



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
06.07.2011 Bulletin 2011/27

(51) Int Cl.:
D04B 15/32 (2006.01) D04B 15/36 (2006.01)

(21) Application number: **10016142.1**

(22) Date of filing: **28.12.2010**

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

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(30) Priority: **29.12.2009 JP 2009299269**

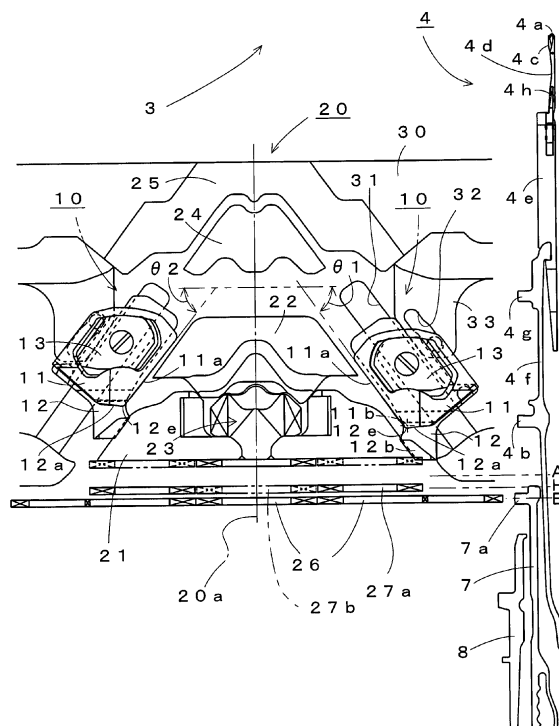
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(54) **Stitch cam device**

(57) [Object] To provide a stitch cam device that has hardly any effect on the function of a stitch density deciding part or a stabilized cam face even when the magnitude of the pull-down angle θ is varied.

[Means to Solve] A rotating cam (11) can vary the pull-down angles (θ_1 and θ_2) as the tilting angle of the pull-down cam face (11a). The guide member (13) guides the rotation cam (11) to rotate around the rotation center (11b) installed inside the stitch density deciding part (12e). Since there is no need of installing a shaft to the rotation center (11b), the arc of the stitch density deciding part (12) can be reduced. The pull-down angle (θ_1) of the stitch cam device (10) on the right side with a large pull-down length of the slide cam (12) is larger than the pull-down angle (θ_2) of the stitch cam device (10) on the left side with the small pull-down length of the slide cam (12), and therefore, a stitch is able to be formed under more suitable conditions according to the stitch density value. Even when pull-down angles (θ_1 and θ_2) vary, the stitch density deciding part (12e) and the stabilized cam face (12a) provided in the slide cam (12) do not vary angles, and the effect of change of pull-down angles (θ_1 and θ_2) to the stability of knitted stitches can be avoided.

Fig. 1



Description

[Technical Field]

[0001] The present invention relates to a stitch cam device mounted to a carriage of a flatbed knitting machine, which works on butts of knitting needles installed on a needle bed side by side, pulls in knitting needles to a needle bed and forms stitches.

[Background Art]

[0002] Hitherto, to a carriage of a flatbed knitting machine, there mounted is a cam system including a stitch cam to which a pull-down cam face for pulling a knitting needle from a state where a forefront hook advances to a needle bed gap into a needle bed. In the event that the stitch cam is allowed to slide moving in an inclined direction of pulling in the knitting needles on the pull-down cam face, the knitting needle pull-in length can be varied and the stitch density value that indicates the size of the stitch can be adjusted (for example, see Patent Literature 1). When the stitch density value is large, the pull-in length of the knitting yarn increases, and stitches become loose. When the stitch density value is small, the pull-in length of knitting yarn decreases and stitches become tight.

[0003] Fig. 7(a) shows the stitch cam which is disclosed in the stitch density controller of Patent Literature 1 with reference character 4, but the reference character is changed to 1. The stitch cam 1 works on a butt 4b of a knitting needle 4 at a pull-down cam face 1a in such a manner that a hook 4a on the forefront side of the knitting needle 4 reverses from the needle bed gap 3 on the forefront side of the needle bed 2 when a carriage, whose illustration is omitted, runs along the surface of the needle bed 2 in the right and left direction of the figure. The knitting needle 4 is pulled into the needle bed 2 and is housed in a needle groove whose illustration is omitted. The pull-down cam face 1a changes to a stitch density deciding part 1b that decides the pull-in length of the knitting needle 4 and is terminated. The stitch density deciding part 1b is called as a "tread". In addition, the knitting needle 4 is typically shown and in particular, the hook 4a is shown not in a state as actually viewed from the surface side of the needle bed 2 but in a state with the hook 4a portion only rotated by 90 degrees. Furthermore, the knitting needle 4 shows as a latch needle and in order to open and close the hook 4a, a latch 4c is equipped.

[0004] Let's assume a state in which a formed stitch is held in the hook 4a and the latch 4c is closed. When the hook 4a is allowed to advance into the needle bed gap 3, the stitch inside the hook 4a remains in the vicinity of the forefront of the needle bed 2, and the stitch opens the latch 4c and moves relatively to a needle shank 4d side. To the hook 4a of the knitting needle 4 that advances into the needle bed gap 3, a knitting yarn 5 is supplied in the needle bed gap 3. When the knitting needle 4 is pulled into the needle bed 2 side by the stitch cam 1, the stitch moved to the needle shank 4d side moves relatively to the hook 4a side, closes the latch 4c on the way, does not enter the hook 4a inside but knocks over the hook 4a, and breaks away to the needle bed gap 3 side. The old loop formed in this way has the illustration omitted and as the stitch 6, a new loop formed by the hook 4a only is shown.

[0005] Fig. 7(b) shows a structure in the vicinity of the stitch density deciding part 1b of the stitch cam 1. The pull-down cam face 1a inclines by the pull-down angle θ only with respect to the direction 2a where the needle bed 2 side relatively moves with respect to the carriage. The pull-down angle θ is held to about 50 degrees. When the width of the stitch density deciding part 1b is large, the knitting yarn 5 might break. When the width of the stitch density deciding part 1b is small, the stitch 6 might be reduced by pull-in of the next knitting needle 4, after the stitch 6 is formed by pull-in of the knitting needle 4.

On the lower side of the stitch cam 1, following the stitch density deciding part 1b, a cam face to stabilize a formed stitch, called as a "runout" 1c may be formed. Even if the runout 1c is formed, the butt 4b of the knitting needle 4 moves in the direction of the extension line 1d of the stitch density deciding part 1b by inertia. If a knot or the like reaches in the part of the runout 1c, the knitting yarn 5 slacks so as to prevent yarn breakage. In addition, irregularities called as a "flattening" 1e may be provided in order to equalize the pull-in yarn length. Furthermore, the stitch density deciding part 1b located at the place where the pull-down cam face 1a changes to a stabilized cam face may have roundness. The stitch density deciding part 1b and the stabilized cam face become necessary to form knitted fabrics with uniform stitch sizes as well as to stabilize adjustment results when stitch density is particularly adjusted.

[0006] In the stitch cam 1, the position of the pull-down cam face 1a protruding to the needle bed 2 side may be shifted and the stitch 6 may be able to be formed by two types of different stitch density values in accordance with the magnitude of the height of the butt 4b protruded from the needle bed 2 to the carriage side. Furthermore, there disclosed is a variable stitch density changing mechanism that makes two types of stitch density values adjustable independently to a certain extent (for example, see Patent Literature 2). In Patent Literature 2, two cams that correspond to stitch cams are moved to slide at the same pull-down angle and the pull-in length is adjusted. The cam face of the lower side of each cam has the same shape at least for the respective portion that corresponds to the tread 1b.

[0007] Incidentally, it is known that the optimum pull-down angle θ of the stitch cam 1 is decided according to the

relation of the pull-in length of the knitting yarn 5 to the gauge that corresponds to the intervals of knitting needles 4 arranged in a line. Consequently, when the pull-in length of the knitting yarn 5 is changed for stitch density adjustment, it is ideal to change the pull-down angle θ , too. With respect to a circular knitting machine, a technique to install and rotate axially a casting-off cam that corresponds to the stitch cam is disclosed (for example, see Patent Literature 3).

[Citation List]

[Patent Literature]

[0008]

[Patent Literature 1] Japanese Patent No. 3899315

[Patent Literature 2] Japanese Patent No. 4016031 [Patent Literature 3] Japanese Unexamined Patent application Publication No. 2001-159055

[Summary of Invention]

[Technical Problem]

[0009] A suitable shape of the stitch cam 1 of the flatbed knitting machine is decided by a design including the stitch density deciding part 1b and the stabilized cam face. In the event of adjusting the stitch density, it is assumed to be ideal to vary the pull-down angle θ together with the pull-in length of the knitting yarn 5, too, and for example, to vary the pull-down angle θ variously in accordance with the magnitude of the pull-in length. In this regard, however, applying the concept of Patent Literature 3 and only varying the pull-down angle θ by rotating the stitch cam 1 simultaneously changes the stitch density deciding part 1b and the angle of the stabilized cam face.

[0010] Forming the stitch density deciding part 1b into a circular arc shape and bringing the circular arc center to coincide with the rotation center of the stitch cam 1 may possibly avoid effect of changes of the pull-down angle θ for deciding the pull-in length by the stitch density deciding part 1b but causes the shape to deviate from the appropriate one. In this regard, however, as in the case of Patent Literature 3, in order to provide a shaft for rotation inside the portion that corresponds to the stitch density deciding part 1b, the circular arc of the stitch density deciding part 1b must be made into a large diameter with excess thickness added to the shaft diameter. In addition, in the event that the runout 1c or the flattening 1e is installed as a stabilized cam face, rotation exerts large effect on these actions.

[0011] It is an object of the present invention to provide a stitch cam device that is hardly effect on the function of a stitch density deciding part or a stabilized cam face even when the magnitude of the pull-down angle θ is varied.

[Solution to Problem]

[0012] The present invention is a stitch cam device that is mounted to a carriage of a flatbed knitting machine and is provided with a pull-down cam face tilted in such a manner as to pull the knitting needle into a direction to exit from a needle bed gap, a stitch density deciding part that decides a pull-in length of the knitting needle at the position where the pull-down cam face finishes tilting, and a stabilized cam face that stabilizes a stitch with the knitting needle pulled in, comprising:

a rotation cam, being able to rotate and having the pull-down cam face as part of the outer shape, an empty space including an inside circular arc face and an outside circular face in the outline corresponding at least to each part of the circular arcs of varying diameters having a rotation center provided inside the stitch density deciding part as a common center, and capable for varying a pull-down angle of the pull-down cam face that tilts in the carriage running direction;

a slide cam having a support surface that supports the rotation cam and being movable to slide along the slope of the pull-down angle of a predetermined criterion with respect to a stitch density value;

a guide member housed in the space of the rotation cam supported by the support surface of the slide cam, having circular arc faces corresponding to the circular arc face inside the contour of the space and the circular arc face outside of the contour of the space, and guiding rotation of the rotation cam while bringing the corresponding circular arcs into contact with each other; and

a rotating mechanism, supported by the support surface of the slide cam, rotates the rotation cam guided by the guide member.

[0013] In addition, in the present invention, said stitch density deciding part and said stabilized cam face are equipped

to the slide cam.

[0014] In the present invention, said stitch density deciding part has an arc portion with said rotation center used as a center and the stitch density is decided at the arc portion.

[0015] In addition, in the present invention, on said carriage, a linear sliding guide groove is formed for guiding said slide cam so as to move sliding along said pull-down angle of said criteria; said rotation mechanism has a rotating guide groove formed to be generally parallel to the sliding guide groove and includes a portion in which distance with the sliding guide groove vary; and the rotation cam is operated in linkage to the slide cam by guiding part of the rotation cam in the rotating guide groove.

[Advantageous Effects of Invention]

[0016] According to the present invention, the rotation cam can be rotated in such a manner as to be capable for varying a pull-down angle of the pull-down cam face that is part of the outer shape of the rotation cam and tilts in the carriage running direction, and is supported by a support surface of a slide cam that can move to slide along the slope of the pull-down angle of a predetermined criterion. When the slide cam is moved to slide in response to the stitch density value, the pull-in length of the knitting yarn can be varied. When the rotation cam is rotated by a rotation mechanism with respect to the slide cam, the pull-down angle of the pull-down cam face can be varied. Inside the rotation cam, the stitch cam device has an empty space including an inside circular arc face and an outside circular face in the contour corresponding at least to each part of the circular arcs of varying diameters having a common rotation center provided inside the stitch density deciding part. In the empty space of the rotation cam, the stitch cam device has circular arc faces corresponding to the inside circular arc face and the outside circular arc face of a contour of the space, and houses a guide member that guides rotation of the rotation cam while bringing the corresponding circular arcs into contact with each other. There is no need to install a shaft at the rotation center, and the diameter of the stitch density deciding part can be reduced, and therefore, even when the magnitude of the pull-down angle θ is varied, it is possible to make it difficult to effect on the function of the stitch density deciding part or the stabilized cam face.

[0017] In addition, according to the present invention, said stitch density deciding part that decides the pull-in length of the knitting needle and said stabilized cam face that stabilizes the stitch with the knitting needle pulled in are equipped to the slide cam, and therefore, a stitch cam device that does not effect on functions of the stitch density deciding part or the stabilized cam face, even when the magnitude of the pull-down angle θ is varied, can be obtained.

[0018] Furthermore, according to the present invention, said stitch density deciding part decides the stitch density at an arc portion, the center of which is the rotation center when the rotation cam is rotated, and therefore, even when the pull-down angle of the pull-down cam face is varied by the rotation of the rotation cam, a condition for deciding the stitch density is able to be kept unchanged.

[0019] Furthermore, according to the present invention, the slide cam and the rotation cam are able to be geared by such a simple mechanism for providing a sliding guide groove to guide the slide cam as well as a rotating guide groove to guide the rotation cam to the carriage.

[Brief Description of Drawings]

[0020]

[Fig. 1] Fig. 1 is a plan view and a side view showing a construction of a stitch cam device 10 as one example of the present invention together with a knitting needle 4 and other portions of the cam system mounted to a carriage 20.

[Fig. 2] Fig. 2 is a partial plan view and a cross-sectional side view of the stitch cam device 10 of Fig. 1, showing a state in which changes of the pull-in length and changes of the pull-down angle are geared.

[Fig. 3] Fig. 3 is a plan view showing a rotation cam 11, slide cam 12, and guide member 13 used for the stitch cam device 10 of Fig. 1.

[Fig. 4] Fig. 4 is a left side view, plan view, and front view of the slide cam 12 used for the stitch cam device 10 of Fig. 1.

[Fig. 5] Fig. 5 is a plan view and a front view showing the rotation cam 11 and the guide member 13 used for the stitch cam device 10 of Fig. 1.

[Fig. 6] Fig. 6 is a plan view showing part of a mechanism for driving the stitch cam device 10 of Fig. 1.

[Fig. 7] Fig. 7 is a simplified plan view showing a shape of conventional stitch cam device 1 and its function.

[Description of Embodiments]

[0021] Hereinafter, Fig. 1 through Fig. 6 show a construction of a stitch cam device 10 as one example of the present invention. The portions that correspond to the matters explained in Fig. 7 are shown with the same reference characters designated. A knitting needle 4 shows as a latch needle which opens and closes a hook 4a by a latch 4c, but to a

compound needle that opens and closes a hook by a slider, the present invention can be applied in the same manner.

[Examples]

[0022] Fig. 1 shows a construction of a stitch cam device 10, one example of the present invention, with a knitting needle 4 and other portions of a cam system mounted to a carriage 20, too. The knitting needle 4 housed in a needle groove of a needle bed, whose illustration is omitted, has a hook 4a at forefront of a needle body 4e and a butt 4b, which is subjected to action of the stitch cam device 10, is installed to a needle jack 4f, separate body from the needle body 4e. The knitting needle 4 has a transfer function for moving stitches between opposing needle beds with a needle bed gap 3 in-between, and in the vicinity of the area where the needle jack 4f is connected to the needle body 4e, a butt 4g used for transfer action is installed. In addition, to the needle body 4e, a blade 4h that latches a stitch during stitch transfer is installed, too. On the back of the needle jack 4f, a select jack 7 is disposed. From the select jack 7, a butt 7a protrudes to the carriage side. On the back of the select jack 7, a selector 8 that performs needle selection for selecting the knitting needle 4 is disposed. The select jack 7 allows the butt 7a to take one of the three positions B, H, A in accordance with the results of needle selection by the selector 8.

[0023] The stitch cam device 10 includes a rotation cam 11, slide cam 12, and guide member 13, and is mounted to the carriage 20 on the surface side facing the needle bed. The carriage 20 reciprocates along the arrangement direction of knitting needles 4 and makes the same action in either of the reciprocating directions. The carriage 20 therefore has cam systems that are symmetrical with respect to the centerline 20a. The stitch cam devices 10, too, are arranged right and left along a chevron slope so that the stitch cam devices 10 are symmetrical with respect to the centerline 20a. The cam systems, symmetrical with respect to this kind of centerline 20a, include a fixed needle raising cam 21, movable needle raising cam 22, transfer receiving cam 23, dual-purpose transfer cam for sending and receiving 24, and guide cam 25. In addition, at the location where the butt 7a of the select jack 7 takes by position B, a fixed presser 26 is disposed. The location where the butt 7a takes by position H, a movable half presser 27a and tuck presser 27b are disposed.

[0024] The cam system as described as above is mounted to a base plate 30 of the carriage 20. The movable needle raising cam 22 is changed over in such a manner that the movable needle raising cam 22 protrudes from the surface of the base plate 30 when a stitch is formed, and sinks into the base plate 30 at the time of stitch transfer. To the base plate 30, a guide groove 31 that guides a slide cam 12 of the stitch cam device 10 in the same manner as Patent Literature 1 is mounted. In addition, to the base plate 30, a cam plate 33 having a rotation guide groove 32 that guides rotation of the rotation cam 11 is mounted, too. The rotation guide groove 32 may be formed directly to the base plate 30. The rotation cam 11 is supported to be rotatable by the guide member 13 mounted to the slide cam 12, and is able to vary pull-down angles θ_1 and θ_2 as tilting angles of the pull-down cam face 11a. To the lower part of the slide cam 12, a stitch density deciding part 12e same as the stitch density deciding part 1b of Fig. 7(b), and a stabilized cam face 12a including the runout 1c, the flattening 1e and so on are installed. The guide member 13 guides a rotation cam 11 in such a manner that the rotation cam 11 rotates around the rotation center 11b installed to the inside of the stitch density deciding part 12e.

[0025] In Fig. 1, the pull-down angle θ_1 of the stitch cam device 10 on the right side with a large pull-down length of the slide cam 12 is larger than the pull-down angle θ_2 of the stitch cam device 10 on the left side with a small pull-down length of the slide cam 12. In this regard, however, even when the pull-down angles θ_1 and θ_2 vary, the stitch density deciding part 12e and the stabilized cam face 12a installed to the slide cam 12 do not have their angles varied, and therefore, they can avoid effect of changes of pull-down angles θ_1 and θ_2 . Incidentally, to the slide cam 12, there installed is a receiving cam 12b that restricts the butt 4b of the knitting needle 4 which is pulled in along the pull-down cam face 11a from being excessively pulled in by inertia, too.

[0026] Fig. 2 shows a state in which the stitch cam device 10 of Fig. 1 is used to gear the change of the pull-in length to the change of the pull-down angle. Fig. 2(a) shows a state with a little pull-in length. Fig. 2(b) shows a state with a large pull-in length. Fig. 2(c) shows a construction of a cross section as viewed from a cutting surface line C-C. The rotation cam 11 has an outer shape of almost parallelogram and has an empty space, whose top and bottom contours are formed by circular arc faces 11c, 11d, inside of the outer shape. From the top and the bottom of the side opposed to the pull-down cam face 11a in the rotation cam 11, almost columnar shaped protrusions 11e, 11f protrude to the rear surface side. In the empty place of the rotation cam 11, the guide member 13 is housed and is mounted to a support face 12c of the slide cam 12 by a fixing bolt 13a. To the guide member 13, retaining portions 13b and circular arc faces 13c, 13d that are fitted to the circular arc faces 11c, 11d of the rotation cam 11 and guide rotation of the rotation cam 11 are provided, respectively. Each of circular arc faces 11c, 11d; 13c, 13d have the rotation center 11b as the common center.

[0027] Portions similar to the stitch density deciding part 12e and the stabilized cam face 12a of the slide cam 12 are formed as a stitch density deciding part 11h and stabilized cam face 11i in the lower part of the rotation cam 11, too. The stitch density deciding parts 11h, 12e include an arc portion of the same radius around the rotation center 11b. In Fig. 2(a), the stitch density deciding part 12e and the stabilized cam face 12a of the non-rotating slide cam 12 are located

lower than the stitch density deciding part 11c and the stabilized cam face 11i of the rotation cam 11, and perform action to the butt 4b of the knitting needle 4. In Fig. 2(b), the stitch density deciding parts 11h, 12e as well as stabilized cam faces 11i, 12a of the rotation cam 11 and the slide cam 12 coincide and work on equally to the butt 4b of the knitting needle 4.

[0028] The slope of the pull-down cam face 11a of the rotation cam 11 is varied by guiding the protrusion 11e in the rotation guide groove 32. The rotation guide groove 32 is formed in such a manner as to be nearly parallel to the guide groove 31. However, on the side with a small stitch density value in the rotation guide groove 32, a getting near portion 32a having small spacing with the guide groove 31 is formed, whereas on the side with a large stitch density value, a getting away portion 32b with large spacing is formed. The rotation guide groove 32 having this kind of the getting near portion 32a and the getting away portion 32b guide the protrusion 11e along a guiding line 32c. The rotation cam 11, to which the protrusion 11e is installed, is mounted to be able to rotate on the support face 12c of the slide cam 12. When the slide cam 12 moves to slide along the guiding line 31a of the guide groove 31, the rotation cam 11 moves to slide along with a rotation that varies the slope of the pull-down cam face 11a. Incidentally, on the lower side of the protrusion 11e, providing a protrusion 11f to be guided by a guide groove 12d of the slide cam 12 allows rotation to be performed still more stably.

[0029] As shown as a cross-sectional construction in Fig. 2(c), the rotation cam 11, the slide cam 12, and the guide member 13 are installed on the surface side in which the base plate 30 of the carriage faces the needle bed. On the rear surface side of the base plate 30, a drive member 40 to drive the slide cam 12 for stitch density adjustment is installed. Between the drive member 40 and the slide cam 12, a guide member 41 that fits to the guide groove 31 is installed.

[0030] Fig. 3 shows the rotation cam 11 used for the stitch cam device 10 of Fig. 1 and a combination of the slide cam 12 with the guide member 13. The rotation cam 11 of Fig. 3(a) has an empty space including a through-hole 11g having circular arc faces 11c, 11d for the top and the bottom of the outer shape, which have radii Rc, Rd from the rotation center 11b, as well as an concaved portion 11j on the pull-down cam face 11a side and an concaved portion 11k on the protrusion 11e side. In Fig. 3(b), the slide cam 12 and the guide member 13 are shown combined, but when the rotation cam 11 is mounted to the support face 12c of the slide cam 12 as in the case of Fig. 2(a),(b), the guide member 13 is removed from the slide cam 12. Inserting the guide member 13 into the through hole 11g with the rotation cam 11 placed on the support face 12c of the slide cam 12 allows the rotation cam 11 to be supported by the support face 12c of the slide cam 12 under the rotatable condition. When the guide member 13 is inserted, the concaved portions 11j, 11k shown in Fig. 3(a) are held down by right and left retaining portions 13b shown in Fig. 3(b).

The portion to which the rotation center 11b is installed of rotation cams 11 covers the surface of the portion, where the stabilized cam face 12a is formed on the lower side, with the slide cam 12. The stabilized cam face 12a which serves as the rear side of this portion coincides with the stabilized cam face 11i of the rotation cam 11 or is exposed further downwards, and works on the butt 4b of the knitting needle 4 pulled in by the pull-down cam face 11a of the rotation cam 11 and can stabilize the stitch.

[0031] Fig. 4 shows a left side view, a plan view, and a front view of the slide cam 12 used for the stitch cam device 10 of Fig. 1. When a protrusion 11f as shown in Fig. 2 is provided for the rotation cam 11, it is needed to provide a guide groove 12d. To the support face 12c, a bolt hole 12e and pin holes 12f are provided to connect the drive member 40 and guide member 41.

[0032] Fig. 5 shows a plan view and a front view of the rotation cam 11 and the guide member 13 used for the stitch cam device 10 of Fig. 1. Fig. 5(a) shows a construction of the rotation cam 11. On the rear side of the rotation cam 11, a roller or the like may be installed in place of installing protrusions 11e, 11f. Fig. 5(b) shows a construction of the guide member 13. To the guide member 13, a bolt hole 13e and pin holes 13f are formed, respectively, at the locations corresponding to the bolt hole 12e and the pin holes 12f of the slide cam 12 shown in Fig. 4.

[0033] Fig. 6 shows part of a mechanism for driving the stitch cam device 10 of Fig. 1. The combination of the rotation cam 11, the slide cam 12, and the guide member 13 are installed on the surface side of the base plate 30 as shown in Fig. 2(c). The drive member 40 is installed on the rear surface side of the base plate 30, and the guide member 41 is housed in the guide groove 31 which is formed on the base plate 30. The guide member 41 is biased to the side where the stitch density is minimized, that is, to the side in which the pull-in length is minimized by a spring 42. A roller 43 installed to the edge of the drive member 40 is guided by a spiral cam whose illustration is omitted, and the roller 43 is driven in such a manner as to the guide member 41 is displaced along the guide groove 31 and the stitch density value is varied. Incidentally, the drive mechanism that rotates the spiral cam is disclosed in Patent Literature 1.

[0034] By the use of this kind of the drive mechanism, for example, the stitch density value and the pull-down angle θ can be geared as follows:

[0035]

[Table 1]

Stitch density value	Pull-down angle θ
0 to 30	52°
35	52.21°
40	52.74°
45	53.38°
50	53.85°
55 to 90	54°

[0036] The relation between the stitch density value and the pull-down angle θ shown in Table 1 is one example which can be variously set by the shapes of the rotating guide groove 32. In this example, a rotation mechanism which mechanically gears the stitch density value to the pull-down angle θ is provided, but the stitch density value and pull-down angle θ may be independently varied, too. The rotation guide groove 32 in the present example is installed to the cam plate 33 different from the base plate 30, and therefore, moving the cam plate 33 can adjust the pull-down angle θ independently from the stitch density value. It is also possible to directly change the pull-down angle θ of the rotation cam 11 by using not this kind of cam but a rotation actuator or the like. Allowing the stitch density value and the pull-down angle θ to be independently varied not by the use of this kind of cam but by the use of a rotation actuator, etc. can knit fabric by changing the setting to the combination of appropriate stitch density value with the pull-down angle θ according to the characteristic or the like of the knitting yarn 5.

[Reference Signs List]

[0037]

4	Knitting needle
4a	Hook
4b	Butt
10	Stitch cam device
11	Rotating cam
11a	Pull-down cam face
11b	Rotation center
11c, 11d; 13c, 13d	Circular arc face
11h, 12e	Stitch density deciding part
11i, 12a	Stabilized cam face
12	Slide cam
12c	Support face
13	Guide member
20	Carriage
30	Base plate

31 Guide groove

32 Rotation guide groove

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Claims

1. A stitch cam device that is mounted to a carriage of a flatbed knitting machine and is provided with a pull-down cam face tilted in such a manner as to pull the knitting needle into a direction to exit from a needle bed gap, a stitch density deciding part that decides a pull-in length of the knitting needle at the position where the pull-down cam face finishes tilting, and a stabilized cam face that stabilizes a stitch with the knitting needle pulled in, comprising:
 - a rotation cam, being able to rotate and having the pull-down cam face as part of the outer shape, an empty space including an inside circular arc face and an outside circular face in the outline corresponding at least to each part of the circular arcs of varying diameters having a rotation center provided inside the stitch density deciding part as a common center, and capable for varying a pull-down angle of the pull-down cam face that tilts in the carriage running direction;
 - a slide cam having a support surface that supports the rotation cam and being movable to slide along the slope of the pull-down angle of a predetermined criterion with respect to a stitch density value;
 - a guide member housed in the space of the rotation cam supported by the support surface of the slide cam, having circular arc faces corresponding to the circular arc face inside the contour of the space and the circular arc face outside of the contour of the space, and guiding rotation of the rotation cam while bringing the corresponding circular arcs into contact with each other; and
 - a rotating mechanism, supported by the support surface of the slide cam, rotates the rotation cam guided by the guide member.
2. The stitch cam device according to claim 1, wherein said stitch density deciding part and said stabilized cam face are equipped to the slide cam.
3. The stitch cam device according to claim 1 or 2, wherein said stitch density deciding part has an arc portion with said rotation center used as a center and the stitch density is decided at the arc portion.
4. The stitch cam device according to any of claims 1 through 3, wherein on said carriage, a linear sliding guide groove is formed for guiding said slide cam so as to move sliding along said pull-down angle of said criteria; said rotation mechanism has a rotating guide groove formed to be generally parallel to the sliding guide groove and includes a portion in which distance with the sliding guide groove vary; and the rotation cam is operated in linkage to the slide cam by guiding part of the rotation cam in the rotating guide groove.

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Fig. 1

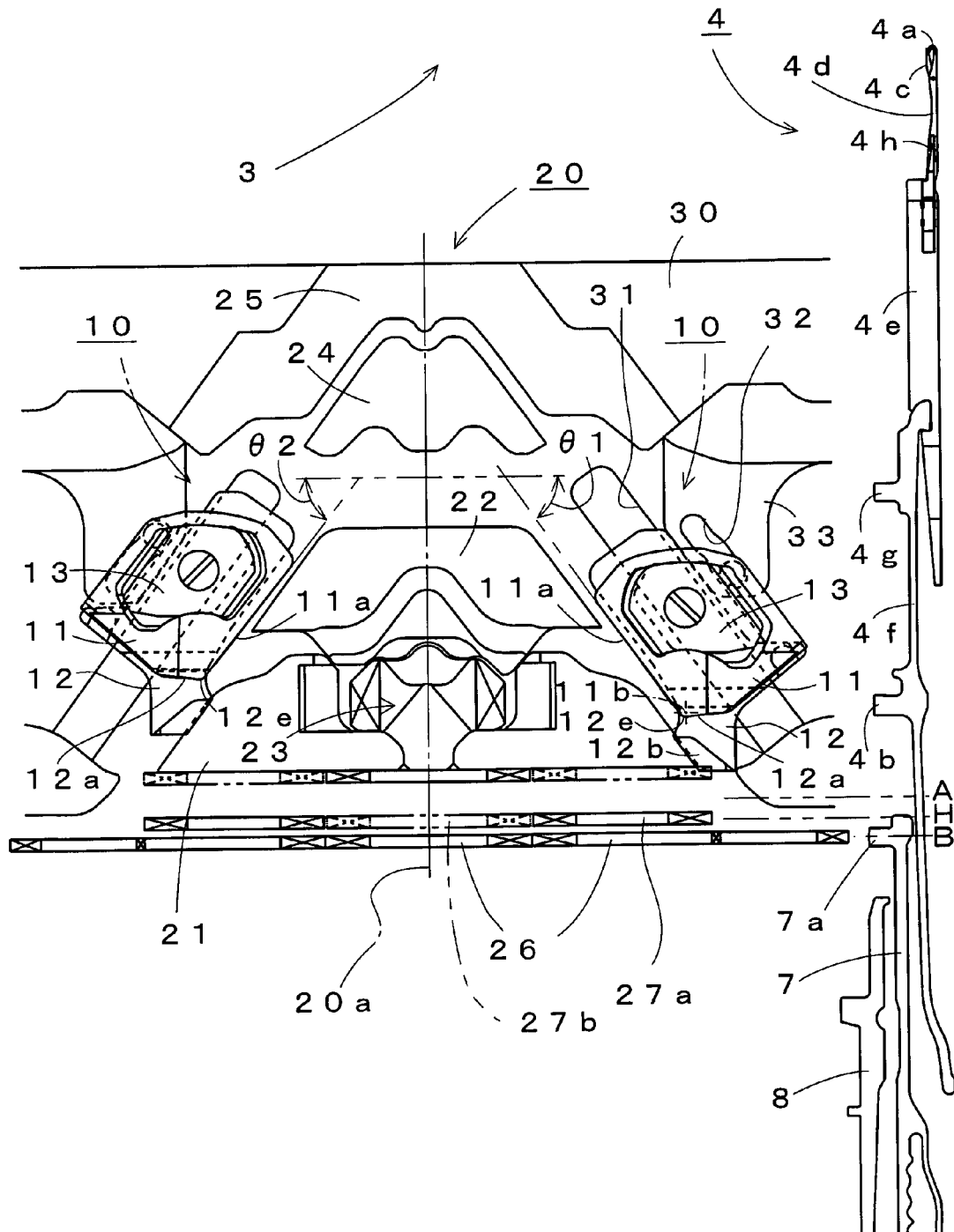
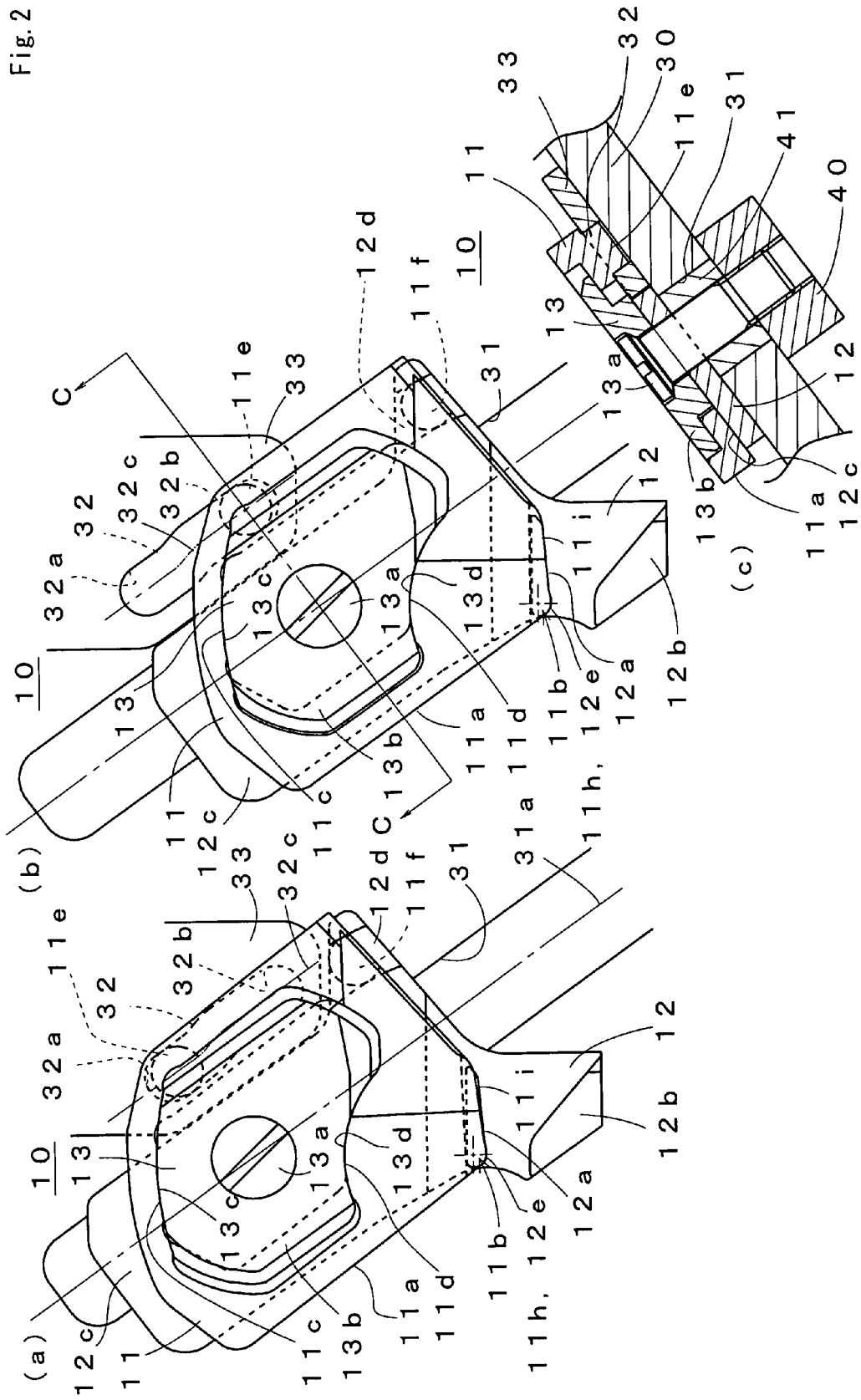


Fig.2



File 3

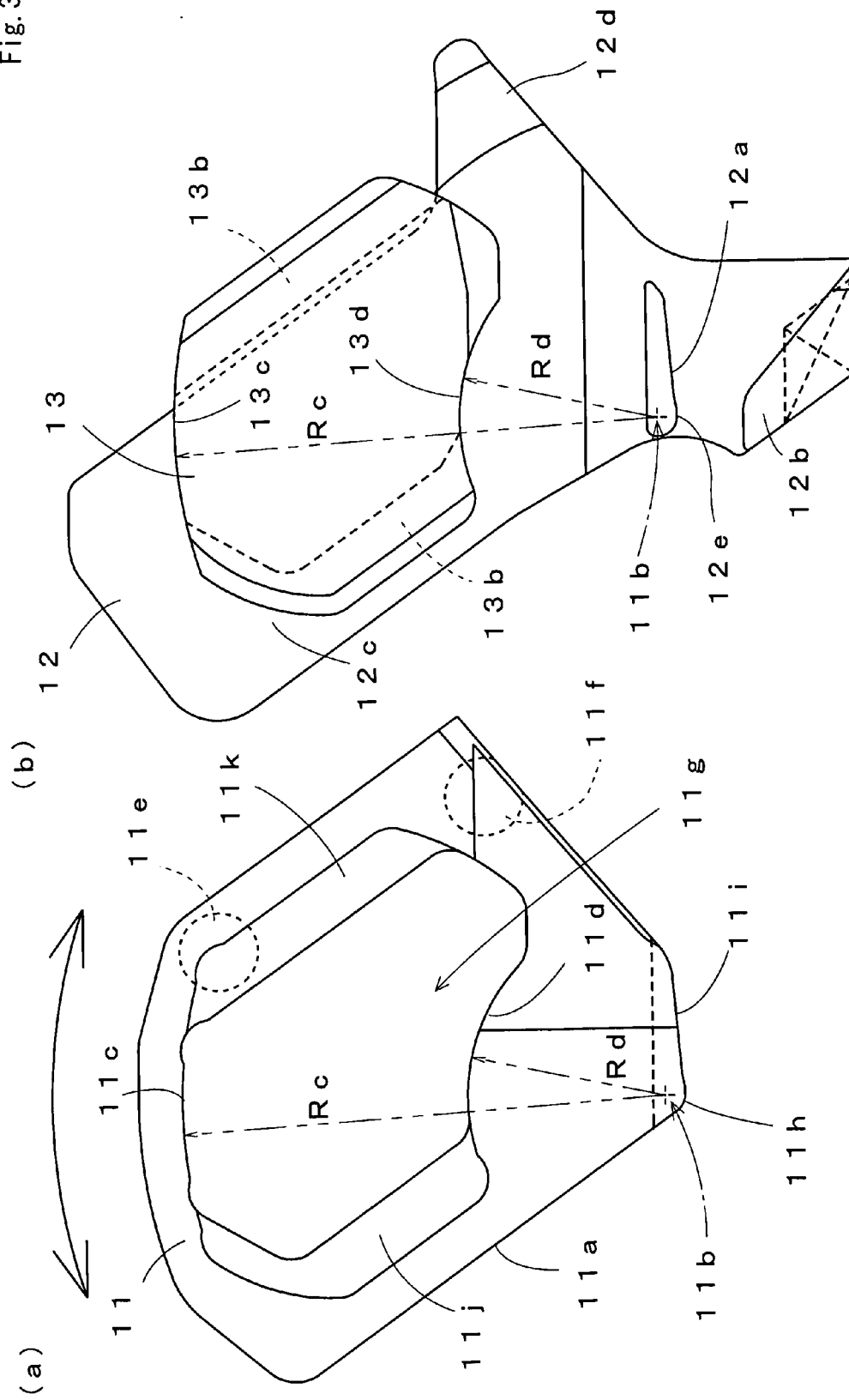


Fig. 4

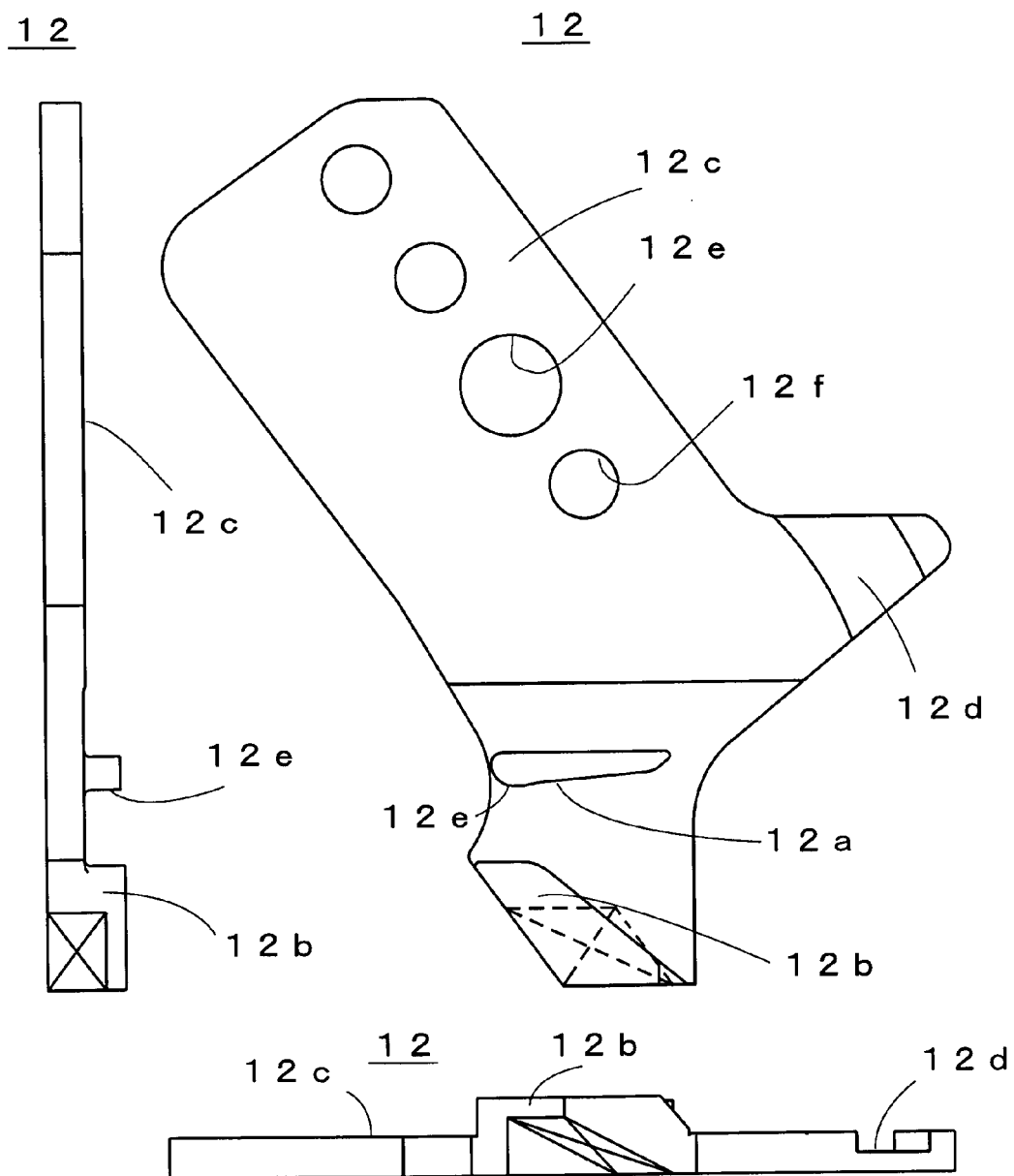


Fig. 5

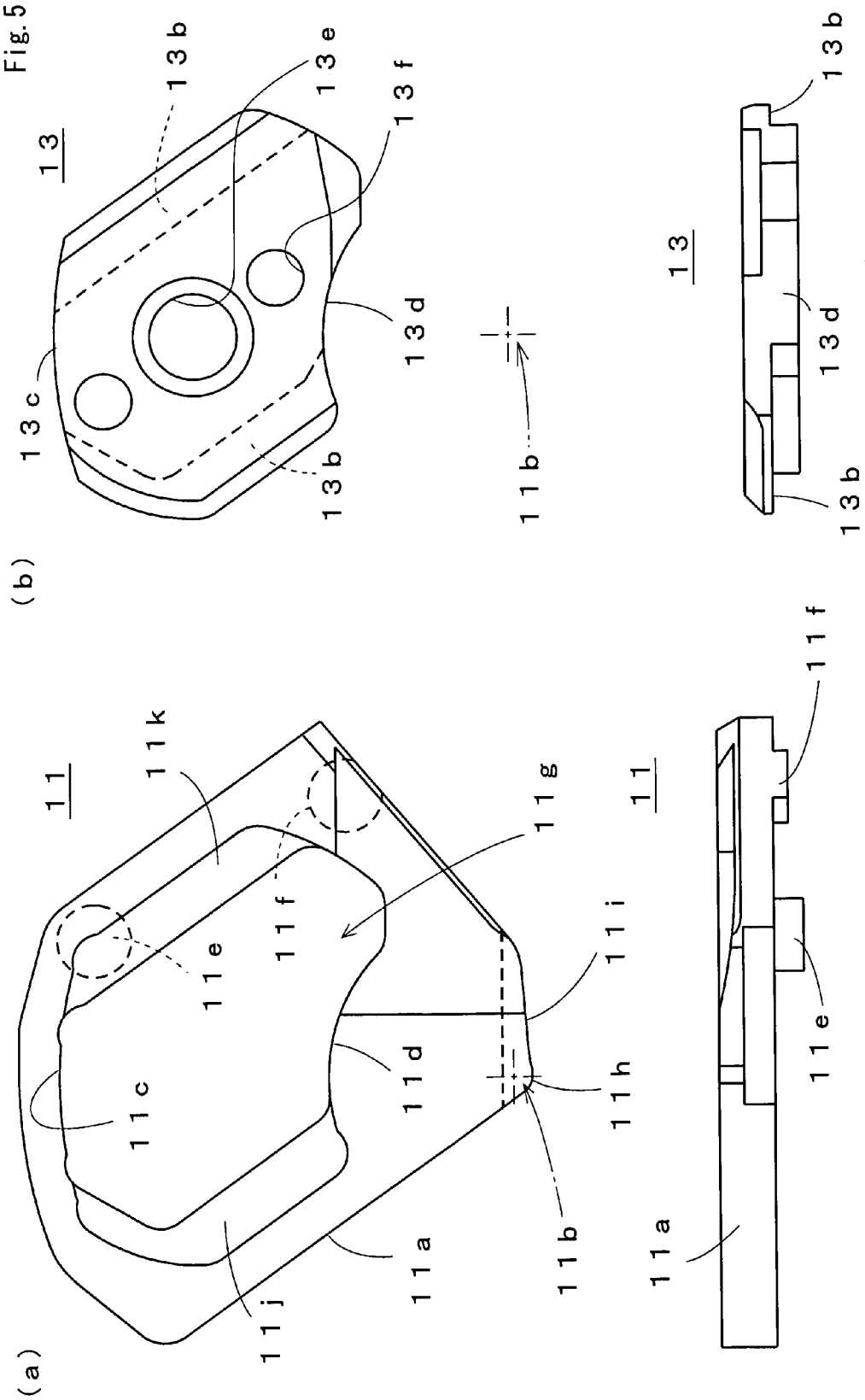


Fig. 6

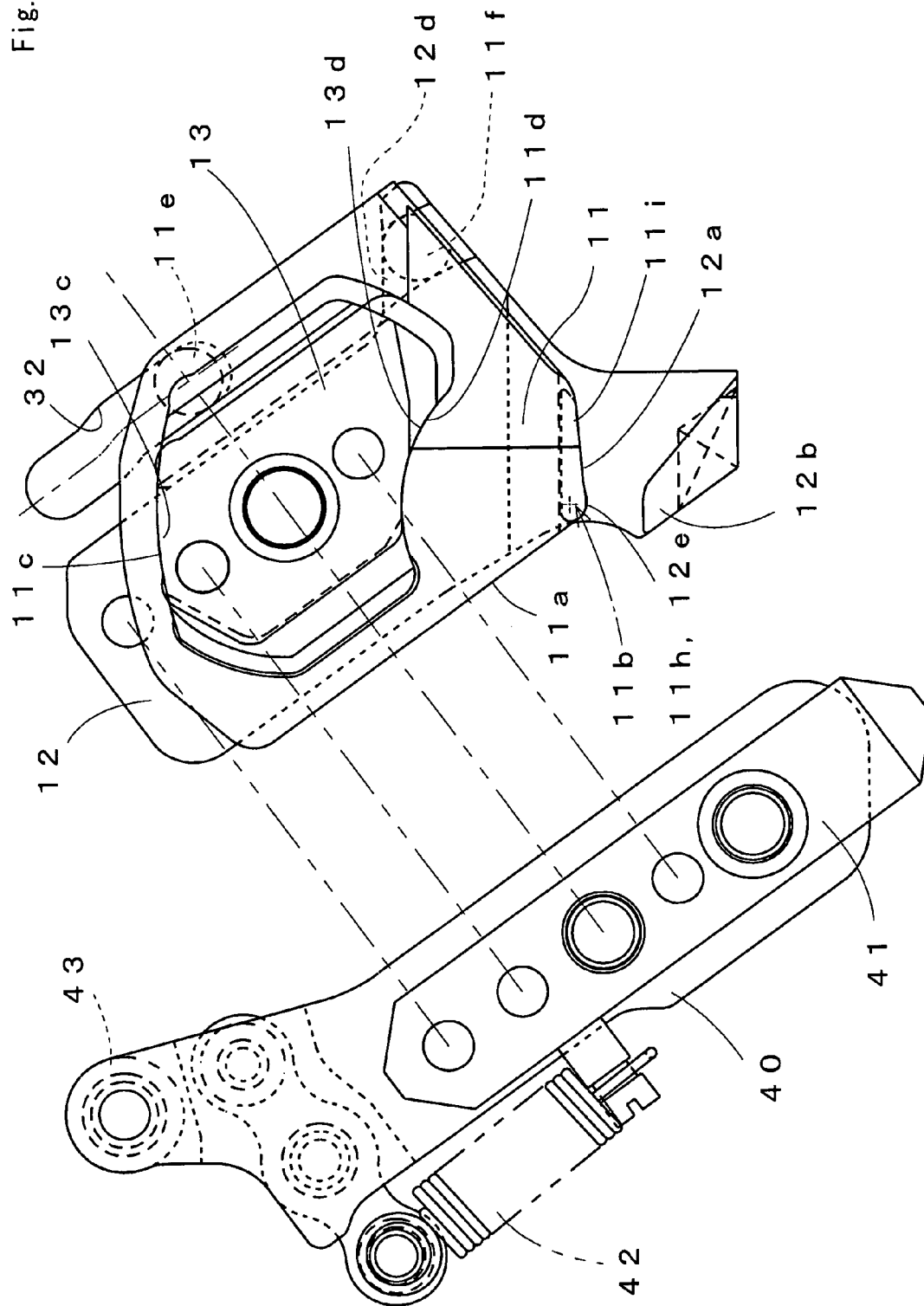
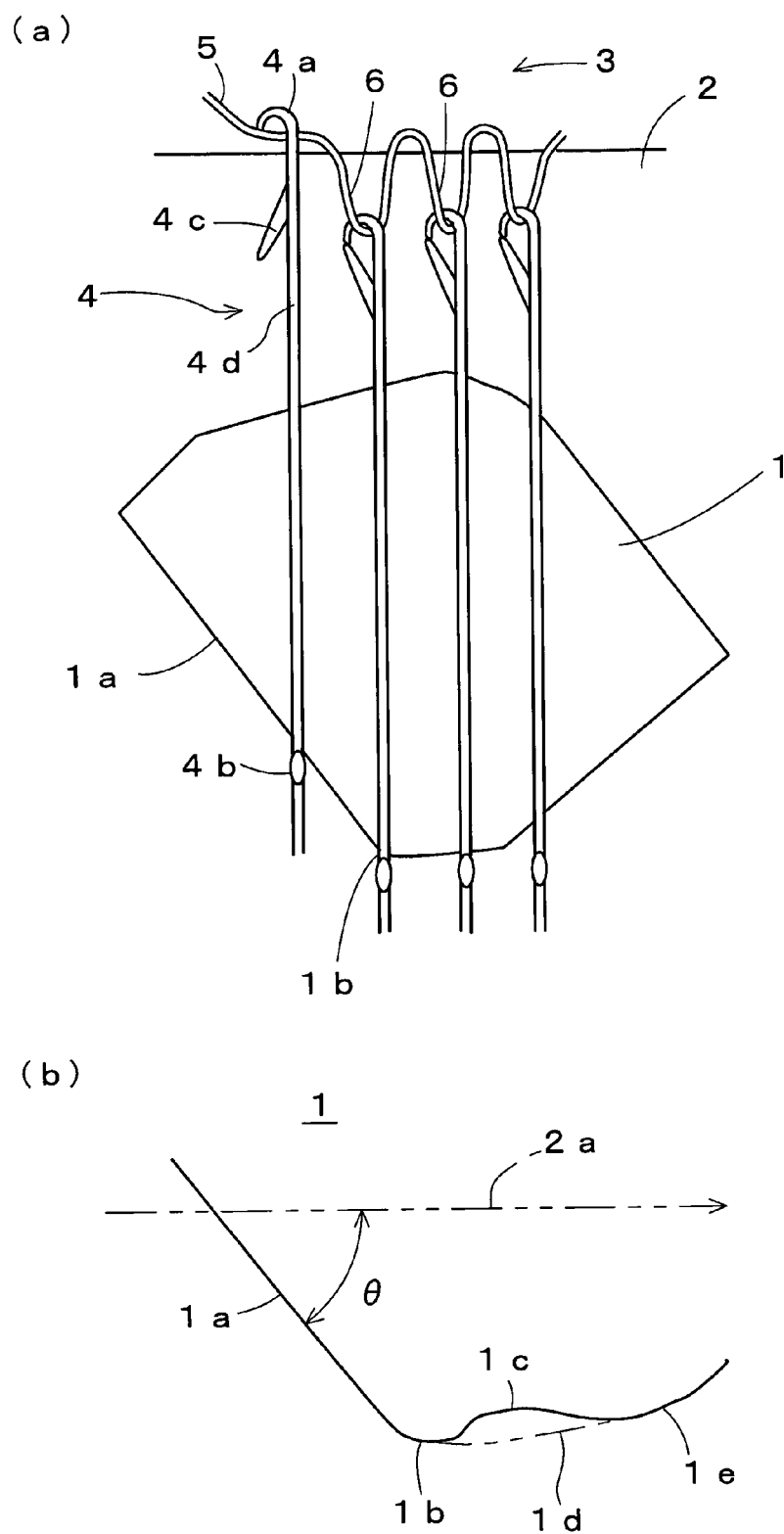


Fig. 7





EUROPEAN SEARCH REPORT

Application Number
EP 10 01 6142

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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			TECHNICAL FIELDS SEARCHED (IPC)
			D04B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 2 May 2011	Examiner Zirkler, Stefanie
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

2
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