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

(11) **EP 3 312 323 B2**

(12) **NEW EUROPEAN PATENT SPECIFICATION**
After opposition procedure

(45) Date of publication and mention of the opposition decision:
22.06.2022 Bulletin 2022/25

(45) Mention of the grant of the patent:
24.04.2019 Bulletin 2019/17

(21) Application number: **17192212.3**

(22) Date of filing: **20.09.2017**

(51) International Patent Classification (IPC):
D03D 49/22 *(2006.01)* ***D03D 49/12*** *(2006.01)*

(52) Cooperative Patent Classification (CPC):
D03D 49/22; D03D 49/12

(54) **WARP LET-OFF DEVICE OF LOOM**

KETTFADEN-ABLASSVORRICHTUNG EINER WEBMASCHINE

DISPOSITIF DE DÉROULEMENT DE LA CHAÎNE D'UN MÉTIER À TISSER

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

(30) Priority: **19.10.2016 JP 2016205114**
15.12.2016 JP 2016242909

(43) Date of publication of application:
25.04.2018 Bulletin 2018/17

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention presupposes a warp let-off device of a loom, the warp let-off device including two warp beams that are disposed at positions that differ from each other in an up-down direction and/or a front-back direction, and easing mechanisms that are provided for the warp beams corresponding thereto and that reduce variations in tension of a warp, each easing mechanism including a support shaft that is provided such that an axis thereof is oriented in a weaving-width direction at the loom and an easing roller that is swingably supported by the support shaft. The present invention relates to the warp let-off device.

2. Description of the Related Art

[0002] As such a warp let-off device that the present invention presupposes as described above and that is used in a loom, a warp let-off device is disclosed in, for example, Chinese Patent Application Publication No. 102677373 (Patent Literature (PTL) 1). The warp let-off device disclosed in PTL 1 includes two warp beams that are disposed at positions that differ from each other in an up-down direction. The warp let-off device also includes easing mechanisms that are provided in correspondence with the warp beams. Warps that are drawn out from the corresponding warp beams are wound around easing rollers of the easing mechanisms corresponding to the warp beams, have their directions changed, and are guided towards a cloth fell.

[0003] In the loom that is disclosed in PTL 1 and that includes such a warp let-off device, a loom frame includes a lower let-off frame and an upper let-off frame, the lower let-off frame supporting, of the two warp beams, the lower warp beam and the upper let-off frame supporting, of the two warp beams, the upper warp beam. That is, the loom frame of the loom according to PTL 1 includes a combination of a body frame, where a reed, a heald frame, etc. are disposed, and the above-described lower let-off frame and upper let-off frame.

[0004] In addition, in the warp let-off device, the easing rollers of the easing mechanisms that are provided in correspondence with the warp beams as described above are supported by the let-off frames that support the corresponding warp beams.

[0005] More specifically, a supporting bracket (hereunder referred to as "lower supporting bracket"), serving as a supporting structural body, is mounted on the lower let-off frame, and the easing roller corresponding to the lower warp beam (hereunder referred to as "first easing roller") is swingably supported by a support shaft via a supporting arm, the support shaft being supported by the lower supporting bracket. Similarly, a supporting bracket (hereunder referred to as "upper supporting bracket"), serving as a supporting structural body, is mounted on the upper let-off frame, and the easing roller corresponding to the upper warp beam (hereunder referred to as "second easing roller") is swingably supported by a support shaft via a supporting arm, the support shaft being supported by the upper supporting bracket. In this way, the warp let-off device according to PTL 1 has a structure in which the easing rollers are supported by the corresponding supporting brackets mounted on the loom frame.

[0006] In the loom including the warp let-off device, when poor handling of warps caused by shedding operations of the warps during weaving occurs, in general, the positions of the easing rollers in an up-down direction are adjusted to improve the handling of the warps. In general looms, a structure for adjusting the positions of the easing rollers (for performing position adjustments) in the up-down direction, such as that disclosed in, for example, Japanese Unexamined Patent Application Publication No. 2010-111981 (Patent Literature (PTL) 2), is used. Therefore, although PTL 1 does not particularly disclose such position adjustments described above, it is assumed that in order to make such position adjustments described above possible, the warp let-off device in PTL 1 uses a structure such as that disclosed in PTL 2.

[0007] Incidentally, regarding the structure disclosed in PTL 2 for performing the above-described position adjustments, more specifically, the warp let-off device in PTL 2 has a structure in which, by screwing bolts inserted through the supporting structural bodies (called "brackets" in PTL 2) that support the easing rollers into the loom frame, the supporting structural bodies are mounted on the loom frame. On the basis of this, as a structure for performing the position adjustments, holes through which the bolts are inserted in the supporting structural bodies are formed as long holes extending in the up-down direction. That is, in order to allow the position adjustments of the easing rollers, a structure for mounting the supporting structural bodies on the loom frame is such that the positions of the supporting structural bodies that support the easing rollers in the up-down direction are changeable in the ranges in which the long holes are provided. Further, as a structure for performing the position adjustments, the warp let-off device includes position adjusting mechanisms including a jack bolt for adjusting the positions of the supporting structural bodies in the up-down direction.

[0008] As described above, the warp let-off device in PTL 1 includes easing mechanisms (easing rollers) for the two warp beams corresponding thereto, and the easing rollers are supported at the loom frame by the corresponding supporting structural bodies. In this case, as described above, when, in order to improve the handling of warps, the above-described position adjustments are performed in the warp let-off device, the positions of the supporting structural bodies in the up-down direction need to be adjusted for the corresponding easing rollers.

[0009] More specifically, since the handling of warps is related to, for example, warp type, the position adjustments may be independently performed for each warp beam (in some cases the adjustment may not be performed for one of the warps). However, the interval in the up-down direction between the first easing roller and the second easing roller of the warp let-off device described above is set such that weaving can be properly performed in connection with other weaving elements on the basis of, for example, the warp type. Therefore, the position adjustments are performed with the interval being the same after a position adjustment. That is, the position adjustments are performed in such a manner that the position adjustment of one of the first and second easing rollers (the supporting structural body that supports the one of the first and second easing rollers) is performed, and then the position adjustment of the other easing roller (the supporting structural body that supports the other easing roller) is performed with the interval being the same as that before the position adjustment of the one of the easing rollers.

[0010] In this way, in the warp let-off device in PTL 1, as described above, the position adjustments for improving the handling of warps must be performed by adjusting the positions of the two supporting structural bodies that support the corresponding easing rollers in the up-down direction. Therefore, compared to general looms including one warp beam, the position adjustments are troublesome and time-consuming, and place a huge burden on an operator.

SUMMARY OF THE INVENTION

[0011] Accordingly, in view of the above-described problems, it is an object of the present invention to provide a structure that is capable of reducing the burden on an operator when adjusting the positions of easing rollers in the above-described presupposed warp let-off device.

[0012] To this end, the above-described presupposed warp let-off device includes a pair of supporting structural bodies that are disposed apart from each other in a weaving-width direction, each supporting structural body being a single supporting structural body that is mounted by a loom frame so as to be displaceable in an up-down direction with respect to the loom frame. Each supporting structural body includes a first supporting section for supporting the support shaft of one of two easing mechanisms and a second supporting section for supporting the support shaft of the other of the two easing mechanisms.

[0013] A so-called "single supporting structural body" in the present invention refers to one in which the first supporting section and the second supporting section are integrally formed as a single structure, and that is mounted on one mounting position on the loom frame. Therefore, the term "single supporting structural body" does not include a combination of two supporting structural bodies that each include supporting sections (a first supporting section and a second supporting section) and that are mounted on different mounting positions on the loom frame. Here, the expression "integrally formed" naturally includes integral molding by, for example, casting or processing. However, the expression "integrally formed" may also include combining a plurality of members.

[0014] In the present invention, each supporting structural body has a structure in which the first supporting section and the second supporting section are displaceable relative to each other in the up-down direction.

[0015] As described above, the warp let-off device that is a warp let-off device according to the present invention and that includes two warp beams has a structure in which two supporting structural bodies, each being a single structure, that include a first supporting section for supporting the support shaft of one of the two easing mechanisms and a second supporting section for supporting the support shaft of the other of the easing mechanisms support the two support shafts of the two easing mechanisms. That is, the warp let-off device has a structure in which the two support shafts and the first easing roller and the second easing roller that are supported by the corresponding support shafts are supported by the two supporting structural bodies that are common to the two support shafts.

[0016] Therefore, according to the warp let-off device of the present invention, by adjusting the position of the common supporting structural bodies in the up-down direction, the positions of the first easing roller and the second easing roller are adjusted at the same time. In addition, the positions of the supporting structural bodies in the up-down direction are adjusted with the interval between the two easing rollers being maintained. In this way, according to the warp let-off device, the position adjustments of the two easing rollers that require the interval before and after the position adjustments to be the same are realized by only adjusting the positions of the common supporting structural bodies in the up-down direction. Therefore, the burden on the operator is reduced compared to that in existing devices.

[0017] In the warp let-off device according to the present invention, when the first supporting section and the second supporting section of each supporting structural body are formed so as to be displaceable relative to each other in the up-down direction, it is possible to properly adjust the interval in accordance with, for example, the warp type.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018]

Fig. 1 is a side view of a loom including a warp let-off device according to an embodiment of the present invention;

Fig. 2 is an explanatory view of a main portion of the

warp let-off device according to the embodiment of the present invention;

Fig. 3 is an enlarged view of a main portion in Fig. 1;

Fig. 4 is a schematic back view of the loom including the warp let-off device according to the embodiment of the present invention; and

Fig. 5 is a side view of a loom including a warp let-off device according to another embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0019] An embodiment of the present invention is described below on the basis of Figs. 1 to 4. In the embodiment described below, two warp beams are disposed apart from each other in an up-down direction as an example. In the embodiment, supporting structural bodies for supporting support shafts (easing rollers) of corresponding easing mechanisms are formed such that an interval between the easing rollers in the up-down direction is adjustable, that is, such that the positions of the easing rollers relative to each other in the up-down direction are changeable. In the description below, a direction of extension of a warp along a warp line is called a front-back direction. On the basis of this, in the description below, a direction of travel of a warp in the front-back direction is defined as a forward direction (front side), and a direction opposite to the direction of travel of the warp is defined as a backward direction (back side).

[0020] In a loom 1, a loom frame 10 includes a pair of side frames 11 and 11 that are disposed apart from each other in a weaving-width direction and that are connected to each other by a beam member. Each side frame includes a body frame 12, which is a main portion, and a let-off frame 13, the left-off frames 13 being portions that support warp beams 21 and 22. That is, the loom frame 10 includes a pair of body frames 12 and 12 and a pair of let-off frames 13 and 13.

[0021] Of these frames, the pair of body frames 12 and 12 are where a heald frame (not shown), a reed 15, and a take-up device 90, etc. are disposed. Each body frame 12 includes a front portion 12a where the take-up device 90 is disposed, and a back portion 12b that extends backward from the corresponding front portion 12a. However, only the front portion 12a of each body frame 12 is grounded with respect to a setting surface where the loom 1 is set; and the back portion 12b of each body frame 12 is formed such that a space exists between a lower surface thereof and the setting surface.

[0022] Regarding the pair of let-off frames 13 and 13, as described above, in a warp let-off device 20 according to the embodiment, the two warp beams 21 and 22 are disposed apart from each other in the up-down direction. Each let-off frame 13 includes a partial let-off frame 13a (may also be hereunder called "lower let-off frame") and a partial let-off frame 13b (may also be hereunder called "upper let-off frame"). The pair of partial let-off frames 13a and 13a support, of the two warp beams 21 and 22, the warp beam 21 that is positioned at the lower side (may also be hereunder called "lower warp beam"). The pair of partial let-off frames 13b and 13b support, of the two warp beams 21 and 22, the warp beam 22 that is positioned at the upper side (may also be hereunder called "upper warp beam").

[0023] Each lower let-off frame 13a is disposed in the space below the back portion 12b of the corresponding body frame 12, is provided in a grounded state with respect to the setting surface, and is at its upper surface in contact with and connected to the back portion 12b of the corresponding body frame 12. However, in the state in which each lower let-off frame 13a is connected to its corresponding body frame 12 in this way, a back portion thereof is positioned behind its corresponding body frame 12 (back portion 12b) in the front-back direction.

[0024] Each lower let-off frame 13a includes a beam guide 14a that supports the lower warp beam 21 (hereunder may also be referred to as "lower beam guide"). Each lower beam guide 14a is provided so as to be mounted on an inner side surface of its corresponding lower let-off frame 13a. In the front-back direction, each lower beam guide 14a is provided on its corresponding lower let-off frame 13a at a location where an axis (rotation center) of the lower warp beam 21 that it supports is close to a back end surface of the back portion 12b of its corresponding body frame 12. Therefore, the lower warp beam 21 is supported by the lower let-off frames 13a and 13a via the lower beam guides 14a and 14a at a location between the pair of lower let-off frames 13a and 13a.

[0025] Each upper let-off frame 13b is provided on an upper surface of the back portion 12b of its corresponding body frame 12, and is connected to its corresponding back portion 12b at a lower surface thereof. However, each let-off frame 13b on its corresponding back portion 12b is positioned within the range in which its corresponding lower let-off frame 13a is provided in the front-back direction.

[0026] Each upper let-off frame 13b includes a beam guide 14b that supports the upper warp beam 22 (hereunder may also be referred to as "upper beam guide"). Each upper beam guide 14b is provided so as to be mounted on an inner side surface of its corresponding upper let-off frame 13b. Each upper beam guide 14b is provided so as to be positioned at an upper end portion of its corresponding upper let-off frame 13b with each upper let-off frame 13b being provided on its corresponding body frame 12 (back portion 12b) as described above. Therefore, the upper warp beam 22 is supported by the upper let-off frames 13b and 13b via the upper beam guides 14b and 14b near the upper end portions of the corresponding upper let-off frames 13b and 13b in the up-down direction at a location between the pair of upper let-off frames 13b and 13b.

[0027] Each upper let-off frame 13b has a shape in which its dimension in the up-down direction is larger than its dimension in the front-back direction with each upper let-off frame 13b provided on its corresponding

body frame 12 as described above. Each upper let-off frame 13b has a dimension in a longitudinal direction (up-down direction) such that the upper warp beam 22 that is supported by the upper beam guides 14b and 14b that are positioned at the upper end portions of the upper let-off frames 13b is in a supported state separated from the lower warp beam 21 that is supported by the lower let-off frames 13a and 13a in the up-down direction. This causes the lower warp beam 21 and the upper warp beam 22 in a state in which they are supported by the pair of let-off frames 13 and 13 to be disposed so as to be separated from each other (such that their positions differ from each other) in the up-down direction.

[0028] Incidentally, in the state shown in Fig. 1, the lower warp beam 21 and the upper warp beam 22 are supported by the pair of let-off frames 13 and 13 such that their positions slightly differ from each other in the front-back direction. However, the difference between the positions in the front-back direction is much smaller than the difference between the positions in the up-down direction. Therefore, regarding the loom that is presupposed by the present invention, the embodiment describes a warp let-off device including the lower warp beam 21 and the upper warp beam 22, that is, two warp beams whose positions in the up-down direction differ from each other in the up-down direction.

[0029] In the loom 1 in which the two warp beams 21 and 22 are supported by the loom frame 10 (the pair of let-off frames 13 and 13) having the above-described structure, the warp let-off device 20 includes two easing mechanisms that are provided in correspondence with the two warp beams 21 and 22. That is, the warp let-off device 20 includes a lower easing mechanism 30a corresponding to the lower warp beam 21 and an upper easing mechanism 30b corresponding to the upper warp beam 22. In the embodiment, the easing mechanisms 30a and 30b are each a so-called negative easing mechanism that reduces variations in tension caused by shedding motion of warps by an urging force of an easing spring. The easing mechanisms 30a and 30b are described in detail below.

[0030] Ordinarily, an easing mechanism of a loom includes a support shaft that is rotatably supported by the loom frame. When an easing roller is supported at two end portions thereof by two supporting arms mounted on the support shaft, the easing roller is swingably supported by the loom frame. In addition, a general negative easing mechanism includes an easing section that is connected to the support shaft. The easing section includes an easing spring that receives tension of a warp wound around the easing roller.

[0031] In a general loom that performs weaving by using a warp that is drawn out from a single warp beam, the warp let-off device includes a guide roller for guiding the warp drawn out from the warp beam towards an easing roller. The guide roller is supported at the loom frame at a shaft portion thereof by, for example, brackets mounted on the loom frame. In addition, even in the embodiment, in the loom 1, the warp let-off device 20 includes a guide roller 40a that guides a warp drawn out from the lower warp beam 21 (hereunder may also be referred to as "lower guide roller") and a pair of supporting brackets 50 for supporting the lower guide roller 40a; and is formed such that the lower guide roller 40a is supported at the loom frame 10 by the pair of brackets 50 and 50.

[0032] More specifically, the supporting brackets 50 are mounted on the body frames 12 (the back portions 12b) of the loom frame 10 so as to extend backwards with respect to back end surfaces of the corresponding body frames 12. Each supporting bracket 50 includes a base portion 51 that is mounted on its corresponding back portion 12b and a rotatably supporting portion 52 that supports the lower guide roller 40a behind its corresponding base portion 51; and these are integrally molded with each other. The lower guide roller 40a includes a cylindrical guide portion 40a1 that is a portion around which a warp is wound and a pair of shaft portions 40a2 and 40a2 that are integrated with the guide portion 40a1 so as to project from corresponding ends of the guide portion 40a1. When the shaft portions 40a2 of the lower guide roller 40a are supported at the rotatably supporting portions 52 of the supporting brackets 50 via, for example, bearings, the lower guide roller 40a is rotatably supported by the pair of body frames 12 and 12 of the loom frame 10. In such a supported state, the lower guide roller 40a is in a state in which its axis is parallel to the weaving-width direction.

[0033] The supporting brackets 50 that support the lower guide roller 40a as described above are such that mounting positions thereof with respect to the body frames 12 are adjustable in the up-down direction. More specifically, each supporting bracket 50 is mounted on its corresponding body frame 12 as described above by screwing a bolt 55 inserted into a mounting hole in the corresponding base portion 51 into its corresponding body frame 12. There are two mounting holes that are disposed side by side in the up-down direction. Each mounting hole is a long hole extending in the up-down direction in a state in which each supporting bracket 50 is mounted on its corresponding body frame 12. Therefore, the mounting positions of the supporting brackets 50 with respect to the corresponding body frames 12 in the up-down direction are changeable within ranges in which the long holes are formed.

[0034] On the basis of this, the warp let-off device 20 includes position adjusting mechanisms 100 for changing the mounting positions of the supporting brackets 50 with respect to the corresponding body frames 12. Each position adjusting mechanism 100 includes a fixing portion 101 mounted on the back end surface of its corresponding body frame 12 (back portion 12b). Each fixing portion 101 is disposed below its corresponding supporting bracket 50. Further, each fixing portion 101 has an internally threaded hole extending therethrough in the up-down direction when each fixing portion 101 is in a mounted state.

[0035] Each position adjusting mechanism 100 includes a jack bolt 102 that is screwed into the internally threaded hole of its corresponding fixing portion 101. Further, each position adjusting mechanism 100 includes a receiving portion 103 that is provided on its corresponding supporting bracket 50, and that is provided so as to oppose in the up-down direction its corresponding jack bolt 102 screwed into its corresponding fixing portion 101. Therefore, in each position adjusting mechanism 100, the jack bolt 102 and its corresponding receiving portion 103 are in a contactable state.

[0036] Regarding the operation of each position adjusting mechanism 100, in adjusting the position of each supporting bracket 50, first, each bolt 55 that mounts (fixes) the supporting bracket 50 on its corresponding body frame 12 is loosened. Since each mounting hole is a long hole as described above, each supporting bracket 50 is in a displaceable state in the up-down direction with respect to its corresponding body frame 12. In this state, an end surface of the jack bolt 102 of its corresponding position adjusting mechanism 100 contacts a lower surface of its corresponding receiving portion 103, that is, each supporting bracket 50 is in a state in which it is supported by its corresponding jack bolt 102. On the basis of this, by changing the screwing amount of the jack bolt 102 with respect to the fixing portion 101 of its corresponding position adjusting mechanism 100, the position of each supporting bracket 50 in the up-down direction is changed (adjusted) in accordance with the screwing amount. By fixing the position of each supporting bracket 50 with respect to its corresponding body frame 12 by its corresponding bolt 55 at the changed position, each supporting bracket 50 is in a state in which its position in the up-down direction is adjusted.

[0037] In such a warp let-off device 20, the lower easing mechanism 30a includes a pair of supporting arms 32 and 32 for supporting a first easing roller 33, which is an easing roller of the lower easing mechanism 30a. The pair of supporting arms 32 and 32 are mounted so as to be unrotatable relative to the pair of shaft portions 40a2 and 40a2 of the lower guide roller 40a. Therefore, the pair of supporting arms 32 and 32 are supported so as to be swingable with respect to the loom frame 10 by the shaft portions 40a2 and 40a2 of the lower guide roller 40a.

[0038] On the basis of this, the first easing roller 33 is swingably supported at two ends thereof by the shaft portions 40a2 and 40a2 of the lower guide roller 40a via the pair of supporting arms 32 and 32, and is swingably provided with respect to the loom frame 10. However, the easing roller 33 in such a supported state is positioned above the lower guide roller 40a in the up-down direction.

[0039] The two shaft portions 40a2 and 40a2 of the lower guide roller 40a are connected to each other by the guide portion 40a1, and are in an integrated state via the guide portion 40a1. That is, although the guide portion 40a1 of the lower guide roller 40a is a member for guiding a warp, the guide portion 40a1 also functions as a portion of a shaft that supports the first easing roller 33. Therefore, the lower guide roller 40a that includes the two shaft portions 40a2 and 40a2 on which the two supporting arms 32 and 32 are mounted and the guide portion 40a1 that functions as a portion of a shaft by connecting the two shaft portions 40a2 and 40a2 to each other can be regarded as a first support shaft 31 for supporting the first easing roller 33 of the lower easing mechanism 30a. In other words, the warp let-off device 20 according to the embodiment has a structure in which the lower guide roller 40a is also used as the first support shaft 31 of the lower easing mechanism 30a.

[0040] Therefore, in the structure of the lower easing mechanism 30a, the support shaft 31 that supports the first easing roller 33 is supported at the loom frame 10 via the supporting brackets 50 mounted on the corresponding body frames 12. Since, as described above, the lower guide roller 40a is provided with its axis being parallel to the weaving-width direction, the first support shaft 31 in its supported state is provided such that its axis is oriented in the weaving-width direction.

[0041] Incidentally, there is a guide roller of a loom having a structure in which a guide portion is supported at a through shaft, which is provided so as to extend through the guide portion, via, for example, a bearing. The lower guide roller 40a may have such a structure. In addition, when a guide roller having such a structure is used as the lower guide roller 40a according to the embodiment, the through shaft of the guide roller functions (is also used as) the first support shaft 31 instead of the entire guide roller.

[0042] In the warp let-off device 20, the lower guide roller 40a has a structure in which one of the two shaft portions 40a2 and 40a2 extends outwardly of the supporting bracket 50 that supports the one of the shaft portions 40a2 in the weaving-width direction. That is, the first support shaft 31 of the lower easing mechanism 30a is provided such that an end side thereof extends outwardly of the supporting bracket 50 that supports the first support shaft 31. On the basis of this, the lower easing mechanism 30a includes an easing section 60 that is connected to an end of the first support shaft 31 at the outer side of the supporting bracket 50.

[0043] The easing section 60 includes an easing lever 61 and an easing rod 62. The easing lever 61 is mounted on the end of the first support shaft 31 so as to be unrotatable relative to the end, and is provided so as to extend downward. The easing rod 62 is rotatably supported at an end thereof by the loom frame 10 (body frame 12), and extends backward from this supporting position and is connected at the other end thereof to the other end of the easing lever 61. However, the easing lever 61 and the easing rod 62 are connected to each other such that their connection position is displaceable along an axis of the easing rod 62. Further, the easing section 60 includes an easing spring 63 that is formed so as to be interposed between the easing lever 61 and the easing rod 62.

[0044] By this structure, in the easing section 60, the

easing spring 63 that applies a predetermined tension to a warp urges the first easing roller 33 in a swing direction, and the swinging of the first easing roller 33 caused by variations in the tension of the warp is received by the easing spring 63 to reduce the variations in the tension of the warp.

[0045] Similarly to the lower easing mechanism 30a, the upper easing mechanism 30b includes a second support shaft 34 that is rotatably supported by the loom frame 10, a pair of supporting arms 35 and 35 that are mounted so as to be unrotatable relative to second support shaft 34, and an easing roller (second easing roller) 36 that is supported at two end portions thereof by the pair of supporting arms 35 and 35. Therefore, the second easing roller 36 is swingably supported by the second support shaft 34 via the pair of supporting arms 35 and 35. Unlike the first support shaft 31 of the lower easing mechanism 30a that is part of the lower guide roller 40a, the second support shaft 34 of the upper easing mechanism 30b is provided as a shaft exclusively for supporting the second easing roller 36.

[0046] On the basis of this, the second support shaft 34 of the upper easing mechanism 30b is supported by the loom frame 10 by using the pair of supporting brackets 50 and 50 that support the first support shaft 31 of the lower easing mechanism 30a.

[0047] More specifically, the supporting brackets 50 that are mounted on the corresponding body frames 12 of the loom frame 10 are each provided with a supporting metal 70 for supporting the second support shaft 34 of the upper easing mechanism 30b. Each supporting metal 70 is a plate member having a substantially rectangular shape (more exactly, a shape having one short side that is semicircular) as viewed in a plate thickness direction. Each supporting metal 70 includes a mounting portion 71 and a rotatably supporting portion 72. Each mounting portion 71 is a one-end-side portion in a long-side direction (a side opposite to the one short side), and is a portion that is mounted on the corresponding supporting bracket 50. Each rotatably supporting portion 72 is the other-end-side portion and supports the second support shaft 34.

[0048] However, each rotatably supporting shaft 72 is circular in the plate-thickness direction, and has a through hole 72a which extends therethrough in the plate-thickness direction and which supports the second support shaft 34. In the illustrated embodiment, each rotatably supporting portion 72 has a plate thickness that is larger than that of its corresponding mounting portion 71. Each mounting portion 71 has mounting holes that extend therethrough in the plate-thickness direction so as to open at both ends in a direction orthogonal to the plate-thickness direction and that are used for mounting the corresponding supporting metal 70 to the corresponding supporting bracket 50. Two mounting holes are disposed side by side in the short-side direction.

[0049] With one of the two end surfaces of the mounting portion 71 of each supporting metal 70 being in contact with an inner side surface of the supporting bracket 50 (more specifically, the base portion 51 of the supporting bracket 50), the mounting portion 71 of each supporting metal 70 is mounted on its corresponding supporting bracket 50. However, in the mounted state, the supporting metals 70 are in a state in which their long-side directions are aligned with the up-down direction and in which the rotatably supporting portions 72 are positioned above the mounting portions 71. Each supporting metal 70 is mounted on its corresponding supporting bracket 50 by screwing the bolts inserted through the mounting holes of the mounting portion 71 into the corresponding supporting bracket 50.

[0050] Accordingly, the warp let-off device 20 includes the pair of supporting metals 70 for supporting the second support shaft 34 of the upper easing mechanism 30b, and has a structure in which each supporting metal 70 is mounted on its corresponding supporting bracket 50 that is supported by the loom frame 10, that is, the pair of supporting metals 70 and 70 are supported by the loom frame 10 via the corresponding supporting brackets 50 and 50.

[0051] Two end portions of the second support shaft 34 of the upper easing mechanism 30b are via, for example, bearings rotatably supported by the two supporting metals 70 and 70 that are supported by the loom frame 10 in this way. In other words, by the pair of supporting brackets 50 and 50 and the pair of supporting metals 70 and 70, the second support shaft 34 is rotatably supported by the loom frame 10. In such a supported state, the second support shaft 34 is in a state in which its axis is parallel to the weaving-width direction, that is, its axis is oriented in the weaving-width direction.

[0052] In the upper easing mechanism 30b in which the second support shaft 34 is supported as described above, the pair of supporting arms 35 and 35 for supporting the second easing roller 36 are mounted so as to be unrotatable relative to the second support shaft 34. The second easing roller 36 is at two end portions thereof swingably supported by the second support shaft 34 via the pair of supporting arms 35 and 35. The second easing roller 36 of the upper easing mechanism 30b is in such a supported state positioned above the first easing roller 33 of the lower easing mechanism 30a in the up-down direction.

[0053] In the upper easing mechanism 30b, the second support shaft 34 in such a supported state is provided such that an end side thereof extends outwardly of the supporting bracket 50 on which the supporting metal 70 is mounted in the weaving-width direction. On the basis of this, the upper easing mechanism 30b includes an easing section 80 that is disposed outwardly of the supporting bracket 50 and that is connected to one end of the second support shaft 34.

[0054] The easing section 80 includes an easing lever 81 and an easing rod 82. The easing lever 81 is mounted so as to be unrotatable relative to the end of the second support shaft 34, and is provided so as to extend forward. The easing rod 82 is rotatably supported at an end thereof

by the loom frame 10 (upper let-off frame 13b), and extends backward from this supporting position and is connected at the other end thereof to the other end of the easing lever 81. However, the easing lever 81 and the easing rod 82 are connected to each other such that their connection position is displaceable along an axis of the easing rod 82. Further, the easing section 80 includes an easing spring 83 that is formed so as to be interposed between the easing lever 81 and the easing rod 82.

[0055] By this structure, in the easing section 80, the easing spring 83 that applies a predetermined tension to a warp urges the second easing roller 36 in a swing direction, and the swinging of the second easing roller 36 caused by variations in the tension of the warp is received by the easing spring 83 to reduce the variations in the tension of the warp.

[0056] The warp let-off device 20 also includes a guide roller 40b that is provided in correspondence with the upper warp beam 22 (hereunder referred to as "upper guide roller"). The upper guide roller 40b is rotatably supported by the loom frame 10 via, for example, a bearing. However, with the upper guide roller 40b being supported by the loom frame 10 in this way, the upper guide roller 40b is positioned above the second easing roller 36 and below the upper warp beam 22 in the up-down direction. On the basis of this, the upper guide roller 40b guides a warp drawn out from the upper warp beam 22 towards the second easing roller 36 of the upper easing mechanism 30b.

[0057] In this way, in the warp let-off device 20 according to the embodiment, the first support shaft 31 of the lower easing mechanism 30a is supported by the rotatably supporting portions 52 of the supporting brackets 50 and 50, and the second support shaft 34 of the upper easing mechanism 30b is supported by the rotatably supporting portions 72 of the supporting metals 70 and 70 mounted on the base portions 51 of the corresponding supporting brackets 50. That is, the warp let-off device 20 has a structure in which the first support shaft 31 is supported by the pair of supporting brackets 50 and 50 and the second support shaft 34 is supported by the supporting metals 70 and 70 that are mounted on the corresponding supporting brackets 50.

[0058] Therefore, in the warp let-off device 20 according to the embodiment, a combination of each supporting bracket 50 and its corresponding supporting metal 70 corresponds to a supporting structural body according to the present invention. That is, the warp let-off device 20 includes a pair of single supporting structural bodies, each including the supporting bracket 50 and the corresponding supporting metal 70 that are integrated with each other. Further, in each supporting structural body having such a structure, the rotatably supporting portion 52 of the supporting bracket 50 that supports the first support shaft 31 corresponds to a first supporting section of the supporting structural body, and the supporting metal 70 that supports the second support shaft 34 corresponds to a second supporting section of the supporting structural body.

[0059] Incidentally, regarding each supporting structural body having such a structure, the supporting bracket 50 includes the rotatably supporting portion 52 and the base portion 51, and the supporting bracket 50 is mounted on the loom frame 10 at its base portion 51. Therefore, regarding the structure that supports the first support shaft 31, each supporting structural body can be considered as having a structure in which the first supporting section (rotatably supporting portion) 52 is supported by the loom frame 10 by the corresponding base portion 51. On the other hand, as described above, each supporting metal 70 that supports the second support shaft 34 is mounted on the base portion 51 of its corresponding supporting bracket 50. Therefore, regarding the structure that supports the second support shaft 34, each supporting structural body can be considered as having a structure in which the second supporting section (supporting metal) 70 is supported by the loom frame 10 by the corresponding base portion 51. Therefore, each supporting structural body includes the corresponding first supporting section 52, the corresponding second supporting section 70, and the base portion 51, which is a common portion that supports each supporting section, and can be considered as having a structure in which each supporting section is supported by the loom frame 10 by the base portion 51.

[0060] In the warp let-off device 20, each supporting bracket 50 is such that, as described above, its mounting position with respect to the loom frame 10 is adjustable in the up-down direction by its corresponding base portion 51, and is displaceable with respect to the loom frame 10 in the up-down direction. Therefore, each supporting structural body according to the embodiment that is considered as having a structure in which the first supporting section 52 and the second supporting section 70 are supported by the loom frame 10 by the corresponding base portion 51 is displaceable with respect to the loom frame 10 in the up-down direction.

[0061] The operation of the warp let-off device 20 having the above-described structure is as follows.

[0062] First, in the warp let-off device 20, in order to overcome poor handling of a warp caused by a shedding operation of the warp during weaving, the position of the first easing roller 33 and the position of the second easing roller 36 in the up-down direction are sometimes adjusted. Here, the position of the first easing roller 33 and the position of the second easing roller 36 in the up-down direction are adjusted by adjusting the first support shaft 31 that supports the easing roller 33 and the second shaft 34 that supports the easing roller 36 in the up-down direction.

[0063] On the basis of this, in adjusting the warp let-off device 20, the positions of the supporting brackets 50 in the up-down direction are adjusted by using the position adjusting mechanisms 100 described above. That is, the mounting positions of the base portions 51 of the supporting brackets 50 with respect to the loom frame

10 are adjusted in the up-down direction. By this, each supporting structural body including the base portion 51 and the first supporting section 52 and the second supporting section 70 that are supported by the base portion 51 as described above is such that its position in the up-down direction is adjusted with the positional relationship between the first supporting section 52 and the second supporting section 70 being maintained due to the first supporting section 52 and the second supporting section 70 being integrated with the corresponding base portion 51. As a result, the support shafts 31 and 34 that are supported by the corresponding supporting sections, and, by extension, the easing rollers 33 and 36 are such that their positions in the up-down direction are adjusted with their positional relationship being maintained.

[0064] In this way, according to the warp let-off device 20, the positions of the two easing rollers 33 and 36, whose positional relationship needs to be maintained before and after their positional adjustments, are adjusted in the up-down direction by only adjusting the mounting positions of the supporting structural bodies, which support the easing rollers 33 and 36 (the first support shaft 31 and the second support shaft 34), with respect to the loom frame 10 in the up-down direction. Therefore, the positional adjustments are facilitated.

[0065] In the embodiment, regarding the mounting of each supporting metal 70 with respect to its corresponding supporting bracket 50, mounting holes for mounting the corresponding supporting metals 70 are long holes extending in the up-down direction in a state in which each supporting metal 70 is mounted. Therefore, in ranges in which the long holes are formed, each supporting metal 70 is such that its mounting position with respect to its corresponding supporting bracket 50 is changeable in the up-down direction. On the basis of this, the warp let-off device 20 includes interval adjusting mechanisms 110 for changing the mounting positions of the supporting metals 70 with respect to the corresponding supporting brackets 50.

[0066] Each interval adjusting mechanism 110 includes a fixing portion 111 that is mounted on an inner side surface of the base portion 51 of the corresponding supporting bracket 50 (that is, a side surface on which the corresponding supporting metal 70 is mounted). Each fixing portion 111 is disposed below its corresponding supporting metal 70. Further, each fixing portion 111 has an internally threaded hole that is formed so as to extend therethrough in the up-down direction in the mounted state of each fixing portion 111. Further, each interval adjusting mechanism 110 includes a jack bolt 112 that is screwed into the internally threaded hole of the corresponding fixing portion 111. Further, each interval adjusting mechanism 110 includes a receiving portion 113 that is provided on its corresponding supporting metal 70, and that is provided so as to oppose in the up-down direction its corresponding jack bolt 112 screwed into its corresponding fixing portion 111. Therefore, in each interval adjusting mechanism 110, each jack bolt 112 and its corresponding receiving portion 113 are in a contactable state.

[0067] Regarding the operation of each interval adjusting mechanism 110, in adjusting the position of each supporting metal 70, first, bolts 75 that mount the supporting metal 70 on the corresponding supporting bracket 50 are loosened. Accordingly, since each mounting hole is a long hole as described above, each supporting metal 70 is in a displaceable state in the up-down direction with respect to its corresponding supporting bracket 50. In this state, an end surface of the jack bolt 112 of its corresponding interval adjusting mechanism 110 contacts a lower surface of its corresponding receiving portion 113, that is, each supporting metal 70 is in a state in which it is supported by its corresponding jack bolt 112. On the basis of this, by changing the screwing amount of the jack bolt 112 with respect to the fixing portion 111 of its corresponding interval adjusting mechanism 110, the position of each supporting metal 70 in the up-down direction is changed (adjusted) in accordance with the screwing amount. At the location where each supporting metal 70 is adjusted by the corresponding interval adjusting mechanism 110 in the up-down direction, each supporting metal 70 is in a state in which it is adjusted in the up-down direction by tightening the bolts 75 inserted through the mounting holes and re-mounting each supporting metal 70 on its corresponding supporting bracket 50.

[0068] In the warp let-off device 20, as described above, the interval in the up-down direction between the two easing rollers 33 and 36 that are supported by the common supporting structural bodies is set such that weaving can be properly performed in connection with other weaving elements on the basis of, for example, the warp type. Therefore, in the warp let-off device 20, the interval is sometimes adjusted due to a change in, for example, the warp type.

[0069] Regarding the adjustment, in the warp let-off device 20 according to the embodiment, the interval is adjusted by adjusting in the up-down direction the position of the second support shaft 34 that supports the second easing roller 36, that is, by adjusting in the up-down direction the position of each supporting metal 70 with respect to its corresponding supporting bracket 50. More specifically, the mounting position of each supporting metal (second supporting section) 70 with respect to the base portion 51 of its corresponding supporting bracket 50 is adjusted in the up-down direction by using the corresponding interval adjusting mechanism 110 described above. By this, in each supporting structural body, the position of the second supporting section 70 in the up-down direction is adjusted with respect to the corresponding first supporting section 52 whose position in the up-down direction is determined in connection with the corresponding base portion 51. As a result, the interval in the up-down direction between the second support shaft 34 that is supported by the second supporting section 70 (second easing roller 36) and the first support shaft 31

that is supported by the first supporting section 52 (first easing roller 33) is in an adjusted state.

[0070] In this way, the warp let-off device 20 is, while having a structure in which the first support shaft 31 that supports the first easing roller 33 and the second support shaft 34 that supports the second easing roller 36 are supported by single supporting bodies, capable of properly adjusting the interval in accordance with, for example, the warp type.

[0071] In the forgoing description, an embodiment of the warp let-off device of a loom according to the present invention (hereunder referred to as "the embodiment") is described. However, the present invention is not limited to the embodiment described above, so that other embodiments (modifications) such as those described below are possible.

(1) In the embodiment, each supporting structural body includes a combination of two members, that is, the supporting bracket 50 that is mounted on the loom frame 10 and that supports the first support shaft 31 and the supporting metal 70 (second supporting section) that is mounted on the corresponding supporting bracket 50 and that supports the second support shaft 34. In addition, as described above, each supporting bracket 50 includes the base portion 51 that is mounted on the loom frame 10 and the rotatably supporting portion 52 (first supporting section) that supports the first supporting shaft 31; and these members are integrally molded with each other. That is, each supporting structural body according to the embodiment includes the first supporting section, the second supporting section, and the common base portion that supports both supporting sections, with the first supporting section and the base portion being included in an integrally molded member, and the second supporting section being provided separately from the first supporting section and the base portion and being mounted on (supported by) the integrally molded member.

[0072] However, in the warp let-off device according to the present invention, each supporting structural body may have a structure in which the first supporting section is provided separately from the base portion and the second supporting section, and the first supporting section is mounted on an integrally molded member including the base portion and the second supporting section. Further, each supporting structural body may have a structure in which the first supporting section, the second supporting section, and the base portion are separately provided, and are integrally combined into a signal structural body.

[0073] In the embodiment, in order to adjust the interval between two easing rollers in the up-down direction, each supporting structural body has a structure in which the mounting position of the supporting metal 70, serving as the second supporting section, with respect to the supporting bracket 50 including the first supporting section is changeable in the up-down direction. That is, each supporting structural body has a structure in which the first supporting section and the second supporting section are displaceable relative to each other in the up-down direction.

[0074] In addition, even in the case in which each supporting structural body has a structure in which the first supporting section is mounted on the integrally molded member including the base portion and the second supporting section, each supporting structural body may have a structure in which the mounting position of the first supporting section with respect to the base portion in the integrally molded member is changeable or unchangeable in the up-down direction.

[0075] Further, even in the case in which each supporting structural body has a structure in which the first supporting section, the second supporting section, and the base portion are separately provided and are integrally combined, each supporting structural body may have a structure in which the mounting position of either one of the first supporting section and the second supporting section or the positions of both of the first supporting section and the second supporting section with respect to the base portion in the up-down direction are changeable, or the mounting positions of both of the first and second supporting sections are unchangeable with respect to the base portion. Alternatively, each supporting structural body may have a structure in which the first supporting section, the second supporting section, and the base portion are integrally molded with each other.

(2) Regarding each support shaft that supports its corresponding easing roller, in the embodiment, the first support shaft 31 that supports the lower easing roller 33 is a shaft also serving as the lower guide roller 40a, and the second support shaft 34 that supports the upper easing roller 36 is a dedicated shaft. Therefore, the two support shafts of the warp let-off device according to the present invention, that is, the two support shafts of the two easing mechanisms provided in correspondence with the two warp beams are such that, in the embodiment, the warp let-off device has a structure in which one of the two support shafts is a shaft that also serves as a guide roller and the other support shaft is a dedicated shaft.

[0076] However, the warp let-off device according to the present invention may have a structure in which one of the two support shafts is a dedicated shaft and the other of the two support shafts is a shaft also serving as a guide roller. Alternatively, the warp let-off device may have a structure in which both support shafts are dedicated shafts. In these cases, in the warp let-off device, the guide roller for guiding a warp drawn out from a warp beam where the support shaft of the corresponding easing mechanism is a dedicated shaft is provided as a dedicated guide roller provided separately from the support shaft as with the structure corresponding to the upper warp beam 22 in the embodiment. Further, the warp let-

off device according to the present invention may have a structure in which both support shafts also serve as guide rollers.

[0077] In the embodiment, the second support shaft 34 is a shaft body extending in the weaving-width direction. That is, in the embodiment, the support shaft provided as a dedicated shaft (dedicated support shaft) is a shaft body extending in the weaving-width direction. However, in the warp let-off device according to the present invention, a pair of shaft portions that are provided apart from each other in the weaving-width direction may be dedicated support shafts. In this case, the shaft portions constituting the dedicated support shafts may be supported by the supporting structural bodies, and one or the other of the pair of supporting arms for supporting the easing rollers may be mounted thereon.

[0078] In the warp let-off device according to the present invention, each easing mechanism is not limited to a negative easing mechanism as in the embodiment, and thus may be a so-called positive easing mechanism that positively swings a corresponding easing roller by, for example, a driving device. In addition, each easing mechanism is not limited to an easing mechanism such as that in the embodiment that includes one easing section that is connected to an end (one side) of the support shaft. Each easing mechanism may include two easing sections that are connected to respective ends of the support shaft. When the support shafts are formed as two shaft portions that are apart from each other in the weaving-width direction as mentioned above, it is desirable that each easing mechanism include two easing sections that are connected to the corresponding shaft portions. Further, in this case, it is desirable that each easing mechanism be the aforementioned positive easing mechanism.

(3) Regarding the loom frame, in the embodiment, in a loom in which two warp beams of the warp let-off device are disposed so that their positions differ from each other in the up-down direction, each side frame 11 of the loom frame 10 includes the body frame 12 and the let-off frame 13 that are separate frames. Each let-off frame 13 includes the lower let-off frame 13a, which corresponds to the lower warp beam 21, and the upper let-off frame 13b, which corresponds to the upper warp beam 22, that are separately provided. In addition, each side frame 11 has a structure in which the body frame 12, the lower let-off frame 13a, and the upper let-off frame 13b are integrally combined.

[0079] However, in the loom frame according to the present invention, each side frame may have a structure in which, when in each side frame a portion of the let-off frame corresponding to the lower warp beam and a portion of the let-off frame corresponding to the upper warp beam are separately provided, one of the two portions is integrally molded with the body frame and the body frame includes the one of the portions. In this case, the partial let-off frame corresponding to the other of the two portions of each let-off frame is integrally combined with the body frame including the one of the portions. In the case of this structure, each let-off frame includes a portion of the body frame and the partial let-off frame corresponding to the other of the portions.

[0080] In the embodiment, in each side frame 11 of the loom frame 10, the lower let-off frame 13a and the upper let-off frame 13b, which are separately formed, of the let-off frame 13 are provided such that a portion of the body frame 12 is interposed therebetween. However, when the let-off frame of each side frame includes two partial let-off frames that are separately provided in correspondence with the warp beams, as disclosed in, for example, the aforementioned Patent Literature 1, the two partial let-off frames may be directly connected to each other in the up-down direction. In this case, each side frame has a structure in which the let-off frame and the body frame are integrally combined with each other with a front end surface of the let-off frame in contact with the back end surface of the body frame.

[0081] In each side frame, the let-off frame is not limited to a let-off frame described above having a structure in which two partial let-off frames that are separately provided are combined with each other. Each let-off frame may have a structure in which the two portions are integrally molded with each other. Alternatively, each side frame may be integrally molded as a whole and formed into a single frame including portions corresponding to the body frame and the let-off frame (lower let-off frame and upper let-off frame) in the embodiment.

[0082] In the embodiment, each supporting structural body is mounted on the body frame 12 of the loom frame 10. When, as described above, each body frame 12 that is positioned forwardly of the corresponding let-off frame is connected to the separately provided let-off frame or is integrally molded to the corresponding let-off frame to form the corresponding side frame, each supporting structural body is mounted on a back end surface of the corresponding let-off frame. Even in the case in which each side frame is formed such that the back end surface of the corresponding body frame is exposed at the back side as in the embodiment, each supporting structural body may be mounted on the back end surface of the corresponding let-off frame. However, when each supporting structural body is mounted on its corresponding let-off frame in this way, the supporting structural bodies are provided such that their mounting positions with respect to the let-off frames in the up-down direction are adjustable. This causes each supporting structural body to be provided so as to be displaceable in the up-down direction with respect to the loom frame.

(4) Regarding the two warp beams of the warp let-off device, in the embodiment, the warp beams 21 and 22 are primarily disposed at positions that differ from each other in the up-down direction. However, in the warp let-off device according to the present invention, for example, as shown in Fig. 5, the two warp beams may be primarily disposed at positions that differ from each other in the front-back direction. The details of the structure of

the warp let-off device shown in Fig. 5 are as follows. In Fig. 5, corresponding structural portions to those according to the embodiment are given the same reference numerals, and are not described below.

[0083] In a warp let-off device 20' shown in Fig. 5, each side frame 11' of a loom frame 10' includes a body frame 12 having the same structure as that according to the embodiment and a let-off frame 13' that is separately provided from the body frame 12. Similarly to the embodiment, each let-off frame 13' includes two partial let-off frames that are separately provided from each other.

[0084] Regarding the two partial let-off frames, a partial let-off frame 13a, which is one of the two partial let-off frames, has the same structure and arrangement with respect to the body frame 12 as those of the lower let-off frames 13a according to the embodiment. On the other hand, as mentioned above, in order to dispose the two warp beams 21 and 22 at positions that differ from each other in the front-back direction, a partial let-off frame 13c, which is the other partial let-off frame, is disposed behind and apart from the partial let-off frame 13a. Accordingly, the loom frame according to the present invention is not limited to one having an integrally combined structure as in the embodiment or an integrally molded structure as described above. The loom frame according to the present invention may have a structure in which a portion of each side frame is separated from portions other than such a portion of each side frame. In the description below, the partial let-off frame 13a is called a front let-off frame, and the other partial let-off frame 13c disposed behind the partial let-off frame 13a is called a back let-off frame.

[0085] By using a beam guide 14a provided at each front let-off frame 13a and a beam guide 14c provided at each back let-off frame 13c, the warp beam 21 is supported by two front let-off frames 13a and 13a, and the warp beam 22 is supported by two back let-off frames 13c and 13c. As a result, the two warp beams, that is, the warp beam 21 and the warp beam 22 are disposed at positions that differ from each other in the front-back direction.

[0086] Incidentally, in the illustrated example, the two warp beams 21 and 22 are disposed such that their positions slightly differ from each other in the up-down direction. However, the amount of difference between the positions in the up-down direction is much smaller than the amount of difference between the positions in the front-back direction. Therefore, this is considered as an example in which the two warp beams 21 and 22 are (primarily) disposed at positions that differ from each other in the front-back direction. Even if the loom frame has a structure such as that shown in Fig. 5, the warp let-off device may have a structure in which the two warp beams 21 and 22 are disposed at positions that are the same in the up-down direction.

[0087] In addition, in the illustrated example, a support shaft 31 of an easing mechanism 30a corresponding to the warp beam 21 and a support shaft 34' of an easing mechanism 30c corresponding to the warp beam 22 are supported by corresponding supporting structural bodies primarily including a supporting bracket 50'. However, each supporting structural body includes a supporting metal 70 which has the same structure as that according to the embodiment, which is mounted on the corresponding supporting bracket 50', and which corresponds to a second supporting section and supports the support shaft 34'. In the illustrated example, the support shaft 34' of the easing mechanism 30c is provided as a shaft also serving as a guide roller 40c of the easing mechanism 30c.

[0088] As in the embodiment, each supporting bracket 50' has a structure in which a first supporting section 52', which is a portion for supporting the support shaft 31, and a base portion 51', which is a portion on which the loom frame 10' is mounted, are integrally molded with each other. Each supporting bracket 50' includes an extending portion that extends behind the first supporting section 52' and that is integrally molded with the first supporting section 52' and the base portion 51'. Each second supporting section (supporting metal) 70 is mounted on the extending portion of the corresponding supporting bracket 50' such that the support shaft 34' is positioned behind and above the support shaft 31 that is supported by the corresponding first supporting section 52'. By this, the easing roller 36' of the easing mechanism 30c is in a state in which it is disposed behind and above the easing roller 33 of the easing mechanism 30a.

[0089] In the illustrated example, as described above, the warp let-off device has a structure in which the easing roller 36' corresponding to the back warp beam 22 is positioned behind and above the easing roller 33 corresponding to the front warp beam 21. This is to prevent a path of a warp drawn out from the back warp beam 22 from intersecting a path of a warp drawn out from the front warp beam 21 and the warps from slidingly contacting each other at the intersection. Accordingly, in the warp let-off device in which the two warp beams are disposed at positions that differ from each other in the front-back direction, it is desirable that the easing roller corresponding to the back warp beam be disposed behind and above the easing roller corresponding to the front warp beam.

[0090] However, when warps are allowed to undergo the sliding contact described above, for example, in the structure shown in Fig. 5, the warp let-off device 20' may have a structure in which the front easing roller 33 corresponds to the back warp beam 22 and the back and upper easing roller 36' corresponds to the front warp beam 21. That is, a warp drawn out from the front warp beam 21 may be wound around the easing roller 36' of the easing mechanism 30c, and a warp drawn out from the back warp beam 22 may be wound around the easing roller 33 of the easing mechanism 30a.

[0091] Although, in the example in Fig. 5, similarly to the embodiment, each supporting structural body is mounted on the body frame 12 of its corresponding side frame 11' of the loom frame 10', each supporting struc-

tural body may be mounted on the back let-off frame 13c of the let-off frame 13' of the corresponding side frame 11'. In this case, each supporting structural body is mounted such that the base portion 51' is oriented so as to be positioned behind the first supporting section 52', and its mounting position in the up-down direction with respect to a front end surface of the back let-off frame 13c is adjustable.

[0092] In the example in Fig. 5, in each side frame 11' of the loom frame 10', the front let-off frame 13a and the back let-off frame 13c, which are separately provided, of the let-off frame 13' are disposed apart from each other in the front-back direction. However, in a loom in which two warp beams of the warp let-off device are disposed at positions that differ from each other in the front-back direction, each let-off frame may have a structure in which a partial let-off frame corresponding to the front let-off frame 13a and a partial let-off frame corresponding to the back let-off frame 13c are integrally combined with each other. In addition, each let-off frame may have a structure in which a portion corresponding to the front let-off frame 13a and a portion corresponding to the back let-off frame 13c are included and are integrally molded with each other.

[0093] In the foregoing description, an example in which two warp beams of the warp let-off device are disposed at positions that differ from each other in the up-down direction or a front-back direction is described. However, in the warp let-off device according to the present invention, the two warp beams may be disposed at positions that do not differ from each other in both the up-down direction and the front-back direction.

[0094] More specifically, for example, each back let-off frame 13c in the example in Fig. 5 may further extend upward as compared to the illustrated example, and the warp beam 22 may be supported at an upper end portion thereof. In the case of this structure, the support shaft 34' of the easing mechanism 30c corresponding to the warp beam 22 is provided as a dedicated shaft, and the guide roller corresponding to the warp beam 22 is provided as a dedicated guide roller between the easing roller 36' and the warp beam 22 in the up-down direction.

[0095] The present invention is not limited to the above-described embodiments. Various modifications can be made within a scope that does not depart from the gist of the present invention.

Claims

1. A warp let-off device (20, 20') for a loom (1), the warp let-off device (20, 20') comprising two warp beams (21, 22) that are disposed at positions that differ from each other in an up-down direction and/or a front-back direction, and easing mechanisms (30a, 30b, 30c) that are provided for the warp beams (21, 22) corresponding thereto and that reduce variations in tension of a warp, each easing mechanism (30a, 30b, 30c) including a support shaft (31, 34, 34') that is provided such that an axis thereof is oriented in a weaving-width direction at the loom (1) and an easing roller (33, 36, 36') that is swingably supported by the support shaft (31, 34, 34'), **characterised in that**

   the warp let-off device (20, 20') includes a pair of supporting structural bodies that are disposed apart from each other in the weaving-width direction, each supporting structural body being a single supporting structural body that is mounted on a loom frame so as to be displaceable in the up-down direction with respect to the loom frame, and

   each supporting structural body includes a first supporting section (52, 52') for supporting the support shaft (31, 34, 34') of one of the two easing mechanisms (30a, 30b, 30c) and a second supporting section (70) for supporting the support shaft (31, 34, 34') of the other of the two easing mechanisms (30a, 30b, 30c),

   wherein each supporting structural body has a structure in which the first supporting section (52, 52') and the second supporting section (70) are displaceable relative to each other in the up-down direction.

Patentansprüche

1. Kettfadenablassvorrichtung (20, 20') für

   eine Webmaschine (1), die Kettfadenablassvorrichtung (20, 20') enthaltend zwei Kettbäume (21, 22), die an Stellen angeordnet sind, welche sich in einer Oben-Unten-Richtung und/oder einer Vorne-Hinten-Richtung voneinander unterscheiden, und Entlastungseinrichtungen (30a, 30b, 30c), die für die dazu entsprechenden Kettbäume vorgesehen sind und die Spannungsvariationen eines Kettfadens reduzieren, jede Entlastungseinrichtung (30a, 30b, 30c) beinhaltend eine Trägerwelle (31, 34, 34'), die so vorgesehen ist, dass eine Achse davon in eine Webbreitenrichtung an der Webmaschine (1) ausgerichtet ist und eine Entlastungsrolle (33, 36, 36'), die von der Trägerwelle (31, 34, 34') schwingend getragen wird,

   dadurch gekennzeichnet, dass die Kettfadenablassvorrichtung (20, 20') ein Paar tragende Strukturkörper beinhaltet, die in der Webbreitenrichtung voneinander beabstandet angeordnet sind, wobei jeder tragende Strukturkörper ein einzelner tragender Strukturkörper ist, der an einem Webmaschinenrahmen befestigt ist, um in der Oben-Unten-Richtung bezüglich des Webmaschinenrahmens verschiebbar zu sein, und jeder tragende Strukturkörper einen ersten Tra-

gabschnitt (52, 52') zum Tragen der Trägerwelle (31, 34, 34') einer der beiden Entlastungseinrichtungen (30a, 30b, 30c) und einen zweiten Tragabschnitt (70) zum Tragen der Trägerwelle (31, 34, 34') der anderen der beiden Entlastungseinrichtungen (30a, 30b, 30c) beinhaltet, wobei jeder tragende Strukturkörper eine Struktur aufweist, in welcher der erste Tragabschnitt (52, 52') und der zweite Tragabschnitt (70) in der Oben-Unten-Richtung relativ zueinander verschiebbar sind.

Revendications

1. Dispositif de déroulement de chaîne (20, 20') pour

un métier à tisser (1), le dispositif de déroulement de chaîne (20, 20') comprenant deux ensouples de chaîne (21, 22) qui sont disposées en des positions qui diffèrent l'une de l'autre dans une direction haut-bas et/ou une direction avant-arrière, et des mécanismes de détente (30a, 30b, 30c) qui sont prévus pour les ensouples de chaîne (21, 22) correspondant à ceux-ci et qui réduisent les variations de tension d'une chaîne, chaque mécanisme de détente (30a, 30b, 30c) comprenant un arbre de support (31, 34, 34') qui est disposé de telle sorte qu'un axe de celui-ci est orienté dans une direction de largeur de tissage au niveau du métier à tisser (1) et un rouleau de détente (33, 36, 36') qui est supporté de manière oscillante par l'arbre de support (31, 34, 34'), **caractérisé en ce que**
le dispositif de déroulement de chaîne (20, 20') comprend une paire de corps structuraux de support qui sont disposés à distance l'un de l'autre dans la direction de la largeur de tissage, chaque corps structural de support étant un corps structural de support unique qui est monté sur un cadre de métier de manière à être déplaçable dans la direction haut-bas par rapport au cadre de métier à tisser, et
chaque corps structural de support comprend une première section de support (52, 52') pour supporter l'arbre de support (31, 34, 34') de l'un des deux mécanismes de détente (30a, 30b, 30c) et une deuxième section de support (70) pour supporter l'arbre de support (31, 34, 34') de l'autre des deux mécanismes de détente (30a, 30b, 30c),
chaque corps structural de support ayant une structure dans laquelle la première section de support (52, 52') et la deuxième section de support (70) sont mobiles l'une par rapport à l'autre dans la direction haut-bas.

FIG. 1

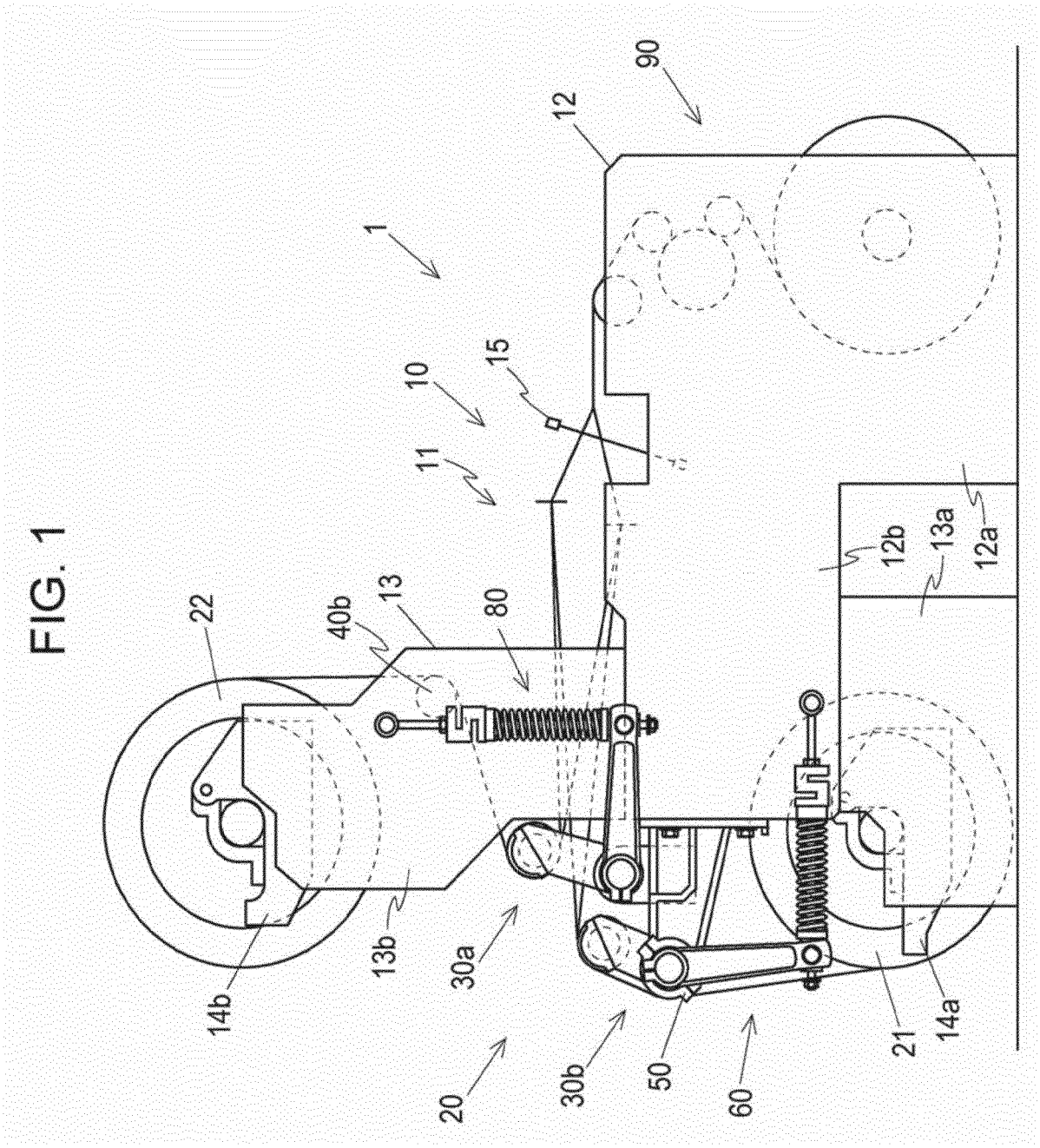

90
12
1
10
15
11
12b
13a
12a
22
40b
13
80
13b
30a
14b
20
30b
50
60
21
14a

FIG. 2

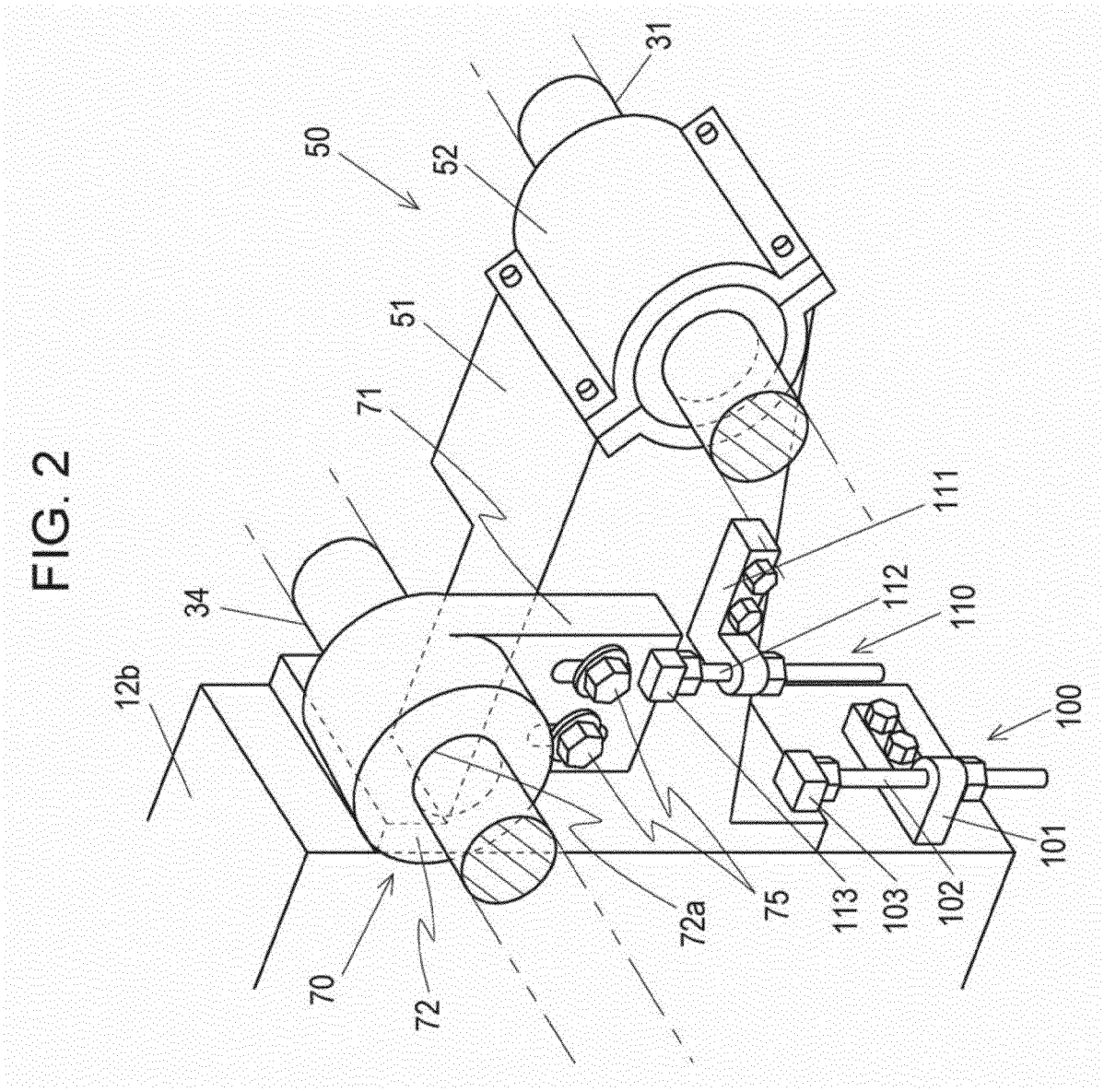


FIG. 3

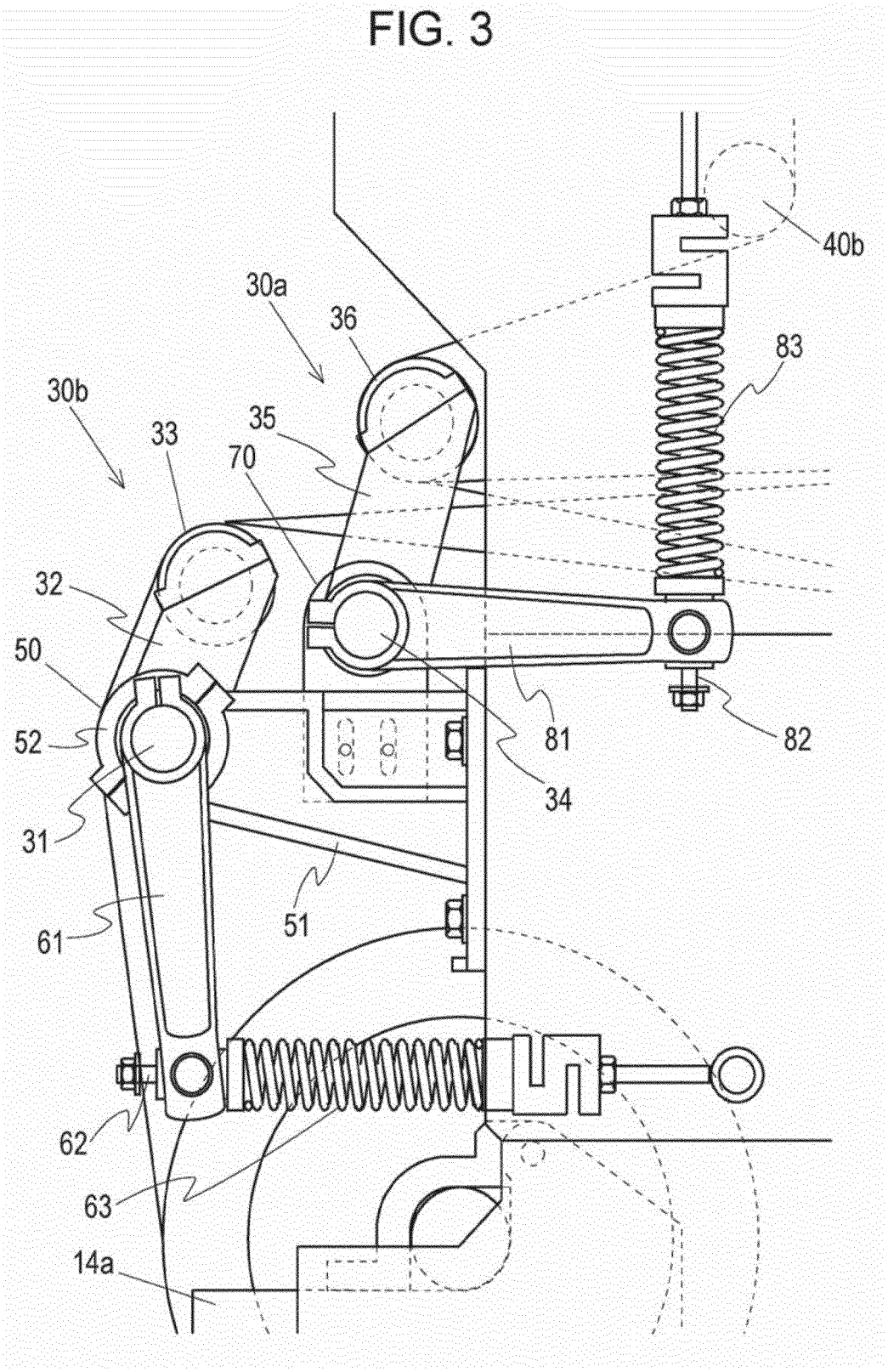


FIG. 4

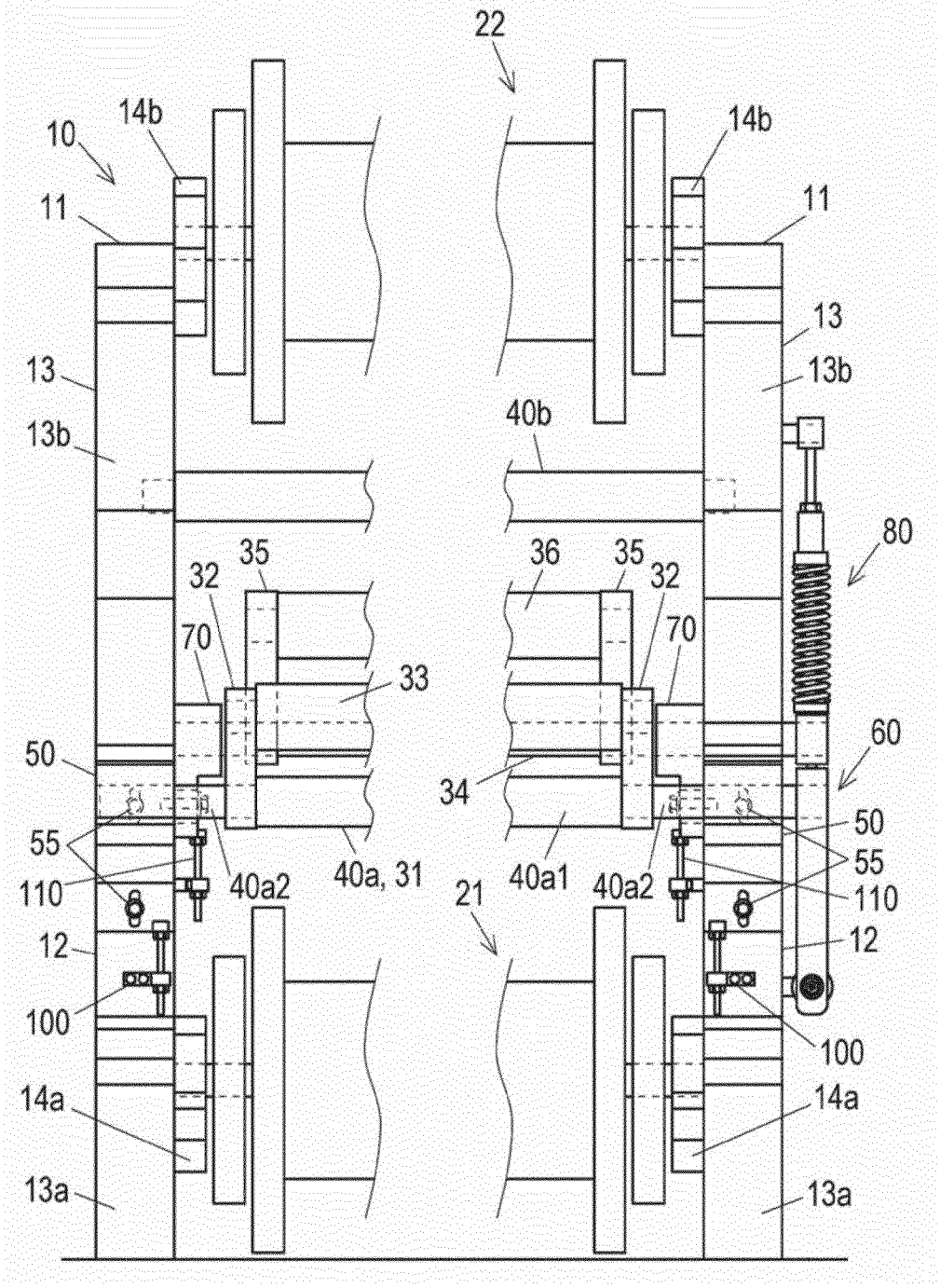
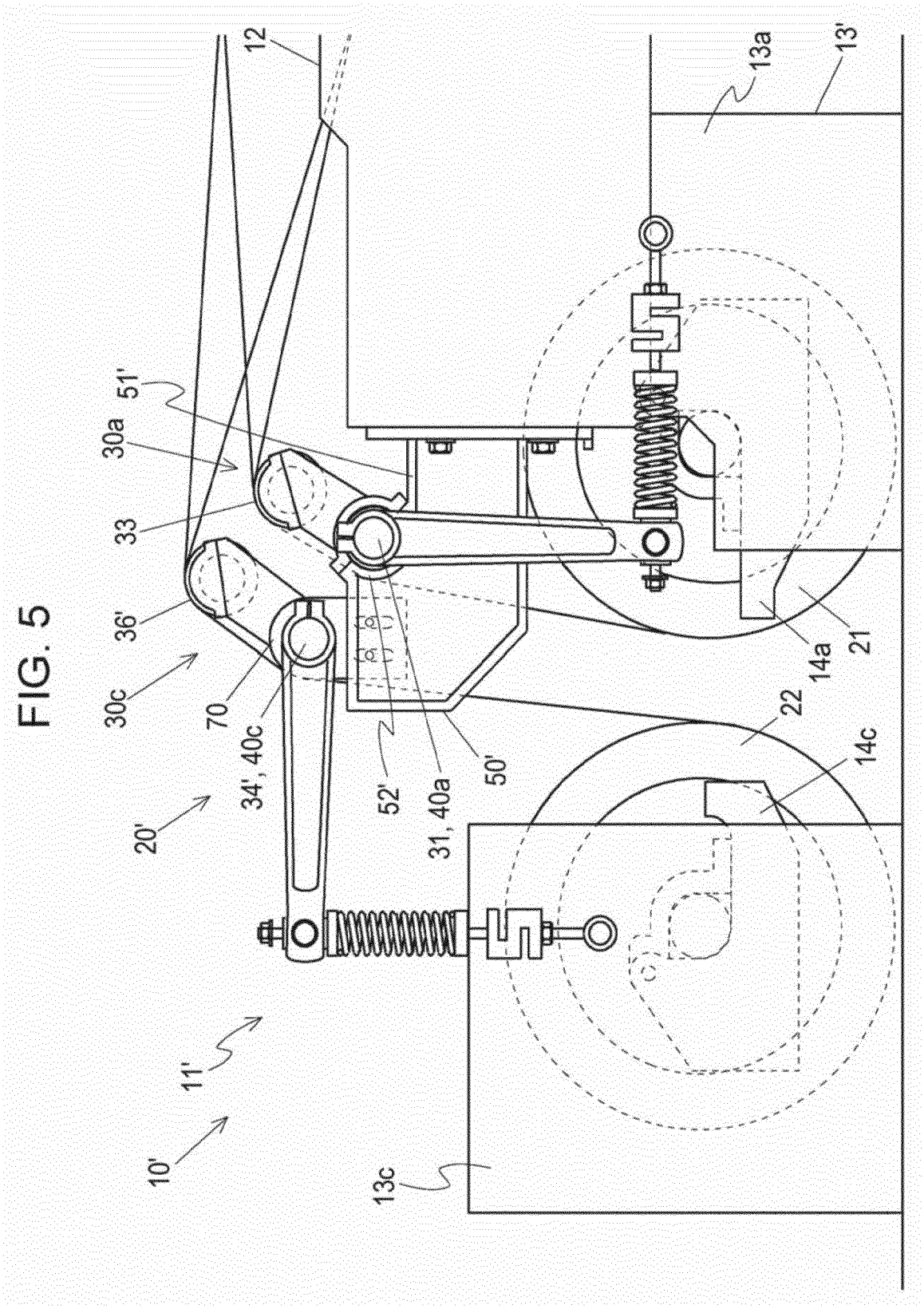

22
14b
10
11
13
13b
40b
80
36
35
32
70
33
60
34
50
55
110
40a, 31
40a2
40a1
21
12
100
14a
13a

FIG. 5


12
13a
13'
51'
30a
33
36'
30c
70
34', 40c
20'
52'
31, 40a
50'
22
14a
21
14c
11'
10'
13c

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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- JP 2010111981 A **[0006]**