresponds to what is called a "rotating shaft" in the present invention. The rotation of the shaft 42b, serving as the rotating shaft, of the sprocket 42 is transmitted to the first take-up roller 21 via the disc case 44, the friction transmitting unit 45, and the connecting shaft 41. As a result, the pressing force that is caused to act upon the friction transmitting unit 45 by the pressing plate 52 causes the rotary torque (driving torque) of the first take-up roller 21 to change. Consequently, a combination of the disc case 44, the friction transmitting unit 45, the pressing plate 52, and the connecting shaft 41 corresponds to what is called a "driving transmission unit" in the present invention.

[0080] In the cloth-winding torque adjusting device 23a in the illustration, by changing the phase of the driven

lever 57 with respect to the first supporting shaft 59 (that is, the position S of the driven lever 57 in Fig. 8A) when winding is started, or by changing the pressing force applied to the pressure lever 54 by the roller 62c as a result of adjusting the urging force provided by the urging-force setting unit 71 at the driven lever 57, the driving torque of the first take-up roller 21 can be adjusted.

[0081] In addition, in the embodiment shown in Figs. 7 to 8B, since the driving mechanisms 23 (cloth-winding torque adjusting devices 23a) are provided in correspondence with the take-up rollers 21 and 22, respectively, even in the embodiment, for the take-up rollers, the driving torques of the respective take-up rollers 21 and 22 are independently adjustable.

[0082] Although, in the embodiment, the first take-up roller 21 and the second take-up roller 22 are disposed at positions that correspond with each other in the front-back direction and at different heights in the up-down direction, the arrangement of the take-up rollers 21 and 22 is not limited thereto. The take-up rollers 21 and 22 may be disposed at positions that do not correspond with each other in the front-back direction. When the take-up rollers 21 and 22 are disposed at positions that do not correspond with each other in the front-back direction, the take-up rollers 21 and 22 may be disposed at different heights in the up-down direction as in the embodiment, or at the same height in the up-down direction. As described in the above-described modification (1), when the one end of the first take-up roller 21 and the other end of the second take-up roller 22 are supported by the second intermediate wall 16 disposed between the two product cloths 7b and 7b in the width direction, the first take-up roller 21 and the second take-up roller 22 may be disposed so that the positions of their axes are aligned with each other when the first take-up roller 21 and the second take-up roller 22 are seen in the width direction.

[0083] Although, in the embodiment, the case in which the present invention is applied to a double-width loom that weaves two product cloths 7b and 7b at the same time is described, the loom 1 to which the present invention is applied is not limited to such a double-width loom. The loom 1 may be a multiple-width loom that weaves three or more product cloths 7b at the same time. Although, in the embodiment, the cloth take-up device 11 is a separate take-up device that exists independently of the body of the loom 1 that performs a weaving operation, the cloth take-up device according to the present invention is not limited to such a separate take-up device. As long as a plurality of take-up rollers can be disposed along with the driving mechanisms 23 at the take-up side of the body of the loom 1, the body of the loom 1 that performs a weaving operation may have a structure that corresponds to the cloth take-up device according to the present invention. When the body of the loom 1 includes the cloth take-up device according to the present invention, the main shaft (driving motor) 34 of the loom 1 may be a driving source in the modification shown in Figs. 7 to 8B.

[0084] The present invention is not limited to the above-described embodiment, so that modifications can be made when appropriate within a range that does not depart from the scope of the claims.

Claims

1. A multiple-width loom that weaves two or more cloths and that comprises a cloth take-up device (11) including a plurality of take-up rollers (21, 22) which are provided in correspondence with the two or more cloths, respectively, the number of the plurality of take-up rollers (21, 22) being the same as the number of the two or more cloths, the plurality of take-up rollers (21, 22) being provided at a take-up side of the loom such that axes of the plurality of take-up rollers (21, 22) are oriented in a width direction of the loom;
wherein the cloth take-up device (11) further includes a plurality of driving mechanisms (23) that are provided in correspondence with the plurality of take-up rollers (21, 22), respectively, each driving mechanism (23) including a rotating shaft that is rotationally driven by a driving device and a driving transmission unit that is provided in correspondence with the corresponding take-up roller and that transmits rotation of the rotating shaft to the corresponding take-up roller,
characterized in that the plurality of driving mechanisms (23) are capable of independently adjusting driving torques of the respective take-up rollers (21, 22).
2. The loom according to claim 1, wherein each driving mechanism (23) further includes a driving motor serving as the driving device,
wherein the cloth take-up device (11) further includes a winding-diameter sensor that detects a winding diameter of a wound cloth on at least one of the plurality of take-up rollers (21, 22) and a driving controlling device that controls driving of the driving motor of each driving mechanism (23), and
wherein the driving controlling device includes a setting unit that, for independently controlling the driving torque of each driving motor, sets, for each driving motor, a set value of a control parameter regarding the driving torque of the driving motor that has been set in correspondence with the winding diameter.

Patentansprüche

1. Webmaschine mit mehreren Breiten, die zwei oder mehr Stoffe webt und die eine Stoffaufnahmeverrichtung (11), die eine Vielzahl von Aufnahmerollen (21, 22) enthält, umfasst, wobei die Vielzahl von Auf-

nahmerollen (21, 22) jeweils entsprechend den zwei oder mehr Stoffen vorgesehen ist und die Anzahl der Vielzahl von Aufnahmerollen (21, 22) die gleiche ist wie die Anzahl der zwei oder mehr Stoffe, wobei die Vielzahl von Aufnahmerollen (21, 22) an einer Aufnahmeseite der Webmaschine so vorgesehen sind, dass die Achsen der Vielzahl von Aufnahmerollen (21, 22) in einer Breitenrichtung der Webmaschine ausgerichtet sind;

wobei die Stoffaufnahmeverrichtung (11) weiter eine Vielzahl von Antriebsmechanismen (23) enthält, die jeweils entsprechend der Vielzahl von Aufnahmerollen (21, 22) vorgesehen sind, wobei jeder Antriebsmechanismus (23) eine rotierende Welle, die durch eine Antriebsvorrichtung rotierend angetrieben ist, und eine Antriebsübertragungseinheit, die entsprechend der jeweiligen Aufnahmerolle vorgesehen ist und die die Rotation der rotierenden Welle auf die jeweilige Aufnahmerolle überträgt, enthält,

dadurch gekennzeichnet, dass die Vielzahl von Antriebsmechanismen (23) in der Lage ist, unabhängig die Antriebsdrehmomente der jeweiligen Aufnahmerollen (21, 22) einzustellen.

2. Webmaschine nach Anspruch 1, wobei jeder Antriebsmechanismus (23) weiter einen Antriebsmotor enthält, der als die Antriebsvorrichtung dient, wobei die Stoffaufnahmeverrichtung (11) weiter einen Wicklungsdurchmessersensor, der einen Wicklungsdurchmesser eines gewundenen Stoffes auf zumindest einer der Vielzahl von Aufnahmerollen (21, 22) erfasst, und eine Antriebssteuervorrichtung, die das Antreiben des Antriebsmotors von jedem Antriebsmechanismus (23) steuert, enthält, und wobei die Antriebssteuervorrichtung eine Einstelleinheit enthält, die, um unabhängig die Antriebsdrehmomente von jedem Antriebsmotor zu steuern, für jeden Antriebsmotor einen Einstellwert von einem Steuerparameter bezüglich des Antriebsdrehmomentes des Antriebsmotors, der entsprechend dem Wicklungsdurchmesser eingestellt wurde, einstellt.

Revendications

1. Métier à tisser à largeur multiple qui peut tisser deux tissus ou plus et qui comprend un dispositif d'enroulement de tissu (11) comprenant une pluralité de rouleaux d'enroulement (21, 22) qui sont disposés en correspondance avec les deux tissus ou plus, respectivement, le nombre de la pluralité de rouleaux d'enroulement (21, 22) étant le même que le nombre des deux tissus ou plus, la pluralité de rouleaux d'enroulement (21, 22) étant disposés au niveau d'un côté d'enroulement du métier à tisser de telle sorte que les axes de la pluralité de rouleaux d'enroulement (21, 22) sont orientés dans le sens de la largeur

du métier à tisser;

le dispositif d'enroulement de tissu (11) comprenant en outre une pluralité de mécanismes d'entraînement (23) qui sont disposés en correspondance avec la pluralité de rouleaux d'enroulement (21, 22), respectivement, chaque mécanisme d'entraînement (23) comprenant un arbre rotatif qui est entraîné en rotation par un dispositif d'entraînement et une unité de transmission d'entraînement qui est disposée en correspondance avec le rouleau d'enroulement correspondant et qui transmet la rotation de l'arbre rotatif au rouleau d'enroulement correspondant, **caractérisé en ce que** la pluralité de mécanismes d'entraînement (23) sont capables de régler indépendamment les couples d'entraînement des rouleaux d'enroulement respectifs (21, 22).

2. Métier à tisser selon la revendication 1, dans lequel chaque mécanisme d'entraînement (23) comprend en outre un moteur d'entraînement servant de dispositif d'entraînement, le dispositif d'enroulement de tissu (11) comprenant en outre un capteur de diamètre d'enroulement qui détecte un diamètre d'enroulement d'un tissu enroulé sur au moins l'un de la pluralité de rouleaux d'enroulement (21, 22) et un dispositif de commande d'entraînement qui commande l'entraînement du moteur d'entraînement de chaque mécanisme d'entraînement (23), et le dispositif de commande d'entraînement comprenant une unité de réglage qui, pour commander indépendamment le couple d'entraînement de chaque moteur d'entraînement, fixe, pour chaque moteur d'entraînement, une valeur de réglage d'un paramètre de commande concernant le couple d'entraînement du moteur d'entraînement qui a été réglé en correspondance avec le diamètre d'enroulement.

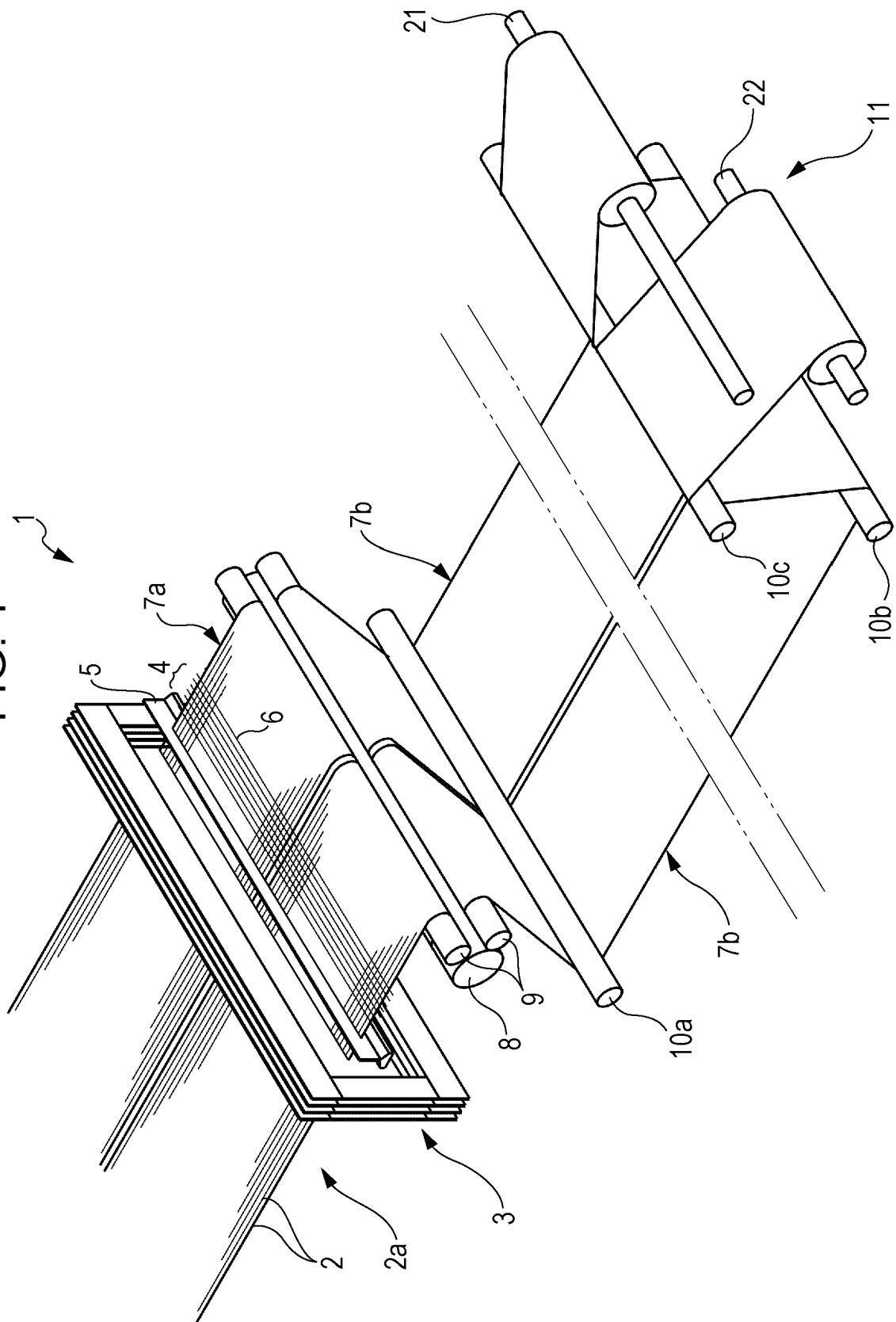
40

45

50

55

FIG. 1



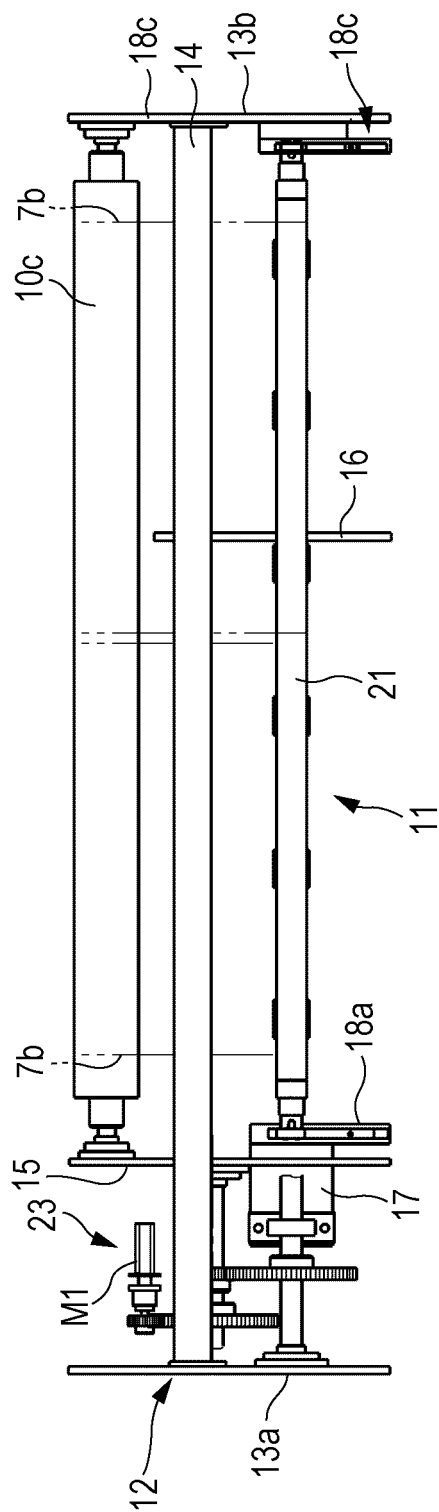


FIG. 2B

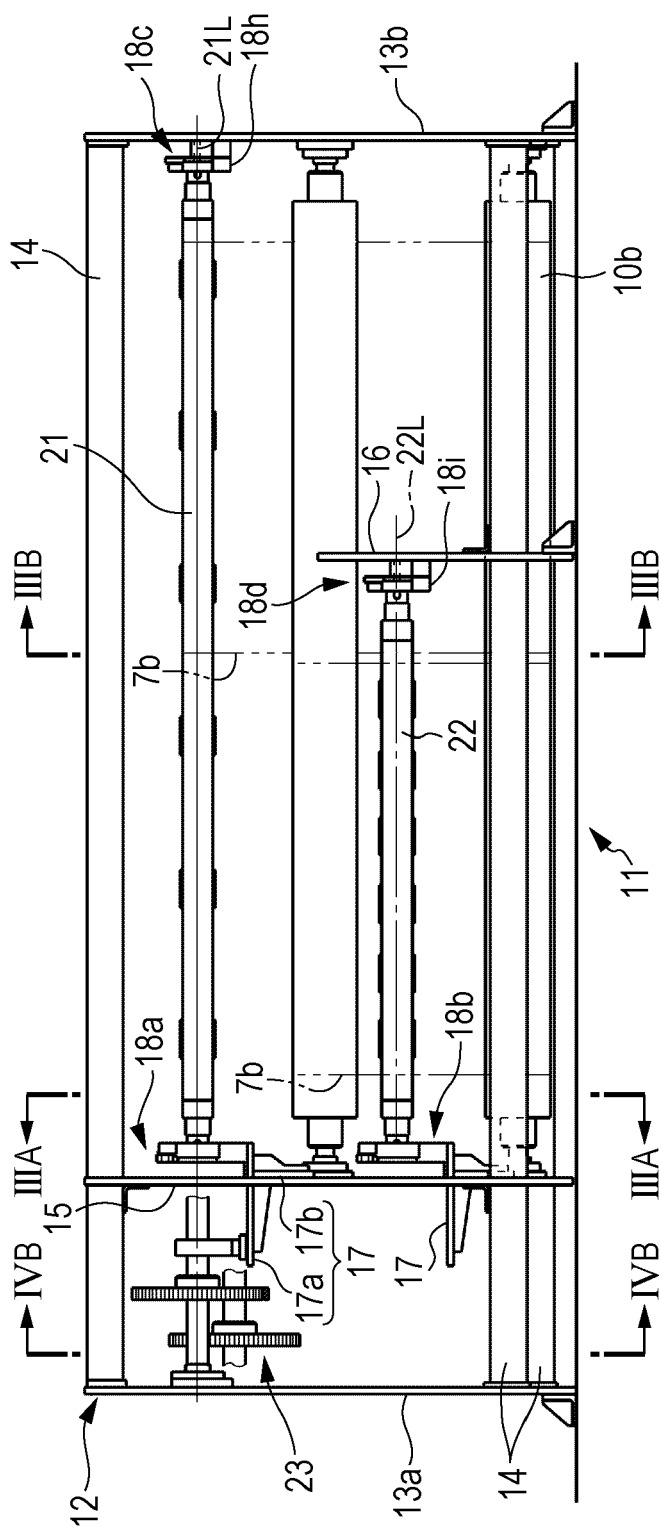


FIG. 2A

FIG. 4A

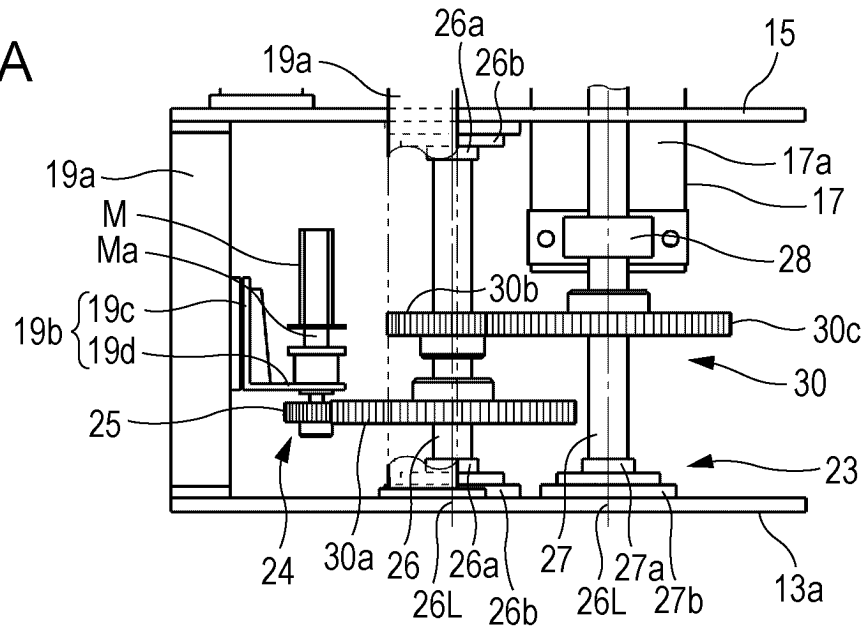


FIG. 4B

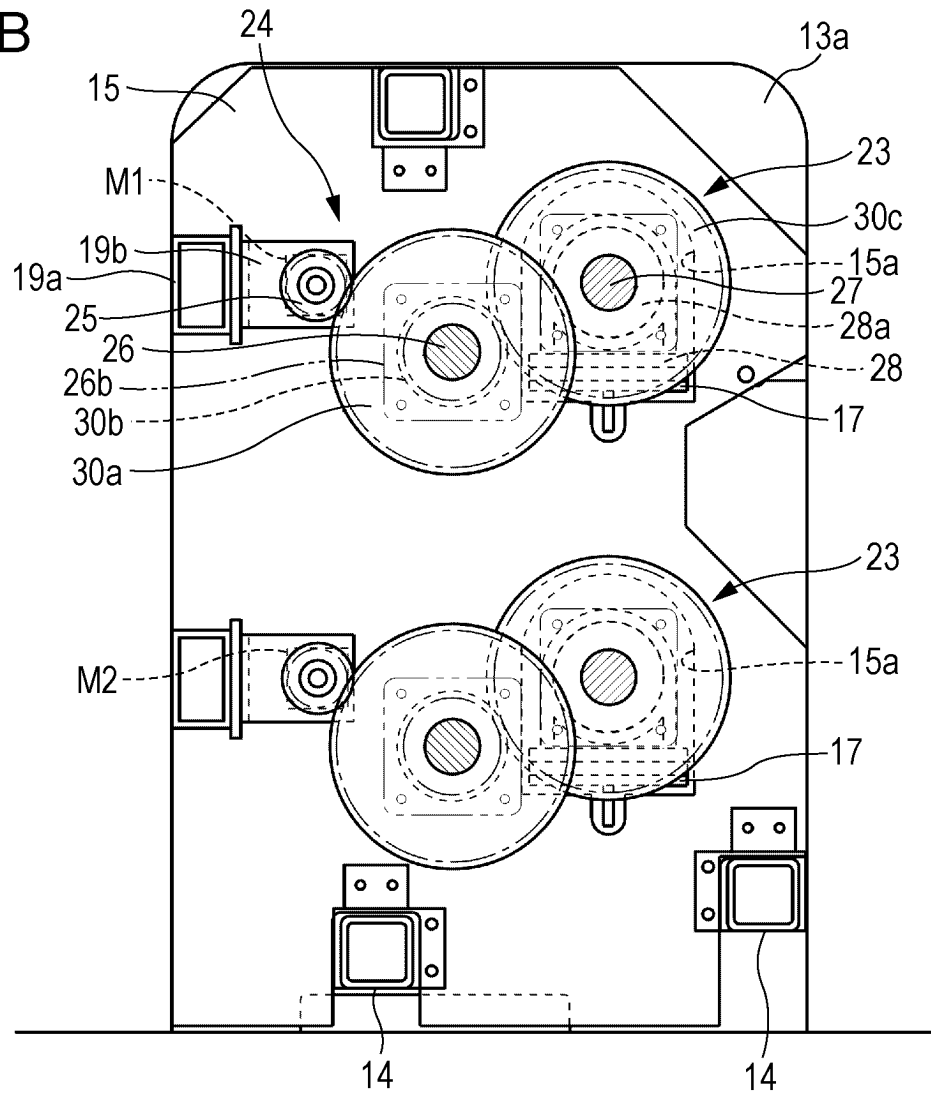
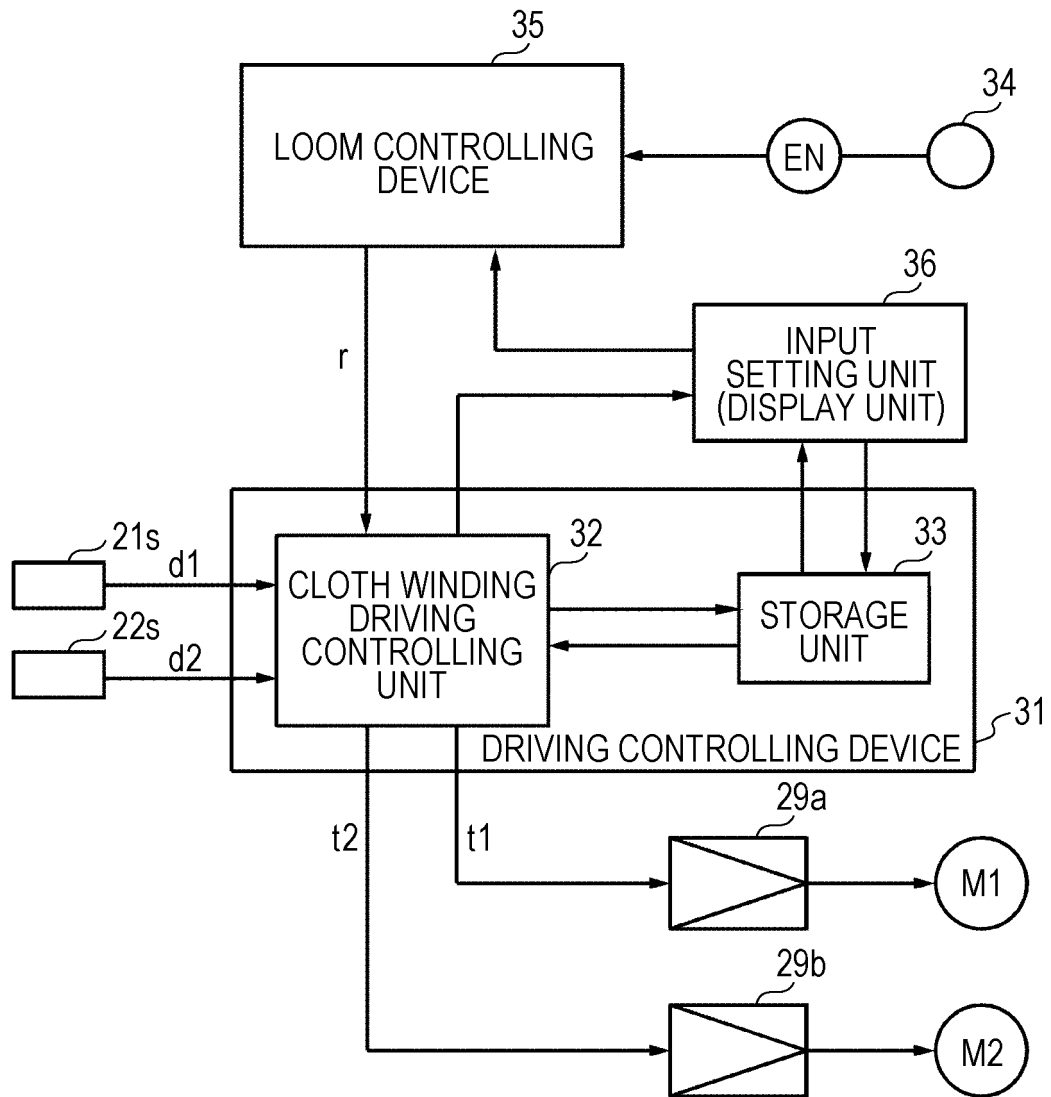


FIG. 5



F/G. 6

36a

[CLOTH TAKE-UP]					

FIG. 7

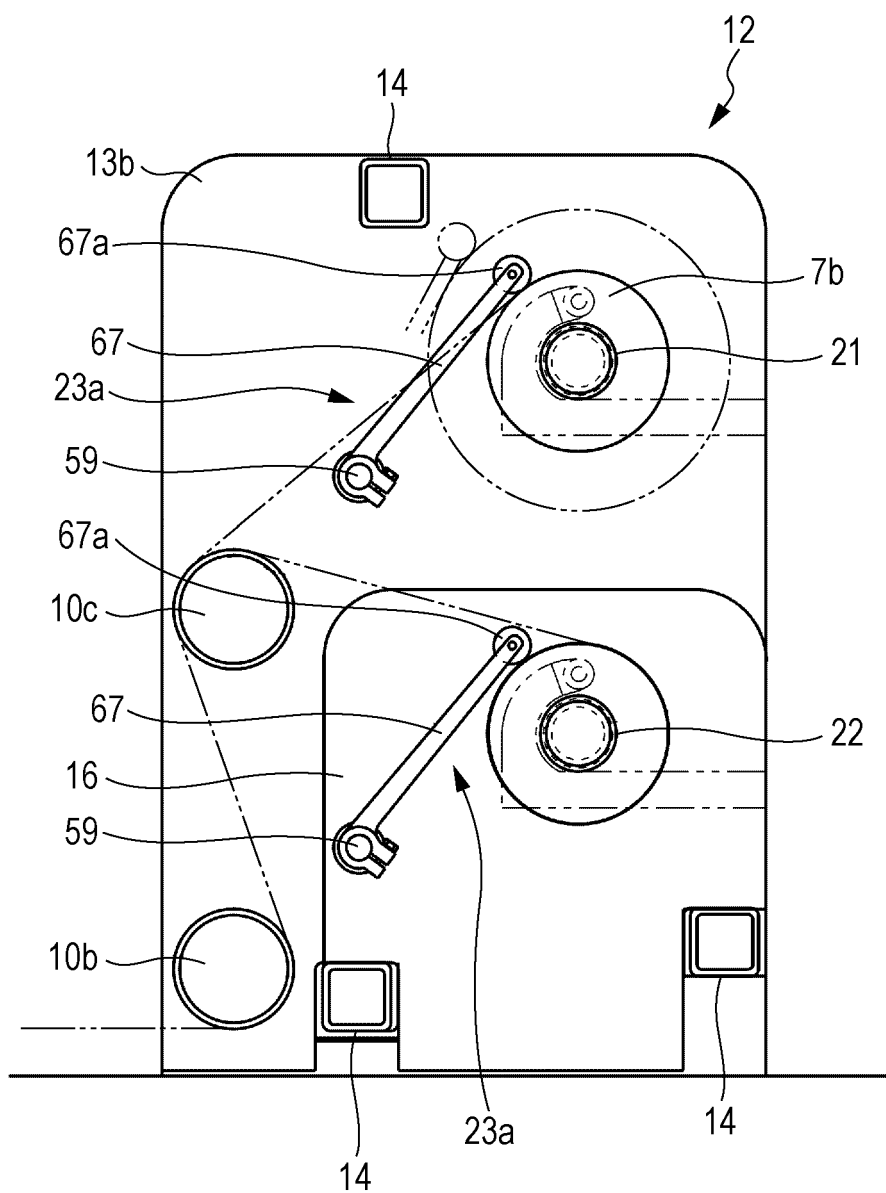


FIG. 8A

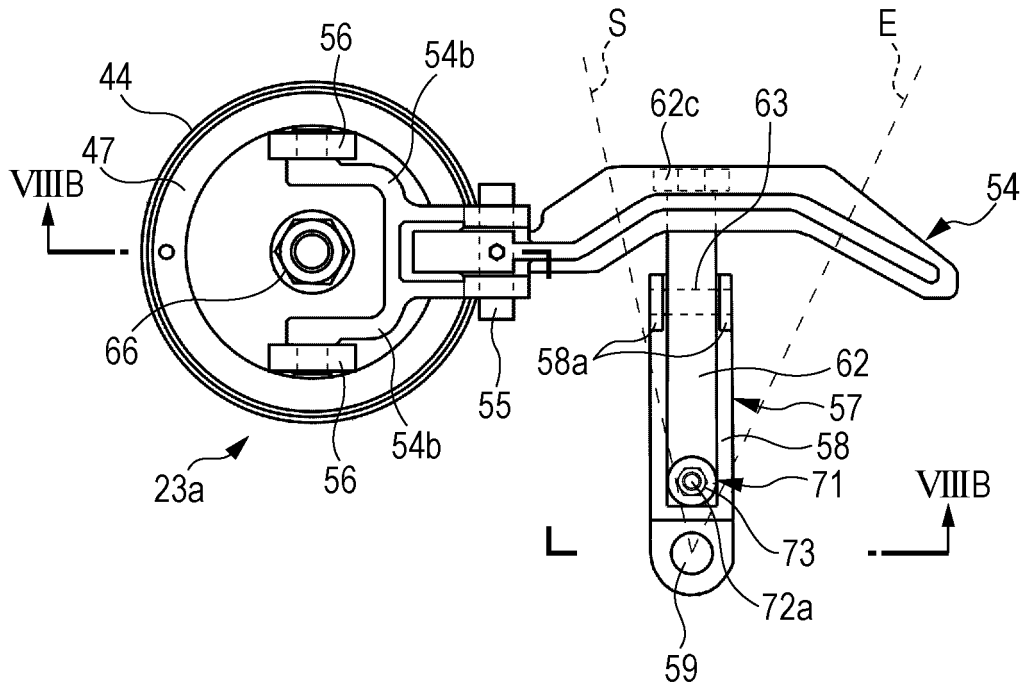
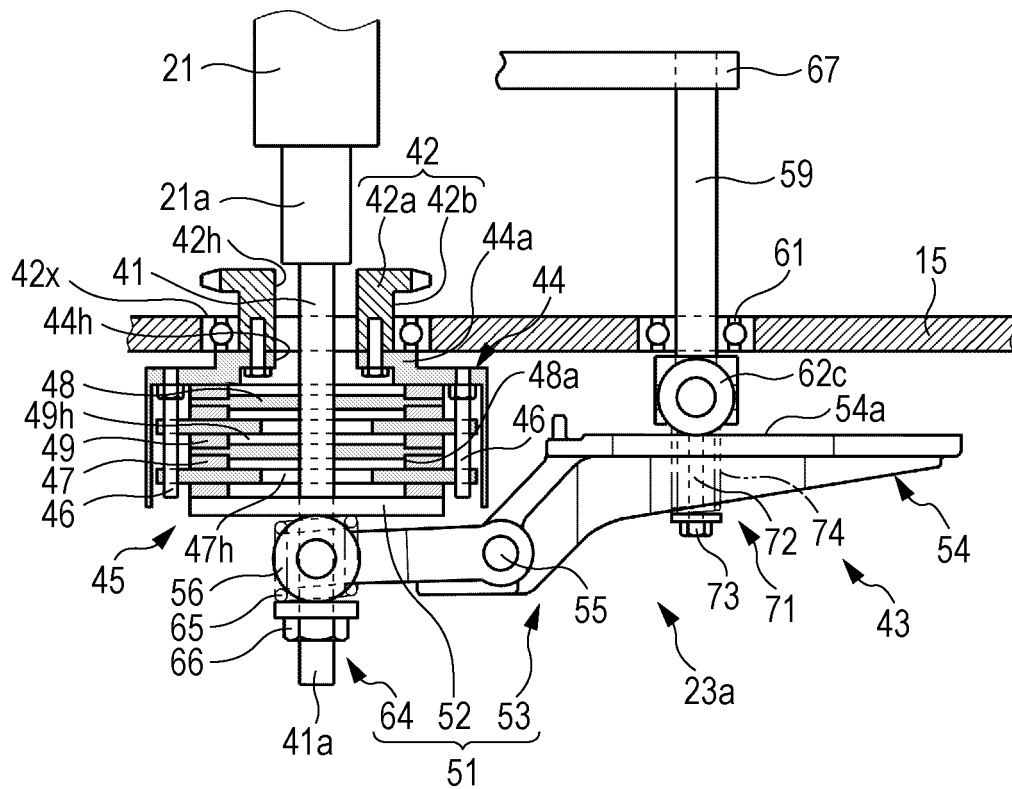


FIG. 8B



REFERENCES CITED IN THE DESCRIPTION

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