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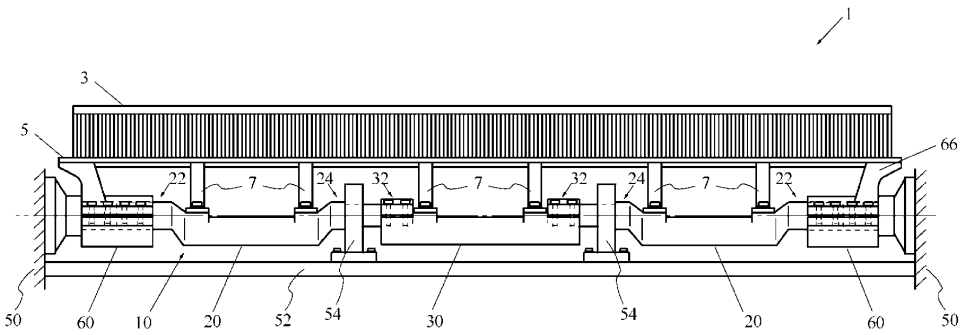
(54) LOOM WITH BEATING DEVICE

(57) A beating device (1) for a loom includes a rocking shaft (10), where the rocking shaft (10) is constituted by connecting a plurality of shaft constituting members consisting of a first shaft member (20) and a second shaft member (30) each having a balance part (26; 36) and both side parts, which are connecting parts, the shaft constituting members at both ends are the first shaft members (20), at least one of the two adjacent shaft constituting members is the second shaft member (30), the two adjacent shaft constituting members are connected in a state where a shaft part (22a, 24a) of a shaft connecting part (22, 24) of the first shaft member (20) or the second shaft member (30), which is the other shaft constituting member is fitted in a hole part (32a) of a hole connecting part (32) of the second shaft member (30), which is one shaft constituting member, and the rocking shaft (10) is connected to support shafts (40) by the shaft parts (22a) of the shaft connecting parts (22) on one side of each of the first shaft members (20) at both ends and is connected to support bodies (54) by the shaft parts (24a) of the shaft connecting parts (24) on the other side.

FIG. 1



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Description

TECHNICAL FIELD

[0001] The present invention relates to a beating device for a loom including a rocking shaft that is configured to support a sley, to which a reed is attached, via a plurality of sley swords, is connected to a pair of support shafts provided to each of left and right side frames of the loom and configured to rock, and therefore, is bridged between the support shafts, is supported, via a bearing, on support bodies provided on a beam member bridged between the side frames, is constituted by connecting a plurality of shaft constituting members dividable in an axis line direction and has balance parts each spaced from a center of rocking toward an opposite side to the reed.

BACKGROUND ART

[0002] A loom has a pair of support shafts configured to rock in conjunction with rotation of a main shaft. Note that, the support shafts are each provided to each of left and right side frames of the loom and are provided in such an aspect that one end portion thereof protrudes from each side frame toward an inner side in a weaving width direction. A rocking shaft of a beating device is connected to both the support shafts. Thereby, the rocking shaft is provided in a state of being bridged between the pair of support shafts.

[0003] In addition to the rocking shaft, the beating device has a plurality of sley swords spaced in an axis line direction on the rocking shaft, a sley attached to the sley swords, and a reed attached to the sley, and is configured so that the reed is supported to the rocking shaft via the sley and the sley swords. Specifically, the beating device has an assembly consisting of the rocking shaft, the sley swords, the sley and the reed. In the beating device, the pair of support shafts rocks, so that the assembly rocks about a shaft center of the rocking shaft as a center of rocking, and therefore, a beating operation is executed.

[0004] Note that, in the assembly of the beating device, the sley and the reed are in positions spaced from the center of rocking. For this reason, the center of gravity of the assembly is positioned closer to the reed than the center of rocking. Therefore, in the beating device, the rocking shaft is generally configured to have a balance part provided in a position spaced from the center of rocking toward an opposite side to the reed so as to bring the position of the center of gravity close to the center of rocking.

[0005] For example, Patent Literature 1 discloses such a beating device. In the beating device (hereinafter, referred to as 'conventional device') disclosed in Patent Literature 1, the rocking shaft consists of a plurality of shaft constituting members, and is constituted by connecting the shaft constituting members in an axis line direction.

[0006] Specifically, the rocking shaft consists of four rocking shaft parts (second rocking shafts and third rocking shafts), which are each a shaft constituting member and are provided spaced from each other in the axis line direction, balance shaft parts (a first balance shaft and a second balance shaft) each provided between the two adjacent rocking shaft parts of the rocking shaft parts, and connecting members (a first connecting unit and a second connecting unit) each configured to connect the rocking shaft part and the balance shaft part each other. The rocking shaft has, as a balance part consisting of the balance shaft parts, a balance part provided in a position spaced from a shaft center of the rocking shaft part becoming the center of rocking.

[0007] The rocking shaft part and the balance shaft part are each formed so that both side parts thereof form a shaft shape. The connecting member has two connecting holes for receiving each of the side part of the rocking shaft part and the side part of the balance shaft part. In addition, the rocking shaft is constituted by integrally connecting each rocking shaft part and each balance shaft part in the axis line direction in a form of fitting the side part of the rocking shaft part into one connecting hole and fitting the side part of the balance shaft part into the other connecting hole.

[0008] The rocking shaft configured in this way is connected at the rocking shaft parts (second rocking shafts) of both ends to a pair of support shafts (first rocking shafts) provided to the left and right side frames, and is rotatably supported at the rocking shaft parts (third rocking shafts) positioned on inner sides of the rocking shaft parts of both ends via bearings by support bodies (intermediate support units) supported on a beam member bridged between the side frames.

CITATION LIST

PATENT LITERATURE

[0009] Patent Literature 1: JP2005-344223A

SUMMARY OF INVENTION

[0010] In the conventional device, since the rocking shaft and the configuration for supporting the rocking shaft are as described above, as the rocking shaft rocks for the beating operation, an excessive load is applied to the bearing of the support body, and therefore, the bearing is damaged.

[0011] Specifically, in the conventional device, as described above, the rocking shaft is connected at the rocking shaft parts of both ends to the support shafts provided to the left and right side frames, and is supported at the rocking shaft parts different from the rocking shaft parts connected to the support shafts by the support bodies, and thus, is supported on the loom. In addition, the rocking shaft parts connected (supported) to the support shafts and the rocking shaft parts supported by the support bodies are connected to each other, via the connect-

ing members each connected to each of the rocking shaft parts and the balance shaft parts.

[0012] In the rocking shaft of the conventional device, since the two adjacent rocking shaft parts, the connecting members connecting the rocking shaft parts and the balance shaft parts are each provided as separate members and are assembled to constitute the rocking shaft, the assembling may be made in a state where the shaft centers of the two adjacent rocking shaft parts are misaligned with each other, depending on assembling accuracy and the like. For this reason, in the state where the rocking shaft is supported on the loom, as described above, the shaft center of the rocking shaft part connected to the support shaft and the shaft center of the rocking shaft part supported on the support body may be misaligned with each other.

[0013] When the shaft centers of both the rocking shaft parts are misaligned with each other, the rocking shaft part supported on the support body is supported by the bearing in such a form that the shaft center thereof is misaligned from the center of rocking. For this reason, when the rocking shaft is rocked by the support shaft, the rocking shaft part connected to the support shaft is rocked about the shaft center of the support shaft but the rocking shaft part supported on the support body intends to rotate around the center of rocking because it is supported in a position eccentric from the center of rocking. As a result, the excessive load is applied to the bearing of the support body, and thus, the bearing may be damaged.

[0014] It is therefore an object of the present invention to provide a structure of a beating device for a loom capable of preventing a bearing of a support body from being damaged as much as possible as a rocking shaft rocks.

[0015] In order to achieve the above object, the beating device for a loom as described above according to the present invention is characterized in that wherein a plurality of shaft constituting members includes first shaft members and a second shaft member each having a balance part and both side parts, which are connecting parts for connection with adjacent shaft constituting members, wherein the first shaft members each have a configuration where both side parts are shaft connecting parts having shaft parts each formed into a shaft shape and both the shaft connecting parts and the balance part positioned between both the shaft connecting parts are integrally formed, and wherein the second shaft member is formed in such an aspect that one of both side parts is a hole connecting part having a hole part and the other is a hole connecting part having a hole part or a shaft connecting part having a shaft part formed into a shaft shape. In addition, the present invention is characterized in that wherein the rocking shaft is configured such that the shaft constituting members at both ends are the first shaft members, at least one of the two adjacent shaft constituting members is the second shaft member and the two adjacent shaft constituting members are connected in a state where the shaft part of the shaft connecting part of the first shaft member or the second shaft member, which is the other shaft constituting member is fitted in the hole part of the hole connecting part of the second shaft member, which is one shaft constituting member, and wherein the rocking shaft is connected to the support shafts by the shaft parts of the shaft connecting parts on one side of each of the first shaft members at both ends and is connected to the support bodies by the shaft parts of the shaft connecting parts on the other side.

[0016] In the beating device for a loom of the present invention, the balance part of each of the first shaft members and/or the balance part of the second shaft member may be formed to have a circular section in the axis line direction, and may be located in a position overlapping a presence range of the shaft part of the shaft connecting part or the hole part of the hole connecting part, as seen in the axis line direction. In addition, the shaft part of the shaft connecting part on the other side of each of the first shaft members at both ends of the rocking shaft may have a step portion formed by forming a shaft diameter of a part closer to the balance part than a part to be supported on the support body to be larger than a shaft diameter of the part to be supported on the support body.

[0017] In addition, in the present invention, the sley swords may be provided in a form of being supported on each of the shaft constituting members in positions within a presence range of the balance part of each of the shaft constituting members in the axis line direction. In addition, the rocking shaft may be connected to the pair of support shafts via coupling members, each of the coupling members may have a balance part spaced from the center of rocking toward an opposite side to the reed, and the sley swords may be provided in a form of being supported on the coupling members even within a presence range of the balance parts of the coupling members in the axis line direction.

[0018] According to the beating device for a loom of the present invention, the shaft constituting members at both ends of the rocking shaft are formed as the first shaft members that each include the shaft connecting part having the shaft part connected to the support shaft, the shaft connecting part having the shaft part supported on the support body, and the balance part positioned between both the shaft connecting parts and are each constituted by integrally forming both the shaft connecting parts and the balance part. Specifically, the first shaft member is formed as a single member including two shaft connecting parts (shaft parts), and has such a configuration that it is possible to easily implement a state where the shaft centers of both the shaft parts are made to match each other, as seen in the axis line direction, as compared to the conventional device where the two shaft parts (rocking shaft parts) are connected via a separate member (a balance part, a connecting member).

[0019] Thereby, in a state of being supported on the loom, the rocking shaft can easily implement a state where the shaft center of the shaft part connected to the

support shaft and the shaft center of the shaft part supported on the support body match each other (both the shaft centers are not misaligned with each other), as seen in the axis line direction. Therefore, according to the beating device for a loom of the present invention where the rocking shaft is prepared in this way, even when the rocking shaft rocks for a beating operation, a load, which is generated when both the shaft centers are misaligned with each other as in the conventional device, is not applied to the bearing of the support body. As a result, the damage of the bearing of the support body caused due to the load is prevented as much as possible.

[0020] By constituting the first shaft member as described above, it is also possible to easily implement a configuration where the balance part positioned between both the shaft connecting parts becomes parallel to the center of rocking. Thereby, it is possible to make the balance state of the first shaft member of the rocking shaft more uniform over the axis line direction.

[0021] In addition, in the beating device for a loom of the present invention, when the balance part of the first shaft member and/or the balance part of the second shaft member is formed to have a circular section in the axis line direction, it is possible to reduce the inertia by the balance part caused due to the beating operation, as compared to a configuration where the sectional shape is elliptical. Thereby, it is possible to improve the compatibility of the loom with the high-speed operation.

[0022] Further, in the beating device for a loom of the present invention, the first shaft members at both ends of the rocking shaft are each configured so that the shaft part of the shaft connecting part supported on the support body has the above-described step portion. Thereby, the bending of the rocking shaft caused due to the beating operation is reduced.

[0023] More specifically, in association with the beating operation, the inertia of the sley and the reed provided on the sley and a shock at a time of beating operation are applied to the rocking shaft via the sley swords, as a load. The load is applied to the rocking shaft, as a force to bend the rocking shaft.

[0024] Regarding this, when the first shaft members at both ends of the rocking shaft are each configured as described above, the first shaft member can be supported on the support body in a state where an end face of the step portion is in contact with a side surface of the support body. Thereby, even when the load is applied to the rocking shaft, the force in a bending direction by the load is received by the support body on a contact surface of the step portion with the support body, so that the bending of the rocking shaft is reduced. As the bending of the rocking shaft is reduced in this way, vibrations of the beating device at a time of beating operation are reduced and the compatibility of the loom with the high-speed operation is improved.

[0025] Further, in the beating device for a loom of the present invention, when the sley swords are provided in a form of being supported on each of the shaft constituting members in the positions within the presence range of the balance part of each shaft constituting member in the axis line direction, the deterioration of the balance state of the beating device at a time when the load is applied to the rocking shaft is reduced.

[0026] Specifically, as described above, the load is applied to the rocking shaft via the sley swords. Note that, the load acts in a direction of deteriorating the balance state, especially, in the parts at which the sley swords are provided. When the balance state in the parts at which the sley swords are provided is deteriorated, the balance state of the entire assembly is also deteriorated. Regarding this, the sley swords are provided as described above, i.e., the balance part is present in the positions of each shaft constituting member in which the sley swords are provided, so that when the load is applied to a part to which the load is to be applied, the deterioration of the balance state at the part is reduced. As a result, the deterioration of the balance state of the entire beating device (assembly) caused due to the load is reduced.

[0027] Further, in the beating device for a loom of the present invention, the coupling members configured to connect the rocking shaft and the support shafts each have the balance part, and the sley swords are also provided within the presence range of the balance parts of the coupling members in the axis line direction, so that the load applied via the sley swords at a time of beating operation is received not only by the rocking shaft but also by the coupling members. As a result, the bending of the rocking shaft caused due to the load is further reduced, and the deterioration of the balance state is further reduced.

BRIEF DESCRIPTION OF DRAWINGS

[0028]

FIG. 1 is a front view of a loom according to an embodiment of the present invention.
FIG. 2 is an enlarged view of main parts of FIG. 1.
FIG. 3 is a sectional view taken along an A-A line in FIG. 2.
FIG. 4 is a sectional view taken along a B-B line in FIG. 2.
FIG. 5 is a sectional view taken along a C-C line in FIG. 2.

DESCRIPTION OF EMBODIMENTS

[0029] Hereinafter, an embodiment of a loom to which the present invention is applied will be described with reference to FIGS. 1 to 5.

[0030] The loom has a beating device 1 including a reed 3 for beating weft inserted in weaving against a cloth fell of a woven fabric. The beating device 1 has a configuration where the reed 3 is attached on a sley 5 and the sley 5 is supported on a rocking shaft 10 via a plurality of sley swords 7. The beating device 1 is supported on

the loom by support shafts 40 and 40 of the rocking shaft 10, which are each provided to each of left and right side frames 50 and 50 of the loom.

[0031] Each support shaft 40 is rotatably supported on each side frame 50. The pair of support shafts 40 and 40 is each connected to the rocking shaft 10 via coupling members 60 and 60. The loom is also configured so that the pair of support shafts 40 and 40 is rocked by a main shaft (not shown). In the loom, the support shafts 40 are rocked, so that the rocking shaft 10 is rocked and the beating is executed.

[0032] In the loom, a beam member 52 is bridged between the side frames 50 and 50, and the rocking shaft 10 is also supported by support bodies 54 attached on the beam member 52. Note that, the support body 54 is configured to rotatably support the rocking shaft 10 via a bearing 58a. In the present embodiment, for example, the two support bodies 54 spaced in a weaving width direction are provided.

[0033] In the beating device 1 of the loom, according to the present invention, the rocking shaft is constituted by connecting a plurality of shaft constituting members consisting of a first shaft member and a second shaft member and each having a balance part provided spaced from a center of rocking toward an opposite side to the reed. In the present invention, the rocking shaft is constituted so that the shaft constituting members positioned at both ends are the first shaft members. In the present embodiment, the rocking shaft 10 consists of the first shaft members at both ends and one second shaft member positioned between both the first shaft members. The rocking shaft 10 is described in detail, as follows.

[0034] The rocking shaft 10 consists of the two types of shaft constituting members of the first shaft members 20 and the second shaft member 30, and is configured so that the shaft constituting members at both ends are the first shaft members 20. Therefore, the rocking shaft 10 is supported by the support shafts 40 in a form of being connected to each of the support shafts 40 at one side part of both side parts of each of the first shaft members 20. In other words, one of both side parts of each of the first shaft members 20 is constituted as a connecting part 22 that is connected to the support shaft 40. In addition, the shaft constituting member positioned between the first shaft members 20 and 20 at both ends of the rocking shaft 10 is constituted as one second shaft member 30, as described above. Therefore, the other of both side parts of each of the first shaft members 20 is constituted as a connecting part 24 that is connected to the second shaft member 30.

[0035] As for the first shaft member 20, the first shaft member 20 has a balance part 26 between the connecting parts 22 and 24 on both sides thereof. The connecting parts 22 and 24 have shaft-shaped shaft parts 22a and 24a that are each connected to the support shaft 40 or the second shaft member 30, respectively, as described above. Specifically, both the connecting parts 22 and 24 are constituted as the shaft connecting parts of the present invention. Both the shaft connecting parts 22 and 24 of the first shaft member 20 are spaced in an axis line direction of the shaft parts 22a and 24a, and exist in such a form that shaft centers of the shaft parts 22a and 24a are made to match each other, as seen from the axis line direction.

[0036] The shaft part 22a of one shaft connecting part 22 connected to the support shaft 40 has a diameter (outer diameter) that is substantially the same as a diameter of the support shaft 40. On the other hand, the shaft part 24a of the other shaft connecting part 24 connected to the second shaft member 30 has a diameter that is larger on one end-side becoming the balance part 26-side than a diameter of the other end-side. In other words, the shaft part 24a has a step portion 24a1 formed by forming a shaft diameter of a part on one end-side (balance part 26-side) to be larger than a shaft diameter of a part on the other end-side. Additionally describing, the diameter of the part on one end-side of the shaft part 24a is formed to be substantially the same as the diameter of the shaft part 22a of one shaft connecting part 22.

[0037] In the present embodiment, the balance part 26 positioned between the shaft connecting parts 22 and 24 is formed to have a circular (shaft shape) section. A diameter of the balance part 26 is substantially the same as the diameter of the shaft part 22a. Note that, the balance part 26 of the first shaft member 20 is formed so that an axis line thereof is parallel to axis lines of the shaft parts 22a and 24a and a shaft center thereof is located in a position eccentric with respect to the shaft centers of the shaft parts 22a and 24a of the shaft connecting parts 22 and 24 on both sides, as seen in the axis line direction. Also, an eccentric amount of the balance part 26 is substantially the same as a radius of the shaft part 22a. Therefore, in the first shaft member 20, a presence range of the balance part 26 and presence ranges of the shaft parts 22a and 24a overlap, as seen in the axis line direction.

[0038] The first shaft member 20 has a configuration where both the shaft connecting parts 22 and 24 and the balance part 26 are directly connected to each other. Therefore, both the shaft connecting parts 22 and 24 has intermediate parts 22b and 24b that continue to the shaft parts 22a and 24a on the balance part 26-side with respect to the shaft part 22a and 24a and also continue to the balance part 26 eccentric to the shaft parts 22a and 24a.

[0039] The first shaft member 20 whose both the shaft connecting parts 22 and 24 are directly connected to the balance part 26 at the intermediate parts 22b and 24b is mainly constituted by only the balance part 26 between both the shaft connecting parts 22 and 24, and has a crank shape as a whole. Also, the first shaft member 20 has a configuration where the shaft parts 22a and 24a and the intermediate parts 22b and 24b of both the shaft connecting parts 22 and 24 and the balance part 26 are integrally formed. Specifically, the first shaft member 20 is formed as a single member having the shaft connecting

parts 22 and 24 and the balance part 26.

[0040] As for the second shaft member 30, the second shaft member 30 is connected to each of the first shaft members 20 and 20 at both ends of the rocking shaft 10, as described above. Therefore, both side parts of the second shaft member 30 are constituted as connecting parts 32 and 32 that are connected to the first shaft members 20 and 20. The second shaft member 30 is constituted to have a balance part 36 between both the connecting parts 32 and 32. Note that, the balance part 36 is formed to have a circular (shaft shape) section, like the balance part 26 of the first shaft member 20. In addition, a diameter of the balance part 36 is substantially the same as the diameter of the balance part 26 of the first shaft member 20.

[0041] As for both the connecting parts 32 and 32 of the second shaft member 30, since the connecting parts of the first shaft member 20 are the shaft connecting parts, as described above, both the connecting parts 32 and 32 are each configured to receive the shaft part 24a of the shaft connecting part 24 on the other side of the first shaft member 20 and to have a hole part 32a for the receiving. Specifically, both the connecting parts 32 and 32 are constituted as the hole connecting parts of the present invention.

[0042] Note that, in the present embodiment, each of the hole connecting parts 32 is constituted by two parts of a receiving part 33 continuing to the balance part 36 and a cover part 34 attached to the receiving part 33. As for each of the hole connecting parts 32 configured as described above, the receiving part 33 has a block shape and an end face (attached surface) to which the cover part 34 is attached. Note that, the cover part 34 has a plate shape, and one end face in a plate thickness direction is configured as an attaching surface to the receiving part 33.

[0043] The receiving part 33 and the cover part 34 are formed with arc-shaped grooves (arc grooves) 33a and 34a opening to the attached surface and the attaching surface and configured to form the hole part 32a in a state where the receiving part 33 and the cover part 34 are assembled. Note that, both the arc grooves 33a and 34a are formed over the entire width direction (extension direction of the groove) of the receiving part 33 and the cover part 34. A curvature radius of an arc surface of each of both the arc grooves 33a and 34a is substantially the same as a radius of the part on the other end-side (a side opposite to the balance part 26) of the shaft part 24a of the other shaft connecting part 24 of the first shaft member 30. However, an arc angle of each of both the arc grooves 33a and 34a is smaller than 180°.

[0044] The receiving part 33 is formed so that an end face on an opposite side to the attached surface in a direction (height direction) orthogonal to the attached surface has an arc shape, as seen in an extension direction (the width direction) of the arc groove 33a. Specifically, the end face on the opposite side is formed as an arc surface. Note that, a curvature radius of the arc surface is substantially the same as the radius of the balance part 36.

[0045] A dimension of the receiving part 33 in the height direction is substantially the same as the diameter of the balance part 36. In addition, dimensions in the width direction of the receiving part 33 and the cover part 34 attached to the receiving part 33 are smaller than a length dimension of the part on the other end-side (farther than the step portion 24a1) of the shaft part 24a of the other shaft connecting part 24 of the first shaft member 20.

[0046] The receiving parts 33 and 33 of both the hole connecting parts 32 and 32 of the second shaft member 30 are present on both sides of the balance part 36 in a state where the width direction is made to match the axis line direction of the balance part 36. However, the balance part 36 and both the receiving parts 33 and 33 are in a state where a shaft center of the balance part 36 and arc centers of the arc surfaces of both the receiving parts 33 and 33 substantially match each other, as seen in the axis line direction of the balance part 36. Therefore, the second shaft member 30 has a configuration where the arc surface of the receiving part 33 matches a part of a circumferential surface of the balance part 36 and presence ranges of both the receiving parts 33 and 33 and a presence range of the balance part 36 overlap, as seen in the axis line direction of the balance part 36.

[0047] The cover part 34 is attached to the receiving part 33, so that the hole connecting part 32 is constituted and the hole part 32a of the hole connecting part 32 is formed by both the arc grooves 33a and 34a formed at each of the receiving part 33 and the cover part 34. Note that, the cover part 34 is attached to the receiving part 33 by using screw members 35. More specifically, each receiving part 33 is formed with a plurality of female thread holes 33b opening to the attached surface (excluding the part of the arc groove 33a). Note that, each cover part 34 is formed with through-holes 34b penetrating through in the plate thickness direction, in positions of the attaching surface corresponding to the female thread holes 33b of the receiving part 33. In addition, the attaching of the cover part 34 to the receiving part 33 is performed in a form of screwing the screw members 35 inserted in the through-holes 34b of the cover part 34 into the female thread holes 33b of the receiving part 33.

[0048] In the second shaft member 30 configured in this way, the balance part 36 is present in a position in which an axis line thereof is parallel to a central line of the hole part 32a of the hole connecting part 32 formed as described above and a shaft center thereof is eccentric from a center of the hole part 32a, as seen in the axis line direction. Since the dimension in the height direction of the receiving part 33 is substantially the same as the diameter of the balance part 36, as described above, the presence range of the balance part 36 and the presence range of the hole part 32a partially overlap, as seen in the axis line direction. In addition, the second shaft member 30 has a configuration where the receiving parts 33 and 33 of both the hole connecting parts 32 and 32 and

the balance part 36 are integrally formed. Specifically, in the second shaft member 30, both the receiving parts 33 and 33 and the balance part 36 are formed in a form of being included in a single member.

[0049] In the present embodiment, the rocking shaft 10 is constituted in such an aspect that the shaft parts 24a of the other shaft connecting parts 24 of the first shaft members 20 are each connected to each of both the hole connecting parts 32 and 32 of the second shaft member 30. Note that, the connection between the hole connecting part 32 of the second shaft member 30 and the shaft part 24a of the other shaft connecting part 24 of the first shaft member 20 is made in a form of inserting the shaft part 24a of the first shaft member 20 into the hole part 32a of the second shaft member 20 formed by attaching the cover part 34 to the receiving part 33, as described above, and tightening the screw members 35 for attaching the cover part 34 to the receiving part 33 to fasten the shaft part 24a by the receiving part 33 and the cover part 34.

[0050] By such connection, the rocking shaft 10 is constituted in such an aspect that the first shaft members 20 and 20 at both ends are connected by the second shaft member 30 and the shaft part 22a of one shaft connecting part 22 of each of the first shaft member 20 is positioned on the outermost side. Specifically, in the rocking shaft 10, the first shaft members 20 and 20 at both ends are arranged to be bilaterally symmetric with respect to the second shaft member 30, as seen in a direction orthogonal to the axis line direction.

[0051] As described above, the plurality of sley swords 7 for supporting the sley 5 to which the reed 3 is attached is attached to the rocking shaft 10. Note that, in the present embodiment, the two sley swords 7 are attached to each of each first shaft member 20 and the second shaft member 30. The attaching positions of the sley swords 7 to each of the shaft constituting members 20 and 30 are positions (positions adjacent to the connecting parts) of both end portions of each of the balance parts 26 and 36.

[0052] The rocking shaft 10 of the present embodiment also has attachment seats 12 for attaching the sley swords 7, which are provided in positions of both end portions of each of the balance parts 26 and 36 of the shaft constituting members 20 and 30. Each of the sley swords 7 is attached to the rocking shaft 10 in a form of being attached to the attachment seat 12.

[0053] The rocking shaft 10 is connected to the pair of support shafts 40 and 40 via coupling members 60 and 60 at the shaft parts 22a and 22a of one shaft connecting parts 22 and 22 of the first shaft members 20 and 20 at both ends of the rocking shaft.

[0054] Each of the coupling members 60 is a member that has, as a main body, a cylindrical part 62 having a through-hole 60a in which the shaft part 22a and the support shaft 40 are inserted. The cylindrical part 62 of the coupling member 60 is formed to have a split clamping structure 62a including a part in a peripheral direction protruding in a radial direction and a slit groove. The coupling member 60 is configured so that, when a screw member of the split clamping structure 62a is tightened in a state where the shaft part 22a and the support shaft 40 are inserted in the cylindrical part 62, the shaft part 22a and the support shaft 40 are fastened and connected.

[0055] In the beating device 1 of the present embodiment, each coupling member 60 also has a balance part 64. The balance part 64 is formed to bulge in a radial direction from the cylindrical part 62 at a part (a part different from the part at which the split clamping structure 62a is provided) on the outer peripheral surface of the cylindrical part 62.

[0056] However, the balance part 64 is formed so that a circumferential surface thereof forms an arc shape, as seen in an axis line direction of the cylindrical part 62. A curvature radius of an outer peripheral surface (arc surface) of the balance part 64 is substantially the same as the radius of each of the balance parts 26 and 36 of the shaft constituting members 20 and 30. Further, the balance part 64 is formed so that a center of curvature of the outer peripheral surface thereof matches the center of each of the balance parts 26 and 36, as seen in the axis line direction, in a state where the support shaft 40 and the rocking shaft 10 (the shaft part 22a of the first shaft member 20) are connected to each other by the coupling member 60. Therefore, in such a state, the presence range of the balance part 64 substantially matches the overlapping part of the balance parts 26 and 36 of the shaft constituting members 20 and 30, as seen in the axis line direction.

[0057] Further, in the beating device 1, a sley sword 66 configured to support the sley 5, like the sley sword 7, is provided in a form of being supported on each coupling member 60 within the presence range of the balance part 64 of the coupling member 60 in the axis line direction. However, the position in which the sley sword 66 is supported on each coupling member 60 is opposite to the balance part 65 on the outer peripheral surface of the cylindrical part 62, as seen in the axis line direction. In the present embodiment, the sley sword 66 is formed integrally with the cylindrical part 62.

[0058] In the beating device 1, the rocking shaft 10 is also supported by the support bodies 54 provided on the beam member 52 bridged between both the side frames 50 and 50, in a state where the rocking shaft 10 is connected to the support shafts 40, as described above, and is thus bridged between the pair of support shafts 40 and 40. The support body 54 has a base part 56 attached to the beam member 52 and a shaft support part 58 provided on the base part 56. In the shaft support part 58, a bearing 58a for supporting the rocking shaft 10 is embedded.

[0059] In the present embodiment, each support body 54 is provided in a position in which the shaft part 24a (a part on the other end-side of the shaft part 24a) of each of the first shaft members 20 at both ends of the rocking shaft 10 is supported. The position is a position in which

the bearing 58a of the support body 54 is in contact with the step portion 24a1 formed at the shaft part 24a, in a state where the support body 54 supports the shaft part 24a.

[0060] According to the beating device 1 of the present embodiment configured as described above, the rocking shaft 10 is provided in such an aspect that the shaft constituting members at both ends are constituted as the first shaft members 20 and the rocking shaft 10 is connected to the support shafts 40 by the shaft parts 22a of the shaft connecting parts 22 on one side of the first shaft members 20 and is also supported on the support bodies 54 by the shaft parts 24a of the shaft connecting parts 24 on the other side on the loom. Further, the first shaft members 20 at both ends are each formed as a single member having the shaft connecting parts 22 and 24 and the balance part 26. Specifically, the first shaft member 20 has such a configuration that it is possible to easily implement a state where the shaft centers of both the shaft parts 22a and 24a of the shaft connecting parts 22 and 24 at both ends are made to match each other, as seen in the axis line direction.

[0061] Therefore, in the state of being supported on the loom as described above, the rocking shaft 10 can easily implement a state where the shaft center of the shaft part 24a supported on the support body 54 and the shaft center of the shaft part 22a connected to the support shaft 40 match each other (a state where both the shaft centers are not misaligned with each other), as seen in the axis line direction. In the beating device 1, the rocking shaft 10 is constituted so that both the shaft centers match each other, as described above. Therefore, even when the rocking shaft 10 rocks for a beating operation, a load, which is generated when both the shaft centers are misaligned with each other, is not applied to the bearing 58a of the support body 54. Thereby, the beating device 1 is less likely to cause a damage of the bearing 58a of the support body 54, which is caused when the load is applied.

[0062] In addition, according to the beating device 1 of the present embodiment, the first shaft member 20 and the second shaft member 30 are formed so that the sectional shape of each of the balance parts 26 and 36 is circular. Further, the first shaft member 20 is constituted so that the presence range of the balance part 26 overlaps the presence range of the shaft parts 22a and 24a of the shaft connecting parts 22 and 24, and the second shaft member 30 is constituted so that the presence range of the balance part 36 overlaps the presence range of the hole parts 32a of the hole connecting parts 32. Thereby, in the rocking shaft 10 consisting of the first shaft members 20 and the second shaft member 30, the balance parts 26 and 36 each having a circular section are positioned with respect to the shaft parts 22a and 24a and the hole parts 32a, as described above, so that the inertia due to the rocking caused by the beating operation becomes smaller.

[0063] More specifically, in the rocking shaft, the balance parts are provided so as to bring the center of gravity of the assembly consisting of the rocking shaft, the sley swords, the sley and the reed of the beating device close to the center of rocking of the rocking shaft. Therefore, the balance parts are provided in positions further spaced from the center of rocking, so that the center of gravity can be brought close to the center of rocking with the balance parts each having a small weight. However, in the case of this configuration, since the radius of rocking of the balance part increases, the inertia due to the rocking caused by the beating operation becomes excessively large.

[0064] Therefore, in the beating device 1 of the present embodiment, the rocking shaft 10 is configured so that the positions of the balance parts 26 and 36 are brought close to the center of rocking, specifically, the presence range of the balance parts 26 and 36 overlap the presence range of the shaft parts 22a and 24a of the shaft connecting parts 22 and 24 and the presence range of the hole parts 32a of the hole connecting parts 32, as seen in the axis line direction. Further, in the rocking shaft 10, while the weight of each of the balance parts 26 and 36 is set so that the center of gravity comes close to the center of rocking, the sectional shape of each of the balance parts 26 and 36 is formed as circular so as to reduce the increase in inertia due to the increase in weight as much as possible. Thereby, in the rocking shaft 10, the inertia due to the rocking is smaller. As a result, the beating device 1 has such a configuration that the inertia of the rocking shaft 10 due to the rocking is reduced as much as possible and the center of gravity is close to the center of rocking.

[0065] Further, in the beating device 1, the shaft part 24a, which is supported on the support body 54, of each of the first shaft members 20 of the rocking shaft 10 is formed to have the step portion 24a1 as described above. Thereby, in the beating device 1, the bending of the rocking shaft 10 caused due to the beating operation is reduced. Specifically, a shock and the like during the beating is applied to the rocking shaft via the sley swords, as a load. The load acts as a force (a force in a bending direction) to bend the rocking shaft. Therefore, in the beating device 1, the shaft part 24a of each of the first shaft members 20 of the rocking shaft 10 is formed to have the step portion 24a1 as described above. In addition, the shaft part 24a is supported by the support body 54 in a state where the bearing 58a and the step portion 24a1 are in contact with each other. Thereby, since the force in the bending direction due to the load is received by the support body 54 at the contact part between the bearing 58a and the step portion 24a1, the bending of the rocking shaft 10 caused due to the load is reduced.

[0066] Further, in the beating device 1, the sley swords 7 provided to the rocking shaft 10 are provided in a form of being supported on each of the shaft constituting members 20 and 30 in the positions within the presence range of the balance parts 26 and 36 of the shaft constituting members 20 and 30, with respect to the axis line direction.

Specifically, the rocking shaft 10 is configured so that the balance parts 26 and 36 are present in the positions of the shaft constituting members 20 and 30, in which the sley swords 7 are provided. According to this configuration, although the load is applied to the rocking shaft via the sley swords, the deterioration in the balance state due to the applied load is reduced as much as possible.

[0067] Further, in the beating device 1, the coupling member 60 configured to connect the support shaft 40 and the rocking shaft 10 each other is also provided with the sley sword 66 for supporting the sley 5. Thereby, the load is received not only by the rocking shaft 10 but also by the coupling member 60. Further, in the beating device 1, the coupling member 60 is also configured to have the balance part 64 as described above. Thereby, in the beating device 1, the deterioration in the balance state due to the applied load is further reduced.

[0068] In the above, one embodiment (hereinafter, referred to as 'above embodiment') of the beating device for a loom to which the present invention is applied has been described. However, the present invention is not limited to the configuration described in the above embodiment, and can also be implemented in other embodiments (modified embodiments) as described below.

[0069] (1) As for the rocking shaft, in the present invention, the shaft constituting members at both ends constituting the rocking shaft are the first shaft members. In the above embodiment, the rocking shaft 10 is configured in such an aspect that the first shaft members 20 and 20 at both ends are connected by one second shaft member 30. Specifically, a part between the first shaft members 20 and 20 at both ends of the rocking shaft 10 is constituted only by one second shaft member 30. However, in the present invention, the shaft constituting member that constitutes the part between the first shaft members at both ends of the rocking shaft is not limited to one second shaft member.

[0070] For example, the rocking shaft can also be constituted such that two second shaft members are provided between the first shaft members at both ends. In the meantime, the two adjacent shaft constituting members are connected in a form of fitting the shaft connecting part (shaft part) of the other shaft constituting member into the hole connecting part (hole part) of one shaft constituting member. Therefore, when the second shaft member is configured like the above embodiment, the two second shaft members are connected by a first shaft member provided therebetween. Specifically, in this case, the rocking shaft has a configuration where the first shaft members at both ends are connected by two second shaft members and one first shaft member.

[0071] (2) As for the second shaft member, in the above embodiment, the second shaft member 30 is configured so that both side parts are the hole connecting parts 32 and 32. However, in the present invention, the second shaft member may also be configured such that one of both side parts is a hole connecting part and the other is a shaft connecting part similar to both side parts (shaft connecting parts) of the first shaft member.

[0072] Note that, the second shaft member having such a shaft connecting part is connected to the hole connecting part (hole part) of another second shaft member at the shaft part of the shaft connecting part. Therefore, when such second shaft member is used for the rocking shaft, the rocking shaft includes two types of the second shaft members. In this case, the rocking shaft has a configuration where the first shaft members at both ends are connected by the two types of the second shaft members.

[0073] Further, in the above embodiment, the hole connecting part of the second shaft member is constituted by the two parts of the receiving part 33 and the cover part 34. However, in the present invention, the hole connecting part of the second shaft member may be formed as a single block-shaped part, in which a through-hole (hole part) into which the shaft part of the shaft connecting part can be inserted is formed. Note that, as a configuration for fixing a state where the shaft part is inserted in the hole part, a split clamping structure or the like may be used, for example.

[0074] In addition, the second shaft member is not limited to the configuration where the connecting parts are partially or entirely integrally formed with the balance part, and for example, may have a configuration where the connecting parts and the balance part are formed as separate members and are assembled. In the above embodiment, as for the configuration of the connecting part of the second shaft member, the hole connecting part is constituted by the two parts. However, even in a configuration where one of the connecting parts is constituted as the shaft connecting part, the shaft connecting part may also be constituted by two or more parts (members). For example, the shaft connecting part may be configured in such an aspect that a part configured in a similar manner to the hole connecting part of the above embodiment or a single block-shaped part (member) having a hole part formed therein is assembled with a shaft member formed as a separate member and the shaft member is used as a shaft part.

[0075] (3) As for the balance part of each shaft constituting member, in the above embodiment, the balance parts 26 and 36 of the shaft constituting members 20 and 30 are each formed to have a circular section. However, in the present invention, the balance part may also be formed to have a sectional shape (for example, an elliptical shape) other than the circular shape. In addition, the balance part of the first shaft member and the balance part of the second shaft member may have different sectional shapes.

[0076] (4) As for the shaft connecting part of the first shaft member, in the above embodiment, the other shaft connecting part 24 of the first shaft member 20 has the step portion 24a1 formed at the shaft part 24a, and is supported in a state where the step portion 24a1 is in contact with the bearing 58a of the support body 54. However, in the present invention, the shaft connecting part

supported on the support body at the shaft part thereof is not limited to the configuration where the shaft part has such a step portion. For example, when the force in the bending direction by the load applied to the rocking shaft due to the beating operation is a force of an allowable magnitude or when another configuration for receiving a force in the bending direction is provided, the step portion at the shaft part can be omitted.

[0077] (5) As for the sley sword, in the above embodiment, the two sley swords provided to the rocking shaft 10 are provided to each of the shaft constituting members 20 and 30. In the above embodiment, the coupling member 60 for connecting the rocking shaft 10 to the support shaft 40 is also provided with the sley sword 66. However, in the present invention, the number of sley swords may be any appropriate number necessary for the beating device, and is not particularly limited. Therefore, the sley swords may be provided in appropriate positions, considering the number necessary for the beating device, and is not limited to the configuration where the sley swords are provided to all of the shaft constituting members. Further, the number of the sley swords provided to each of the shaft constituting members is not limited to two. In addition, the sley sword provided to the coupling member may be omitted.

[0078] Further, in the above embodiment, the sley swords 7 are provided in the positions of the balance parts 26 and 36 of the shaft constituting members 20 and 30, considering the balance state of the assembly. However, as long as the balance state is permitted in relation to weaving, the position of the sley sword on the shaft constituting member may also be the position of the connecting part, not the balance part. In addition, in the above embodiment, as described above, the sley sword is provided to the coupling member, and the balance part is provided to the coupling member so as to correspond to the sley sword. However, the balance part of the coupling member may also be omitted.

[0079] Note that, in the above embodiment, the sley swords 7 are formed as a separate member from the shaft constituting members 20 and 30 and are attached to the shaft constituting members 20 and 30. In addition, the sley sword 66 of the coupling member 60 is formed integrally with the cylindrical part 62 of the coupling member 60. However, in the present invention, the sley sword provided in the position of the rocking shaft (shaft constituting member) may be formed integrally with the shaft constituting member. Also in the configuration where the sley sword is provided in the position of the coupling member, the sley sword may be formed as a separate member from the coupling member and may be attached to the coupling member.

[0080] (6) As for the support body configured to support the rocking shaft, in the above embodiment, the two support bodies 54 are configured to support each of the shaft parts 24a of the first shaft members 20 positioned at both ends of the rocking shaft 10. However, in the present invention, when the rocking shaft is configured to include a shaft constituting member having a shaft connecting part, in addition to the first shaft members at both ends thereof, the support body may also be provided to support the shaft part of the other shaft constituting member, in addition to the two support bodies configured to support the shaft parts of the first shaft members at both ends.

[0081] The present invention is not limited to the above embodiment, and can be variously changed without departing from the gist of the present invention.

REFERENCE SIGNS LIST

[0082]

1:	beating device
3:	reed
5:	sley
7:	sley sword
10:	rocking shaft
12:	attachment seat
20:	first shaft member
22:	connecting part (one shaft connecting part)
22a:	shaft part
22b:	intermediate part
24:	connecting part (the other shaft connecting part)
24a:	shaft part
24a1:	step portion
24b:	intermediate part
26:	balance part
30:	second shaft member
32:	connecting part (hole connecting part)
32a:	hole part
33:	receiving part
33a:	arc groove
33b:	female thread hole
34:	cover part
34a:	arc groove
34b:	through-hole
35:	screw member
36:	balance part
40:	support shaft
50:	side frame
52:	beam member
54:	support body
56:	base part
58:	shaft support part
58a:	bearing
60:	coupling member
60a:	through-hole
62:	cylindrical part
62a:	split clamping structure
64:	balance part
66:	sley sword

Claims

1. A beating device for a loom comprising a rocking shaft that is configured to support a sley, to which a reed is attached, via a plurality of sley swords, is connected to a pair of support shafts provided to each of left and right side frames of the loom and configured to rock, and therefore, is bridged between the support shafts, is supported, via a bearing, on support bodies provided on a beam member bridged between the side frames, is constituted by connecting a plurality of shaft constituting members dividable in an axis line direction and has balance parts each spaced from a center of rocking toward an opposite side to the reed, the beating device for a loom being **characterized in that**:

   wherein the plurality of shaft constituting members comprises first shaft members and a second shaft member each having a balance part and both side parts, which are connecting parts for connection,
   wherein the first shaft members each have a configuration where both side parts are shaft connecting parts having shaft parts each formed into a shaft shape and both the shaft connecting parts and the balance part positioned between both the shaft connecting parts are integrally formed,
   wherein the second shaft member is formed in such an aspect that one of both side parts is a hole connecting part having a hole part and the other is a hole connecting part having a hole part or a shaft connecting part having a shaft part formed into a shaft shape,
   wherein the rocking shaft is configured such that the shaft constituting members at both ends are the first shaft members, at least one of the two adjacent shaft constituting members is the second shaft member and the two adjacent shaft constituting members are connected in a state where the shaft part of the shaft connecting part of the first shaft member or the second shaft member, which is the other shaft constituting member is fitted in the hole part of the hole connecting part of the second shaft member, which is one shaft constituting member, and
   wherein the rocking shaft is connected to the support shafts by the shaft parts of the shaft connecting parts on one side of each of the first shaft members at both ends and is connected to the support bodies by the shaft parts of the shaft connecting parts on the other side.

2. The beating device according to Claim 1, wherein the balance part of each of the first shaft members and/or the balance part of the second shaft member is formed to have a circular section in the axis line direction, and is located in a position overlapping a presence range of the shaft part of the shaft connecting part or the hole part of the hole connecting part, as seen in the axis line direction.

3. The beating device according to Claim 1 or 2, wherein the shaft part of the shaft connecting part on the other side of each of the first shaft members at both ends of the rocking shaft has a step portion formed by forming a shaft diameter of a part closer to the balance part than a part to be supported on the support body to be larger than a shaft diameter of the part to be supported on the support body.

4. The beating device according to one of Claims 1 to 3, wherein the sley swords are provided in a form of being supported on each of the shaft constituting members in positions within a presence range of the balance part of each of the shaft constituting members in the axis line direction.

5. The beating device according to one of Claims 1 to 4, wherein the rocking shaft is connected to the pair of support shafts via coupling members,

   wherein each of the coupling members has a balance part spaced from the center of rocking toward an opposite side to the reed, and
   wherein the sley swords are provided in a form of being supported on the coupling members even within a presence range of the balance parts of the coupling members in the axis line direction.

FIG. 1

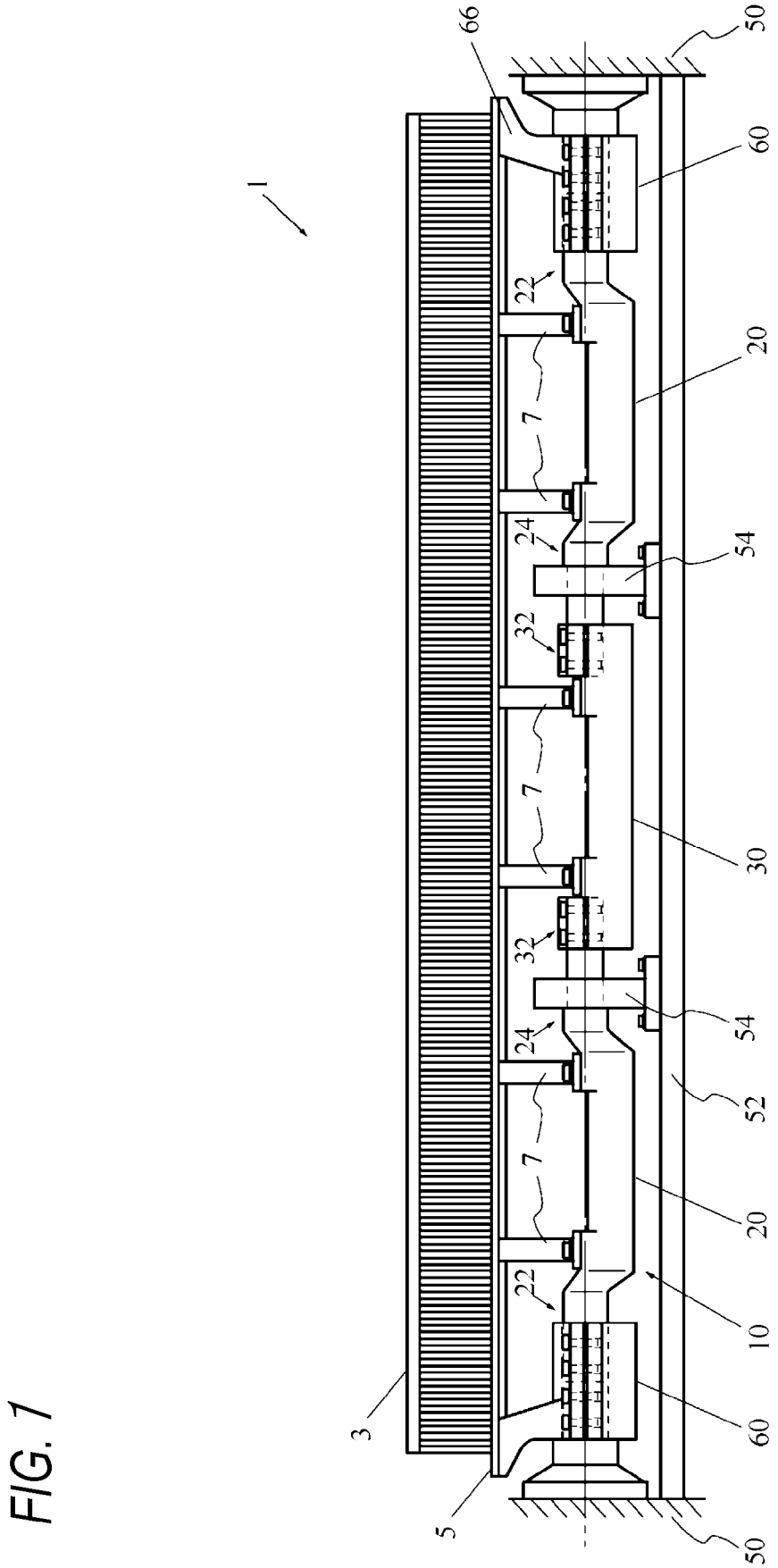

FIG.2

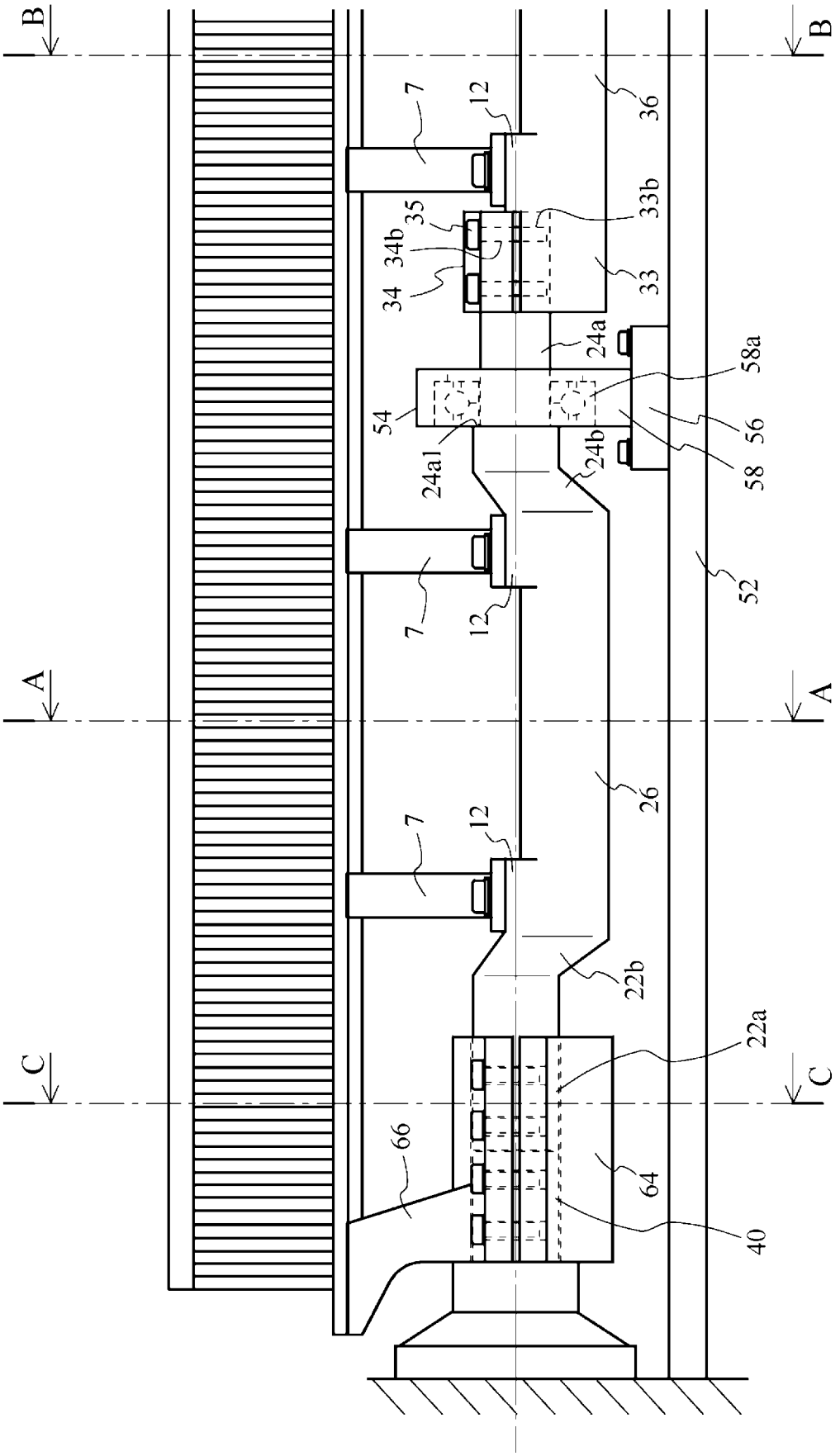
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FIG.3

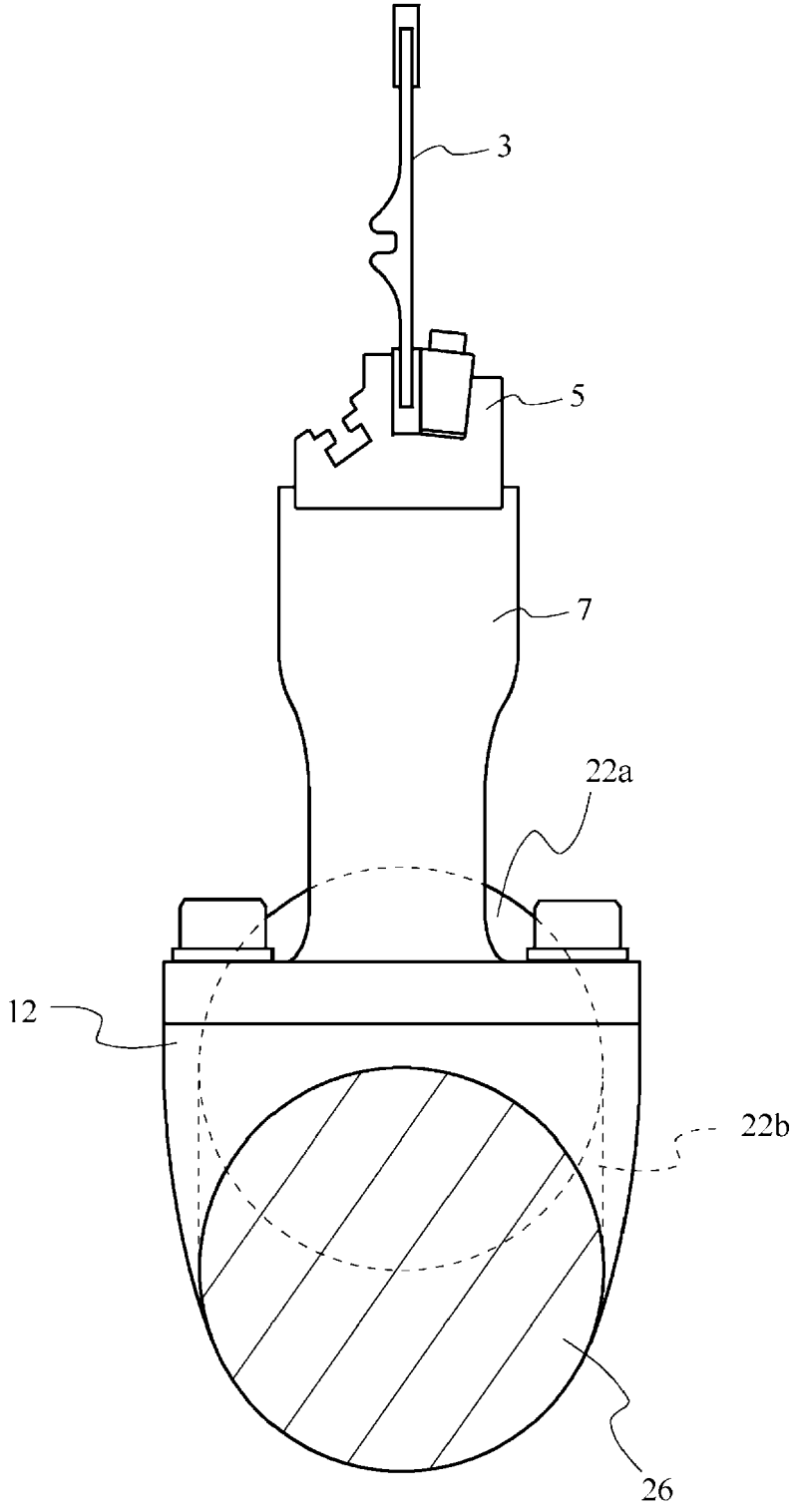


FIG.4

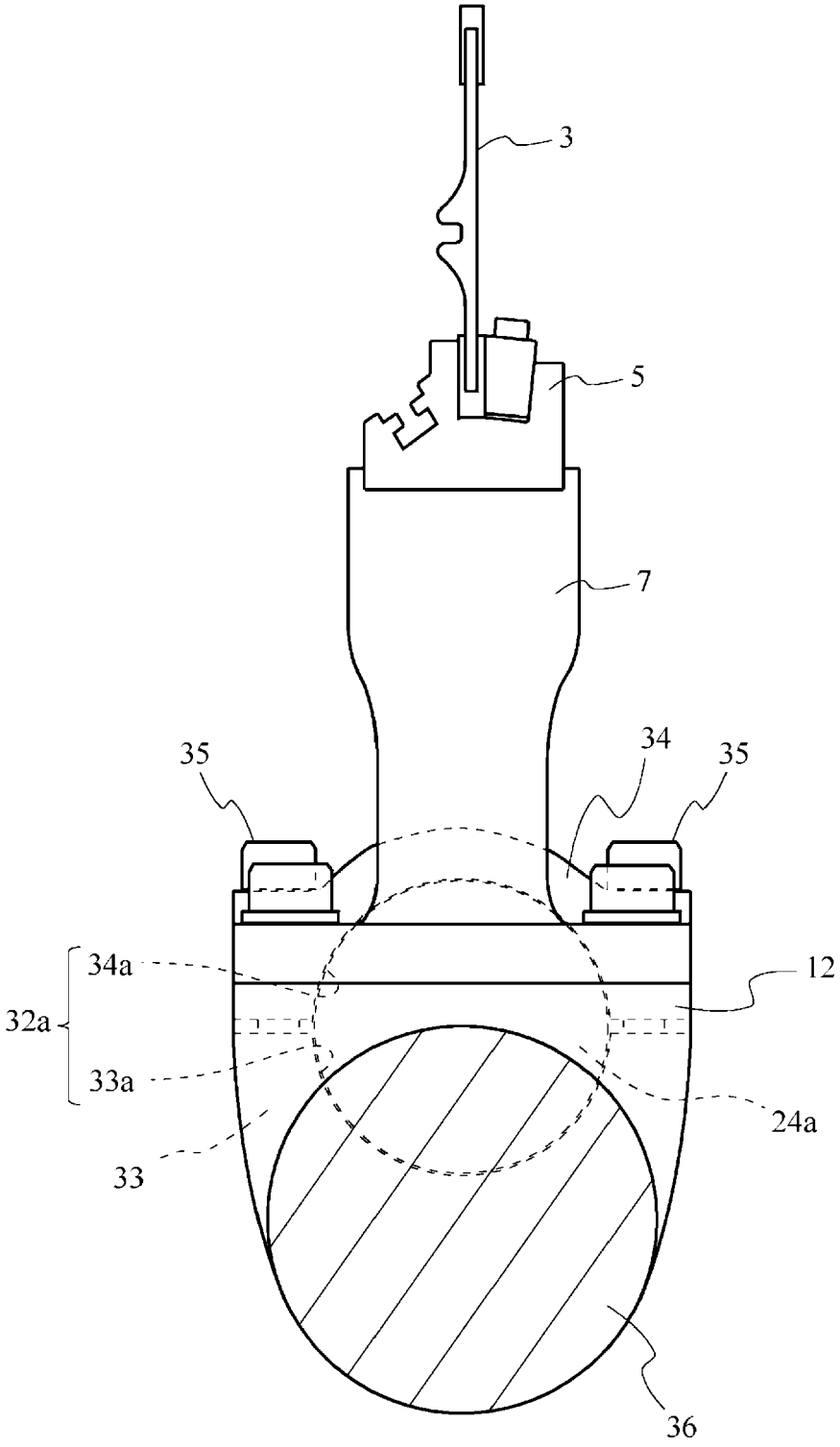
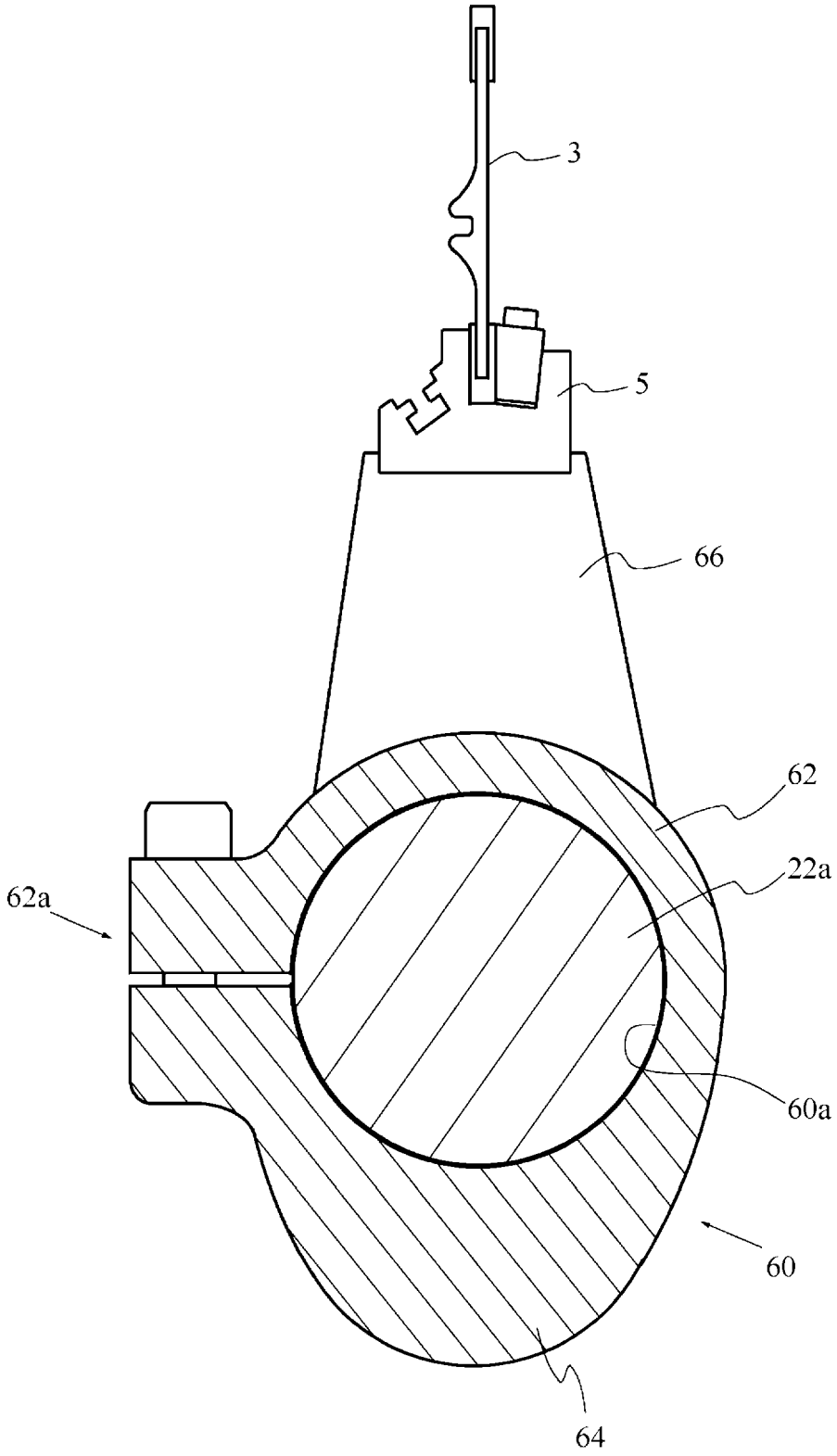


FIG.5



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EUROPEAN SEARCH REPORT

Application Number
EP 21 19 9431

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 1 600 540 A1 (TSUDAKOMA IND CO LTD [JP]) 30 November 2005 (2005-11-30) * abstract * * claims 1-3 * * figures 1, 5, 6, 15 * * paragraph [0001] * * paragraph [0002] * * paragraph [0004] - paragraph [0011] * * paragraph [0020] * * paragraph [0022] * * paragraph [0027] * * paragraph [0033] * * paragraph [0034] * * paragraph [0050] - paragraph [0054] *	1-5	INV. D03D49/60
A	CN 208 844 256 U (SUZHOU SHUANGMING TEXTILE CO LTD) 10 May 2019 (2019-05-10) * the whole document *	1-5	
			TECHNICAL FIELDS SEARCHED (IPC)
			D03D

1 The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	16 February 2022	Heinzelmann, Eric

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16-02-2022

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