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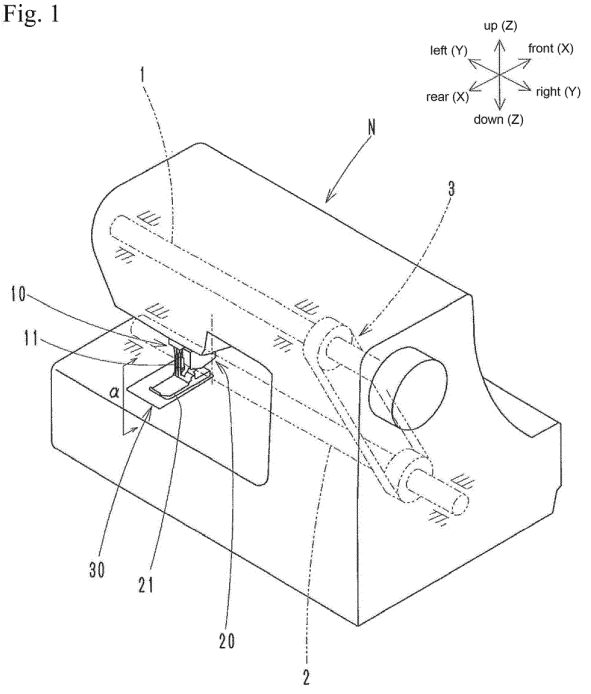
(54) THREAD POSITIONER OF DOUBLE CHAIN STITCH AND SEWING MACHINE HAVING THREAD POSITIONER

(57) The present invention provides a thread positioner and a sewing machine provided with the thread positioner capable of restricting the movement of needle threads in left and right directions without restricting the movement of a looper thread in the left and right directions when forming a hollow ring in a double chain stitch sewing machine. A thread positioner 41 provided on a needle plate 30 of a double chain stitch sewing machine for forming a seam by a plurality of needle threads 15 and a looper thread 55, wherein the thread positioner 41 includes a needle thread holding plate 42 provided below the needle plate 30, the needle thread holding plate 42 extending horizontally from a front to a rear, a rear end portion of the needle thread holding plate 42 includes: a guide portion 43 for guiding the plurality of needle threads 15; and a thread positioning portion for regulating a movement of the plurality of needle threads 15 in a right-and-left direction, and the thread positioning portion includes: a protrusion 45 linearly protruded rearward from the guide portion 43; flat portions 46 formed on left and right side surfaces of the protrusion 45; and an inclined portion 47 formed on a tip of the protrusion 45, the inclined portion 47 being inclined from a right to a rear left.

Fig. 1



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Description

TECHNICAL FIELD

[0001] The present invention relates to a thread positioner of a double chain stitch sewing machine to hold a thread during empty sewing (when forming a hollow ring) for surely forming the hollow ring and a sewing machine having the thread positioner.

BACKGROUND ART

[0002] When performing a double chain stitch (multi thread chain stitch) defined as 406, 407 and the like in JIS-L0120, only seams (hollow rings, chain-off) are formed by a plurality of needle threads and one looper thread by driving the sewing machine without interposing a cloth (fabric) in some cases for treating the thread after the sewing is finished, for example.

[0003] When the cloth is interposed, since the seams (stitches) are formed through the cloth, the shape and the position of the formed seams are fixed and retained by the cloth.

[0004] On the other hand, when the cloth is not interposed, since the formed seams are not retained, the shape of the seams may be collapsed or the position of the needle threads may be changed when the force is applied from the outside of the feed mechanism and the like or the thread tension is changed. In that case, there is a problem that new seams cannot be formed.

[0005] Accordingly, it is proposed that the technology for stabilizing the position of the needle threads and surely forming hollow rings even when the cloth is not interposed by providing a thread positioner having a triangular shape in the vicinity of a needle location hole of a needle plate so that the needle threads are locked at a predetermined interval in the left and right directions (shown in Patent Document 1).

PRIOR ART DOCUMENTS

[Patent Documents]

[0006] [Patent Document 1] Japanese Unexamined Patent Application Publication No. 2000-93671

DISCLOSURE OF THE INVENTION

[Problems to be Solved by the Invention]

[0007] As described above, the role of the thread positioner of Patent Document 1 is to lock and hold the needle threads, which receive the force in the lateral direction caused by the reciprocating motion of a looper near a needle, on the thread positioner at the predetermined position in the left and right directions.

[0008] On the other hand, the vicinity of the needle is also functions as a so-called thread passage through which the thread other than the needle threads (i.e., looper thread) passes.

[0009] In particular, when the needle is moved upward, the looper moves to cross each needle while capturing the needle threads and making the looper thread pass through the needle threads. (The movement of the looper thread from the lower right to the upper left of the thread positioner in accordance with the lateral movement of the looper and the simultaneously performed operation of feeding the seams is called thread cast-off.)

[0010] There is a possibility that the thread positioner may obstruct the movement of the looper thread when the thread cast-off occurs.

[0011] Accordingly, the technical problem is that the thread positioner should satisfy conflicting two demands: the movement of the needle threads in the left and right directions should be restricted; and the movement of the looper thread in the left and right directions (strictly, the movement from right to left) should not be restricted.

[0012] However, it cannot be said that the thread positioner described in Patent Document 1 completely solves the above described problem. The restriction of the movement of the needle threads in the left and right directions is uncertain.

[0013] In order to solve the above described problems, the present invention aims for providing the thread positioner and the sewing machine having the thread positioner of the double chain stitch sewing machine capable of restricting the movement of the needle threads in the left and right directions and not restricting the movement of the looper thread in the left and right directions when forming the hollow rings.

[Means for Solving the Problem]

[0014] In order to solve the above described problems, the present invention employs the configuration of a thread positioner provided on a needle plate of a double chain stitch sewing machine for forming a seam by a plurality of needle threads and a looper thread characterized in that the thread positioner includes a needle thread holding plate provided below the needle plate, the needle thread holding plate extending horizontally from a front to a rear, a rear end portion of the needle thread holding plate includes: a guide portion for guiding the plurality of needle threads; and a thread positioning portion for regulating a movement of the plurality of needle threads in a right-and-left direction, and the thread positioning portion includes: a protrusion linearly protruded rearward from the guide portion; flat portions formed on left and right side surfaces of the protrusion; and an inclined portion formed on a tip of the protrusion, the inclined portion being inclined from a right to a rear left.

[0015] An embodiment of the thread positioner of the double chain stitch sewing machine employs the configuration characterized in that the thread positioning portion is protruded from the needle thread holding plate while an upper surface of the protrusion is inclined up-

ward from the tip. Another embodiment employs the configuration characterized in that the thread positioning portion is protruded from the needle thread holding plate while an upper surface of the protrusion is inclined upward from the tip. Another embodiment employs the configuration characterized in that the thread positioning portion includes: a fixed thread positioning portion fixed to the needle thread holding plate; and a slide thread positioning portion which is retractable in a front-rear direction from a lower portion of the fixed thread positioning portion in accordance with an operation of the double chain stitch sewing machine.

[0016] Furthermore, the double chain stitch sewing machine of the present invention employs the configuration characterized to include the above described thread positioner.

[Effects of the Invention]

[0017] In the thread positioner of the double chain stitch sewing machine of the present invention, since the above described configuration is employed, the movement of the needle threads in the right-and-left direction can be surely restricted by the protrusion while the movement of the looper thread from right to left is not restricted by the inclined portion when the thread cast-off occurs.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018]

Fig. 1 is a perspective view of an outer appearance of a sewing machine including a thread positioner concerning the first embodiment of the present invention.

Fig. 2 is an enlarged exploded view showing a peripheral part of a needle of Fig. 1.

Figs. 3A and 3B are explanatory drawings showing an auxiliary needle plate of Fig. 2. Fig. 3A is an enlarged view of the auxiliary needle plate, and Fig. 3B is an enlarged view of the thread positioner.

Fig. 4 is a cross-sectional view of the peripheral part of the needle of Fig. 1 cut along an α plane.

Figs. 5A and 5B are schematic drawings of the formation of hollow rings concerning the first embodiment of the present invention. Fig. 5A is a drawing showing the first state, and Fig. 5B is a drawing showing the second state.

Figs. 6A and 6B are schematic drawings of the formation of hollow rings concerning the first embodiment of the present invention. Fig. 6A is a drawing showing the third state, and Fig. 6B is a drawing showing the fourth state.

Figs. 7A and 7B are schematic drawings of the formation of hollow rings concerning the first embodiment of the present invention. Fig. 7A is a drawing showing the fifth state, and Fig. 7B is a drawing showing the sixth state.

Figs. 8A and 8B are explanatory drawings showing an auxiliary needle plate concerning the second embodiment of the present invention. Fig. 8A is an enlarged view of the auxiliary needle plate, and Fig. 8B is an enlarged view of a thread positioning portion.

Fig. 9 is an exploded schematic drawing of the auxiliary needle plate concerning the second embodiment of the present invention.

Figs. 10A and 10B are schematic drawings of the formation of hollow rings concerning the second embodiment of the present invention. Fig. 10A is a drawing showing the first state, and Fig. 10B is a drawing showing the second state.

Figs. 11A and 11B are schematic drawings of the formation of hollow rings concerning the second embodiment of the present invention. Fig. 11A is a drawing showing the third state, and Fig. 11B is a drawing showing the fourth state.

Figs. 12A and 12B are schematic drawings of the formation of hollow rings concerning the second embodiment of the present invention. Fig. 12A is a drawing showing the fifth state, and Fig. 12B is a drawing showing the sixth state.

MODES FOR CARRYING OUT THE INVENTION

[0019] Then, a thread positioner of a double chain stitch sewing machine concerning the embodiment of the present invention will be explained with reference to the drawings shown as examples.

[0020] In the following explanation, the vertical direction may be referred to as "up down," the direction from the upper right to the lower left may be referred to as "front-rear," and the direction from the upper left to the lower right may be referred to as "left-right" in the perspective view shown in Fig. 1. Furthermore, the front-rear direction may be referred to as "X-direction" and the left-right direction may be referred to as "Y-direction."

[First embodiment]

[0021] In Fig. 1, 1 is an upper shaft which is rotatably supported on an upper part of a sewing machine N, and 2 is a lower shaft which is rotatably supported on a lower part of the sewing machine N. The upper shaft 1 and the lower shaft 2 are connected with each other by an upper shaft-lower shaft interlocking mechanism 3. The upper shaft 1 and the lower shaft 2 are synchronously rotated by a rotational force of a not-illustrated sewing machine motor.

[0022] 10 is a needle driving device for driving three needles 11 the upper shaft 1 vertically (up and down) by a rotational movement of the needle driving device, 20 is a pressing device having a presser foot 21 and 30 is a needle plate. The needle driving device 10 forms a seam on a sewing object (not illustrated) sandwiched between the pressing device 20 and the needle plate 30.

[0023] As shown in Fig. 2, in the needle driving device

10, three needles 11 (11L, 11M, 11R) are attached to a needle bar 13 by a needle fixing portion 12.

[0024] In the pressing device 20, the presser foot 21 is attached to a presser bar 23 by a presser holder 22.

[0025] The needle plate 30 includes: three needle location holes 31 which are arranged at equal intervals along the direction orthogonal to a cloth feeding direction F so that the three needles 11 pass through the three needle location holes 31 from the above; three grooves 32 formed along the cloth feeding direction F from the three needle location holes 31; a left claw 33 and a right claw 34 formed between the grooves 32 and extended in the cloth feeding direction F; and a feed dog slit 35 formed along the cloth feeding direction F so that a feed dog 60 appears from the feed dog slit 35.

[0026] An auxiliary needle plate 40 is fixed to a lower surface of the needle plate 30 by a screw 37. A thread positioner 41 is provided on the auxiliary needle plate 40 in the vicinity (frontward in the cloth feeding direction F) of the position to which the needles 11 are lowered.

[0027] A looper 50 forms a double chain stitch by a looper thread 55 together with the later described three needle threads 15 inserted through the three needles 11.

[0028] As shown in Fig. 3 and Fig. 4, the thread positioner 41 includes: a needle thread holding plate 42 provided in the frontward of the needles 11 and extended horizontally from the front to the rear; guide portions 43 (left guide portions 43L, center guide portion 43M, right guide portions 43R) formed on three positions of the rear end portion of the needle thread holding plate 42 for guiding three needle threads (not illustrated); and two thread positioning portions 44 (left thread positioning portion 44L, right thread positioning portion 44R) provided between the guide portions 43 for restricting the movement of the needle threads 15 in the right-and-left direction (lateral direction).

[0029] The thread positioning portions 44 includes: a protrusion 45 which is linearly protruded rearward from a guide portions 43 of the needle thread holding plate 42 with a projected dimension (length) D; flat portions 46 formed on left and right side surfaces of the protrusion 45; and an inclined portion 47 formed on a tip of the protrusion 45 so as to be inclined from a right to a rear left.

[0030] As shown in Fig. 4, the protrusion 45 has a streamline shape streamlined toward the cloth feeding direction F. In particular, a lower surface 45a of the protrusion 45 is gradually (gently) inclined from the tip to the lower side so that the looper thread 55 can be smoothly escaped.

[0031] Furthermore, the flat portions 46 formed on the protrusion 45 is inclined from the tip of the protrusion 45 upward, protruded from the upper surface of the needle thread holding plate 42 with a height H, and ended at a predetermined dimension (length).

[0032] Then, the usage, operation and effect of the present embodiment will be explained.

[0033] In the sewing machine N, the needle threads 15 and the looper thread 55 are inserted into the needles 11 and the looper 50 respectively, the rotational movement of the upper shaft 1 is converted into the vertical movement of the needles 11, and the rotational movement of the lower shaft 2 is converted into the movement of the looper 50 and the feed dog 60. Thus, the needles 11, the looper 50 and the feed dog 60 are mutually interlocked to entangle the needle threads 15 and the looper thread 55 with each other and form a seam of the double chain stitch. At this time, when the sewing object (cloth) is sandwiched between the pressing device 20 and the needle plate 30, the seam is formed on the cloth. When the cloth is not provided, only the seam (hollow ring) is formed.

[0034] Using Fig.5A to Fig. 7B, the explanation of the formation of the hollow ring of the double chain stitch and the operation of the thread positioner 41 at that time will be explained.

[0035] Note that the dot in the arrow mark indicating the trajectory of the vertical movement of the needles 11 and in the arrow mark indicating the trajectory of the movement of the looper 50 shows the position (timing) of each configuration in the trajectory.

[0036] In the first state shown in Fig. 5A, the needles 11 are positioned at the lowermost point and the looper 50 is positioned at the rightmost point.

[0037] At that time, the whole seam is pulled in a rearward and downward direction by the lowering motion of the needles 11. However, since the seam (looper thread 55) is in contact with the rear end portion of the thread positioner 41, the seam is prevented from moving downward.

[0038] At the same time, the left and right position of the needle threads 15 is retained (locked) by the right thread positioning portion 44R and the left thread positioning portion 44L of the thread positioner 41.

[0039] Accordingly, even when the whole seam is pulled by the lowering motion of the needles 11, the shape of the seam is not collapsed since the thread positioner 41 exists.

[0040] Next, in the second state shown in Fig. 5B, when the needles 11 are raised by a predetermined amount, loops β are formed on the needle threads 15. When the looper 50 is moved in the left direction, the tip of the looper 50 enters in the loops β.

[0041] At this time, the force of the left movement of the looper 50 is partly transmitted to the needle threads 15 and the needle threads 15 receives the force of moving to the left as a whole. However, since the needle threads 15 are locked by the thread positioner 41 (particularly by the protrusion 45), the movement to the left is restricted.

[0042] Next, in the third state shown in Fig. 6A, the looper 50 captures all of the loops β and the needles 11 re further raised. Furthermore, the needle threads 15 are tightened by the operation of a not-illustrated needle thread take-up lever.

[0043] Next, in the fourth state shown in Fig. 6B, the needles 11 are raised to the uppermost point and the looper 50 is moved rearward while capturing the needle

threads 15.

[0044] At the same time, the whole seam is transferred frontward by the feed dog 60 by a predetermined amount.

[0045] By the above described operations and the operation of tightening the needle thread take-up lever in the third state, the looper thread 55 entered under the lower right of the right thread positioning portion 44R passes over the right thread positioning portion 44R and moves to the upper left of the right thread positioning portion 44R in the fourth state (cast-off of looper thread 55). At this time, since the looper thread 55 passes over the right thread positioning portion 44R along the inclined portion 47, the cast-off can be surely done.

[0046] Next, in the fifth state shown in Fig. 7A, the looper 50 moves to the right. However, since the needles 11 are lowered while scooping the looper thread 55, the needle threads 15 and the looper thread 55 are crossed with each other.

[0047] At this time, the force of the right movement of the looper 50 is partly transmitted to the needle threads 15 and the needle threads 15 receives the force of moving to the right as a whole. However, since the needle threads 15 are locked by the thread positioner 41 (particularly by the protrusion 45), the movement to the right is restricted. Thus, the needles 11 can surely capture the looper thread 55.

[0048] Next, from the sixth state shown in Fig. 7B to the first state, the looper 50 further moves to the right and moved to the front. Thus, the looper 50 is gradually released from the engagement of the needle threads 15. On the other hand, since the needles 11 are lowered while scooping the looper thread 55, a new seam is formed.

[0049] As described above, in the present embodiment, the hollow ring is continuously formed by the double chain stitch by repeating the cycle from the first state to the sixth state.

[0050] At that time, the movement of the needle threads 15 in the right-and-left direction is restricted by the protrusion 45 of the thread positioner 41. In addition, the looper thread 55 is allowed to move from the lower right to the upper left when the thread cast-off occurs in the looper thread 55 by the operation of the inclined portion 47 of the thread positioner 41. Thus, the hollow ring can be surely formed even when the cloth does not exist.

[0051] As described above, the looper thread 55 passes over only the right thread positioning portion 44R when the thread cast-off occurs as a basic behavior. However, the looper thread 55 can also pass over the left thread positioning portion 44L when the thread cast-off occurs depending on the difference of the flexibility caused by the material of the thread and the difference of the sewing conditions such as a sewing speed.

[0052] Accordingly, it is preferable to form the inclined portion 47 also on the left thread positioning portion 44L in addition to the right thread positioning portion 44R.

[Second embodiment]

[0053] Then, the embodiment where the configuration of the thread positioning portions 44 of the thread positioner 41 in the first embodiment will be explained.

[0054] In the present embodiment, the same reference signs are assigned to the configurations same as the first embodiment in the drawings. Thus, the detailed explanation will be omitted and the difference will be mainly explained.

[0055] In Fig. 8, 70 is an auxiliary needle plate. A thread positioner 71 is provided on the auxiliary needle plate 70 in the vicinity (front) of the cloth feeding direction F with respect to the position to which the needles 11 are lowered.

[0056] The thread positioner 71 includes: a needle thread holding plate 72 provided in the frontward of the needles 11 and extended horizontally from the front to the rear; guide portions 73 formed on three positions of the rear end portion of the needle thread holding plate 72 for guiding three needle threads (not illustrated); and two thread positioning portions 74 (right thread positioning portion 74R, left thread positioning portion 74L) provided between the guide portions 73 for restricting the movement of the needle threads 15 in the right-and-left direction (lateral direction).

[0057] As shown in Fig. 8 and Fig. 9, an inclined portion 74a is formed on the tip of the thread positioning portions 74. The thread positioning portions 74 includes: a fixed thread positioning portion 75 fixed to the needle thread holding plate 72; and a slide thread positioning portion 80 which is retractable in a front-rear direction from a lower portion of the needle thread holding plate 72 in accordance with an operation of the sewing machine N.

[0058] A slide groove 76 and a slide hole 77 are formed on a lower surface of the needle thread holding plate 72 for guiding a slide plate 82 provided with the slide thread positioning portion 80 at the tip of the slide plate 82. The slide plate 82 is energized toward a driving cam 83 fixed to the lower shaft 2 by a compression spring 78 provided between a guide portion 79 and the slide plate 82. Thus, the slide plate 82 is slid in the front-rear direction in synchronization with the rotation of the lower shaft 2 by the operation of the driving cam 83 fixed to the lower shaft 2.

[0059] Accordingly, as shown in Fig. 8B, the projected dimension D of a slide protrusion 81 of the slide thread positioning portion 80 is periodically changed from Dmin to Dmax in synchronization with the rotation of the lower shaft 2.

[0060] Using Fig. 10A to Fig. 12B, the formation of the hollow ring of the double chain stitch and the operation of the thread positioner 71 at that time will be explained.

[0061] However, since the formation of the seam of the double chain stitch is same as that of the first embodiment shown in Fig. 5A to Fig. 7B, only the difference will be explained.

[0062] As described above, the rotation of the lower shaft 2 (i.e., process of sewing) the slide thread position-

ing portion 80 is slid in the front-rear direction with respect to the needle thread holding plate 72 by the operation of the driving cam 83. Thus, the projected dimension D is changed.

[0063] In particular, in the fourth state where the thread cast-off occurs in the looper thread 55 as shown in Fig. 11B, the timing of the driving cam 83 is specified so that the projected dimension D becomes the minimum value Dmin.

[0064] In other states such as the first state where the tension is applied to the needle threads 15 as shown in Fig. 10A, the second state where the force in the lateral direction is applied to the needle threads 15 by the looper 50 as shown in Fig. 10B, the fifth state shown in Fig. 12A and the sixth state shown in Fig. 12B, the timing of the driving cam 83 is specified so that the projected dimension D is increased within the range between Dmid and Dmax.

[0065] By adopting the above described configuration, the movement of the looper thread 15 in the left and right directions is more surely restricted by the slide protrusion 81 where the projected dimension D is increased. In addition, the looper thread 55 is allowed to move from the right to the left more surely when the thread cast-off occurs in the looper thread 55 by the operation of the inclined portion 74a of the thread positioning portions 74 where the projected dimension D becomes the minimum value Dmin. Thus, the hollow ring can be more surely formed even when the cloth does not exist.

[0066] As a variation of the second embodiment, it is also possible to form the configuration of sliding the thread positioning portions 74 by sliding the thread positioning portions 74 with respect to the auxiliary needle plate 70 or by sliding the auxiliary needle plate 70 with respect to the needle plate 30.

[0067] As another variation of the second embodiment, it is also possible to further provide a stopping mechanism for separating the driving cam 83 and the slide plate 82 from each other and stop the movement of the slide plate 82 in the front-rear direction and a sensor for detecting the existence and absence of the sewing object. In the above described variation, the slide protrusion 81 is slid when the sewing object does not exist, while the sliding of the slide protrusion 81 is stopped when the sewing object exists. Thus, the thread positioner 71 can be surely enabled only when forming the hollow ring.

[Industrial applicability]

[0068] In a thread positioner provided on a needle plate of a double chain stitch sewing machine for forming a seam by a plurality of needle threads and a looper thread, the thread positioning portion can surely restrict the movement of the needle threads in the right-and-left direction by a protrusion without restricting the movement of the looper thread from right to left by an inclined portion when a thread cast-off occurs. Thus, the present invention is advantageous for the thread positioner applied to the double chain stitch sewing machine.

[Description of the Reference Numerals]

[0069]

D: projected dimension
F: cloth feeding direction
H: height
N: sewing machine
α: cutting plane
β: loop
1: upper shaft
2: lower shaft
3: upper shaft-lower shaft interlocking mechanism
10: needle driving device
11: needle
11L: L needle
1IM: M needle
11R: R needle
12: needle fixing portion
13: needle bar
15: needle thread
20: pressing device
21: presser foot
22: presser holder
23: presser bar
30: needle plate
31: needle location hole
32: groove
33: left claw
34: right claw
35: feed dog slit
37: screw
40, 70: auxiliary needle plate
41, 71: thread positioner
42, 72: needle thread holding plate
43, 73: guide portion
43R: right guide portion
43M: center guide portion
43L: left guide portion
44, 74: thread positioning portion
44R, 74R: right thread positioning portion
44L, 74L: left thread positioning portion
45: protrusion
45a: lower surface
46: flat portion
47, 74a: inclined portion
50: looper
55: looper thread
60: feed dog
75: fixed thread positioner
76: slide groove
77: slide hole
78: compression spring
79: guide portion
80: slide thread positioning portion
81: slide protrusion

82: slide plate
83: driving cam

Claims

1. A thread positioner provided on a needle plate of a double chain stitch sewing machine for forming a seam by a plurality of needle threads and a looper thread, wherein

   the thread positioner includes a needle thread holding plate provided below the needle plate, the needle thread holding plate extending horizontally from a front to a rear,
   a rear end portion of the needle thread holding plate includes:

   a guide portion for guiding the plurality of needle threads; and
   a thread positioning portion for regulating a movement of the plurality of needle threads in a right-and-left direction, and

   the thread positioning portion includes:

   a protrusion linearly protruded rearward from the guide portion;
   flat portions formed on left and right side surfaces of the protrusion; and
   an inclined portion formed on a tip of the protrusion, the inclined portion being inclined from a right to a rear left.

2. The thread positioner of the double chain stitch sewing machine according to claim 1, wherein
   a lower surface of the protrusion of the thread positioning portion is inclined downward from the tip.

3. The thread positioner of the double chain stitch sewing machine according to claim 1 or 2, wherein
   the thread positioning portion is protruded from the needle thread holding plate while an upper surface of the protrusion is inclined upward from the tip.

4. The thread positioner of the double chain stitch sewing machine according to any one of claim 1 to 3, wherein
   the thread positioning portion includes:

   a fixed thread positioning portion fixed to the needle thread holding plate; and
   a slide thread positioning portion which is retractable in a front-rear direction from a lower portion of the fixed thread positioning portion in accordance with an operation of the double chain stitch sewing machine.

5. A double chain stitch sewing machine having the thread positioner according to any one of claim 1 to 4.

Fig. 1

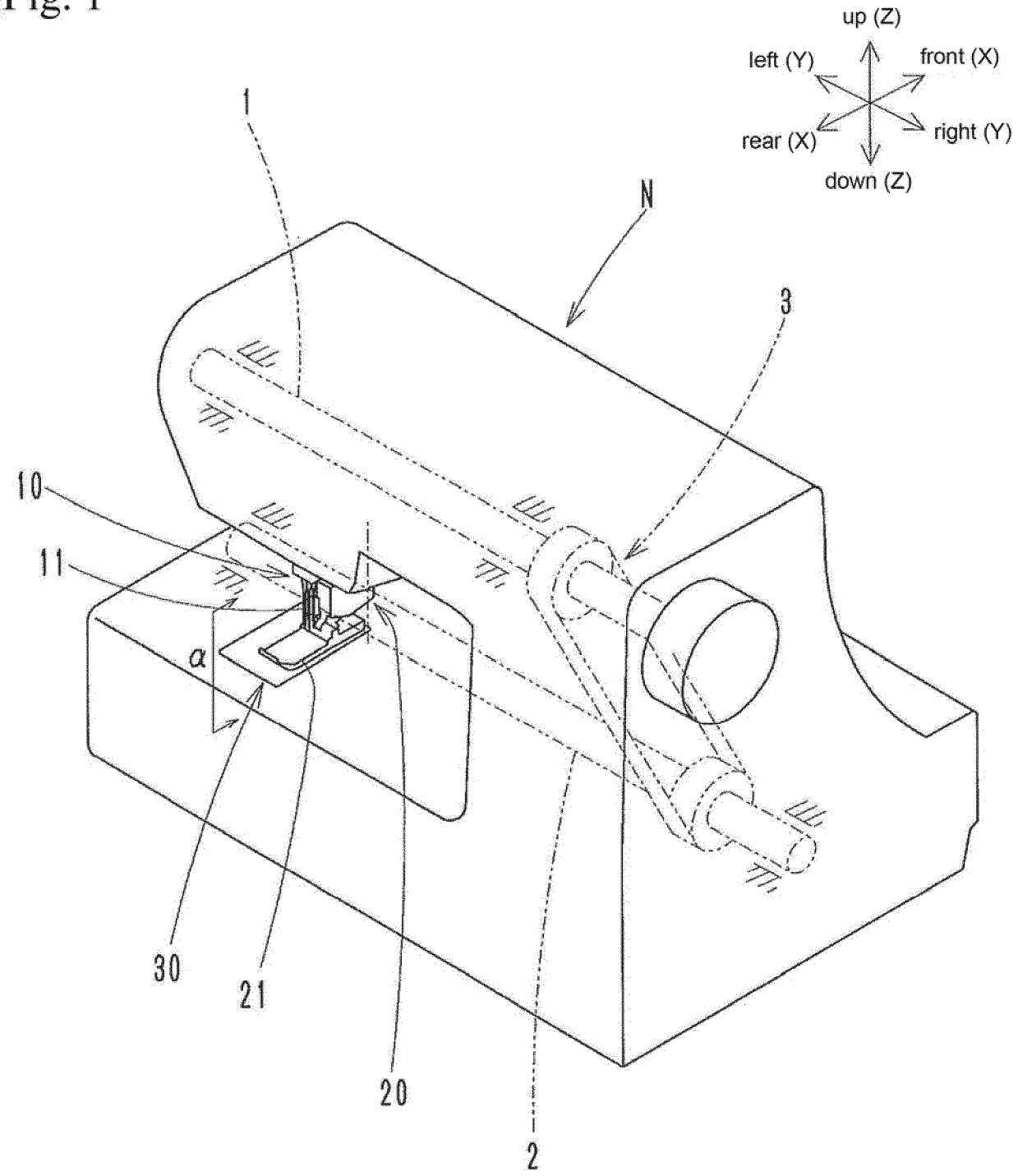
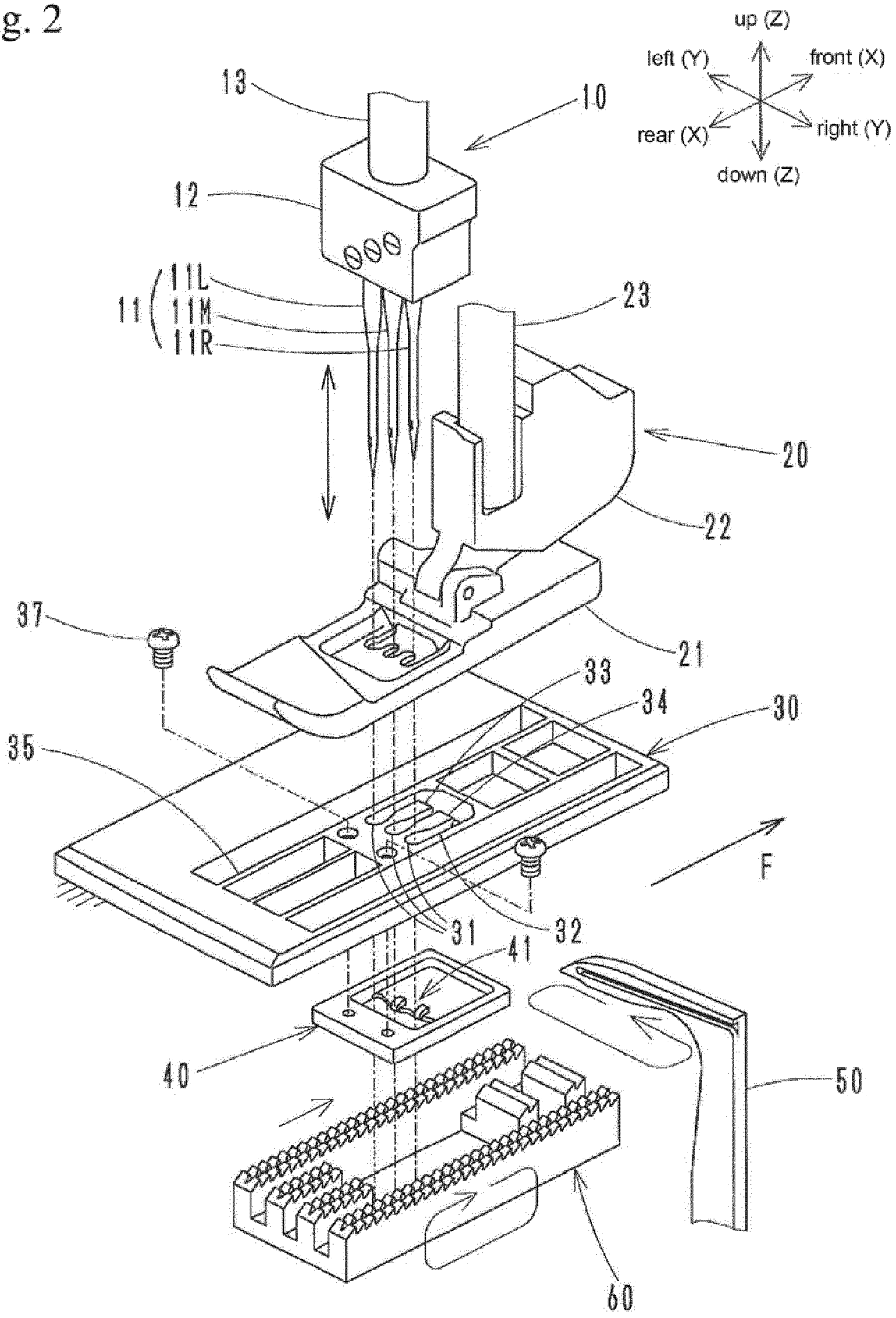


Fig. 2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front (X)
rear (X)
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down (Z)
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10
12
11
11L
11M
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30
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F
31
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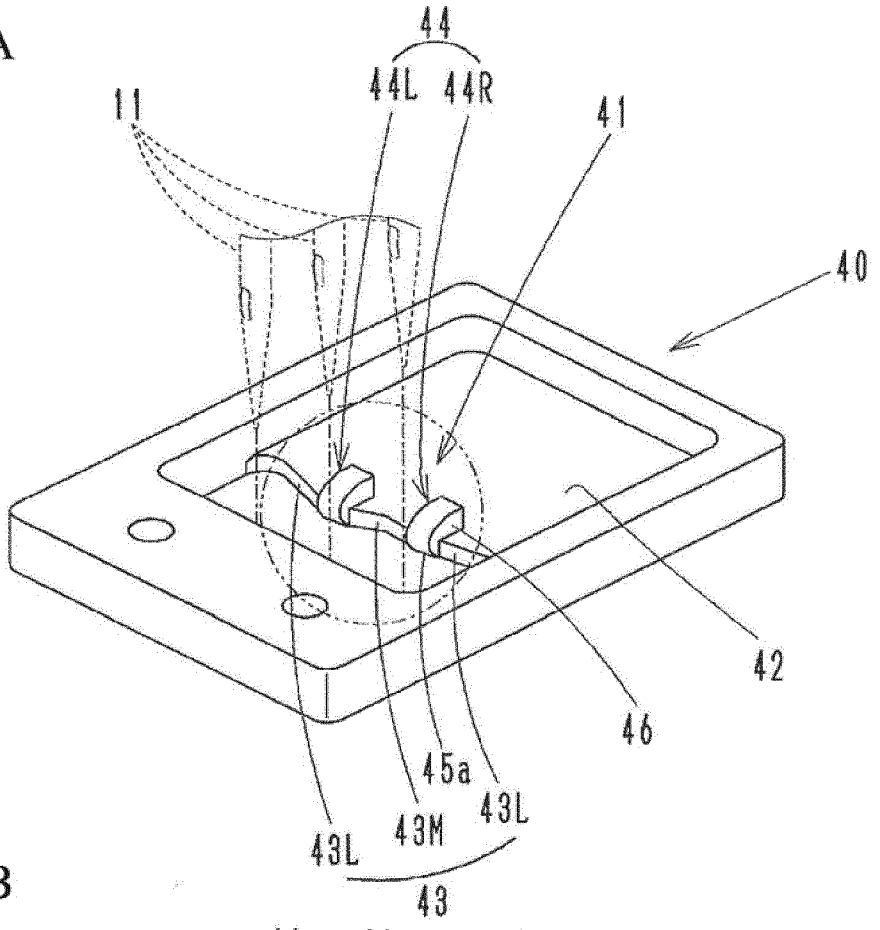
Fig. 3A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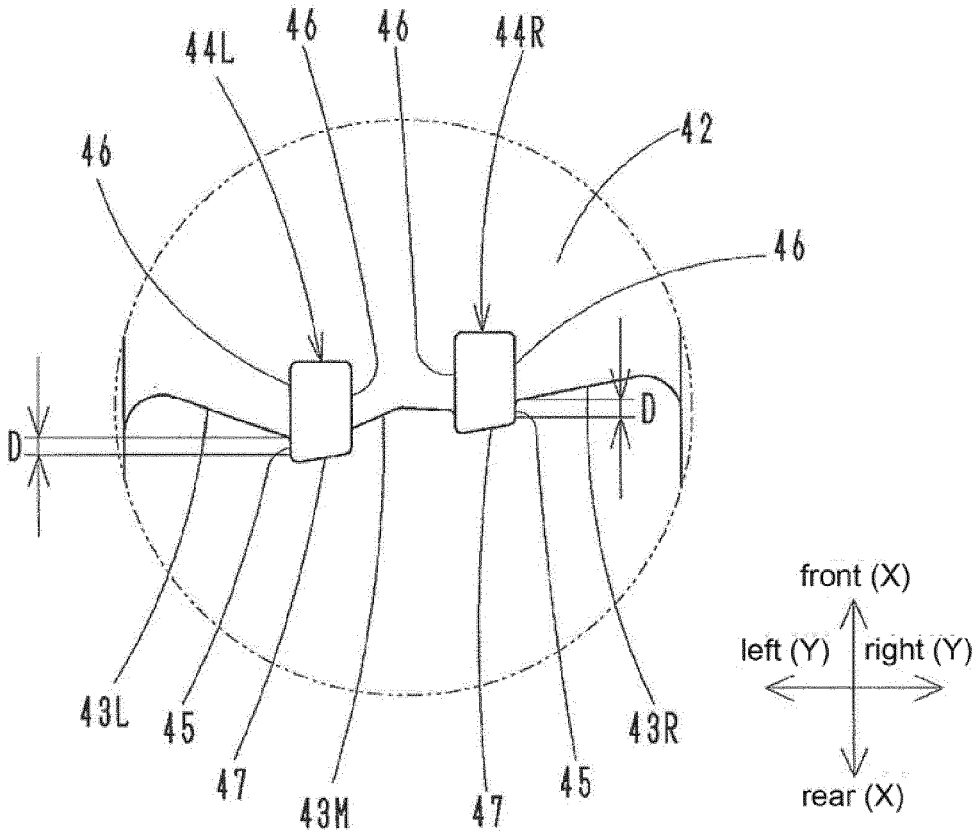
44L
44R
11
41
40
42
46
45a
43L
43M
43L
43

Fig. 3B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42
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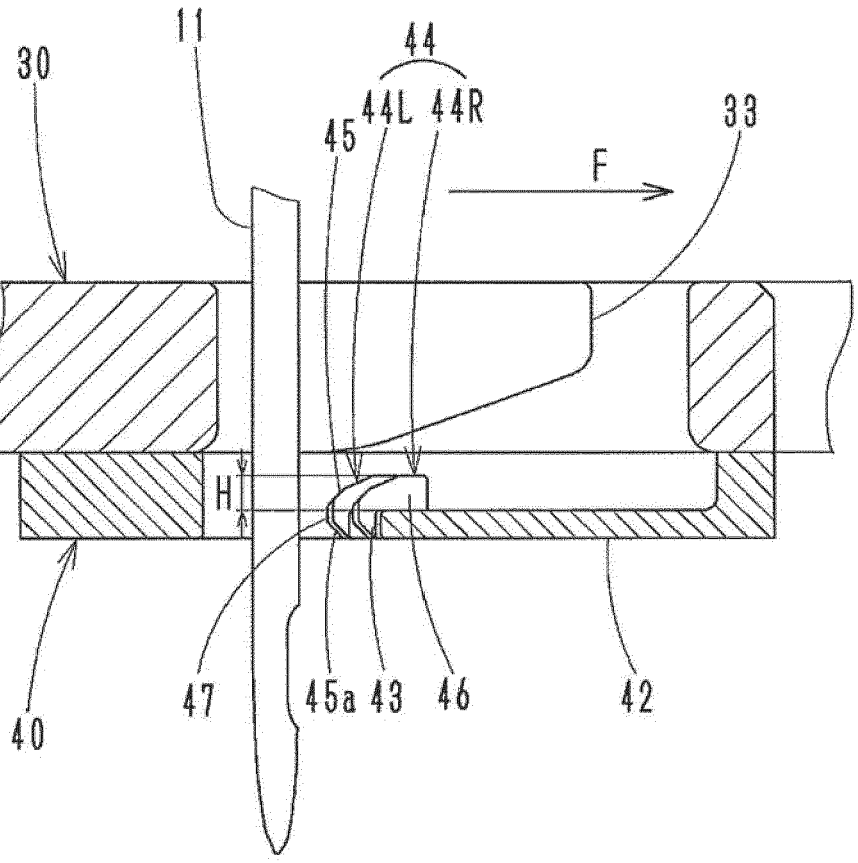
front (X)
left (Y)
right (Y)
rear (X)

Fig. 4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44R
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33
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H
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45a
43
46
42

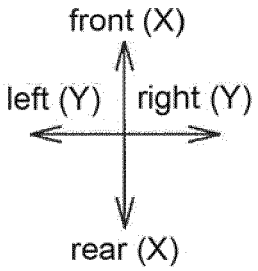

front (X)
left (Y)
right (Y)
rear (X)

Fig. 5A

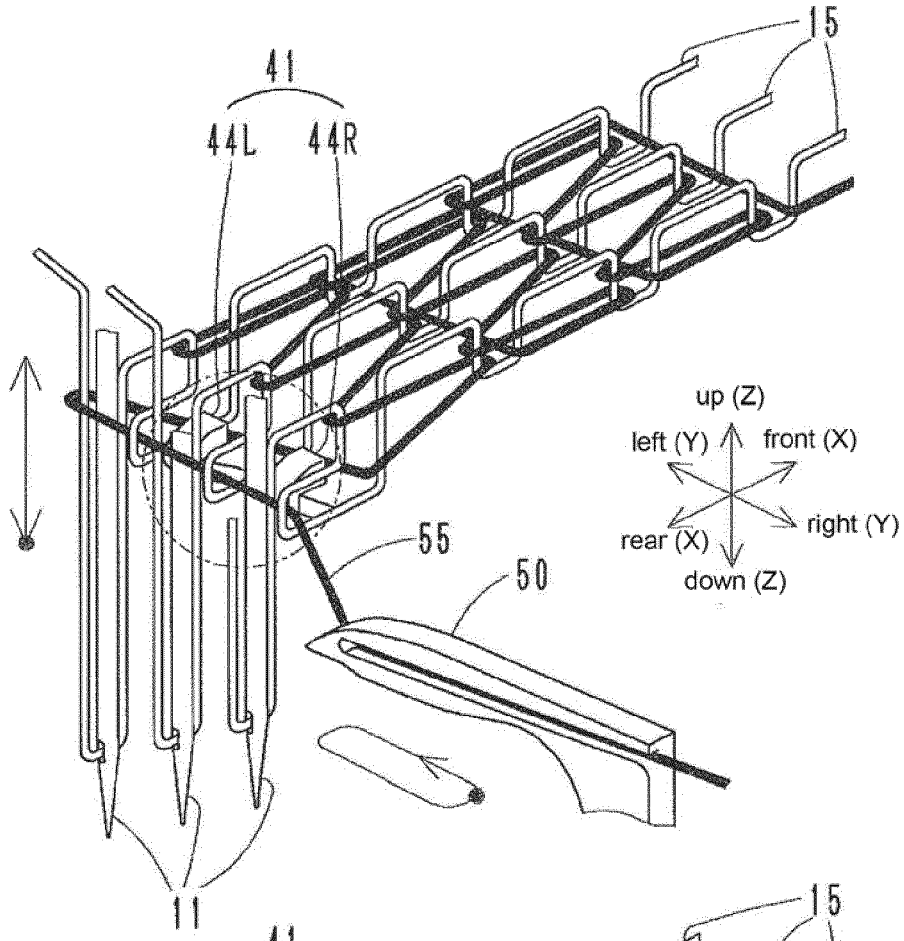

15
41
44L
44R
up (Z)
left (Y)
front (X)
right (Y)
rear (X)
down (Z)
55
50
11

Fig. 5B

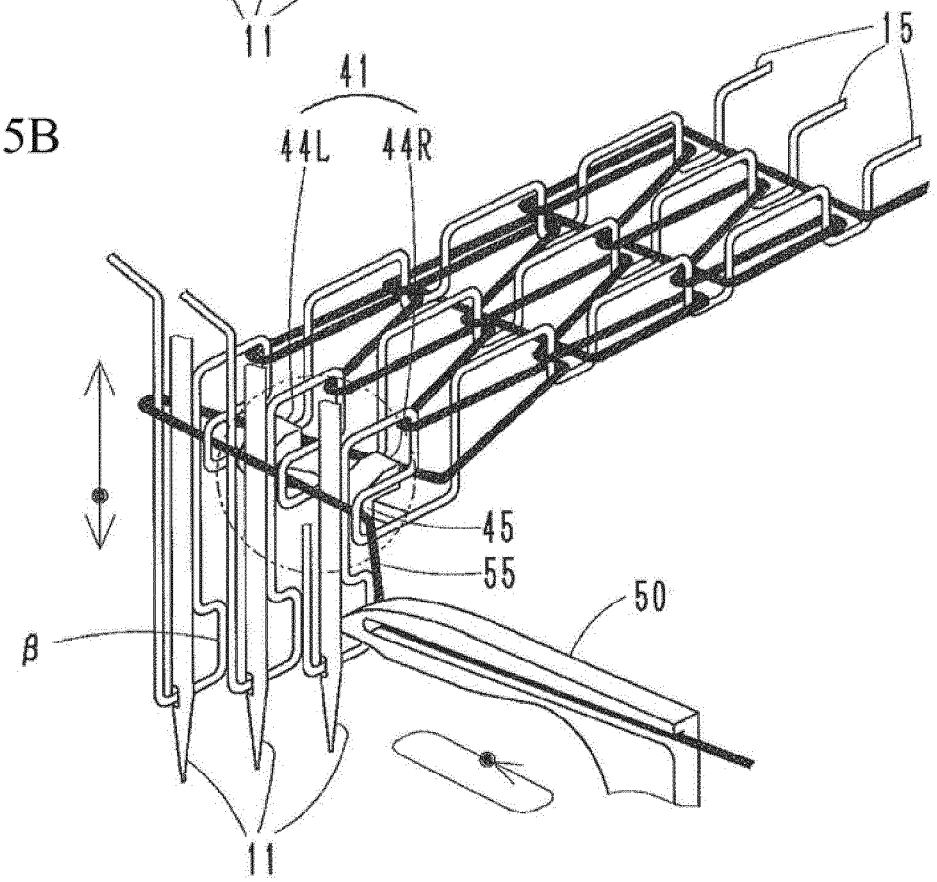

15
41
44L
44R
45
55
50
β
11

Fig. 6A

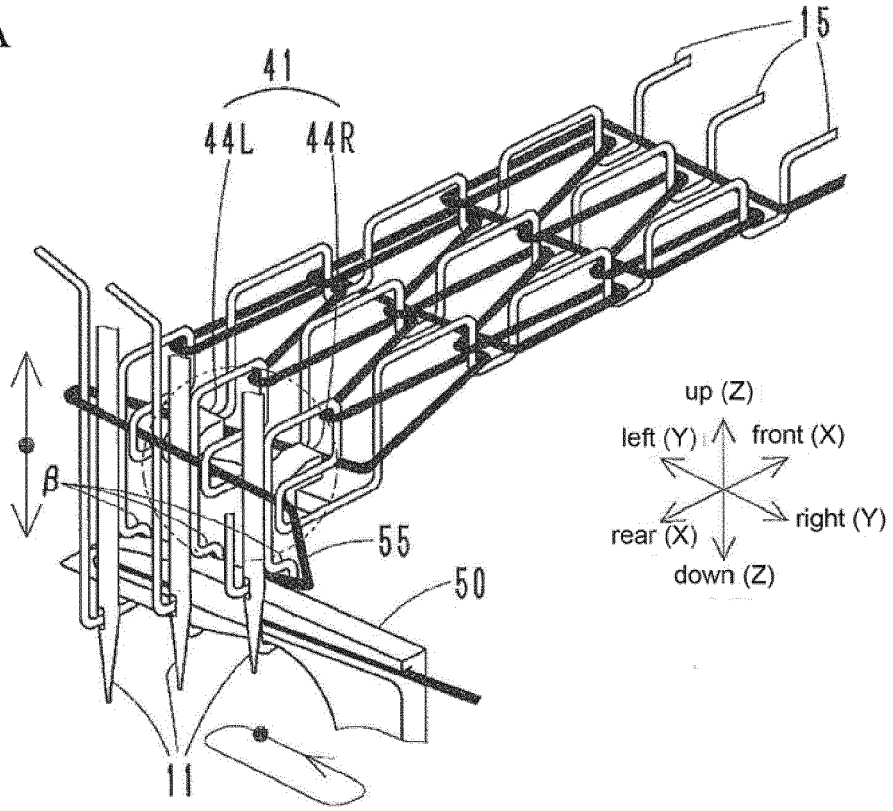

15
41
44L
44R
β
55
50
11
up (Z)
left (Y)
front (X)
rear (X)
right (Y)
down (Z)

Fig. 6B

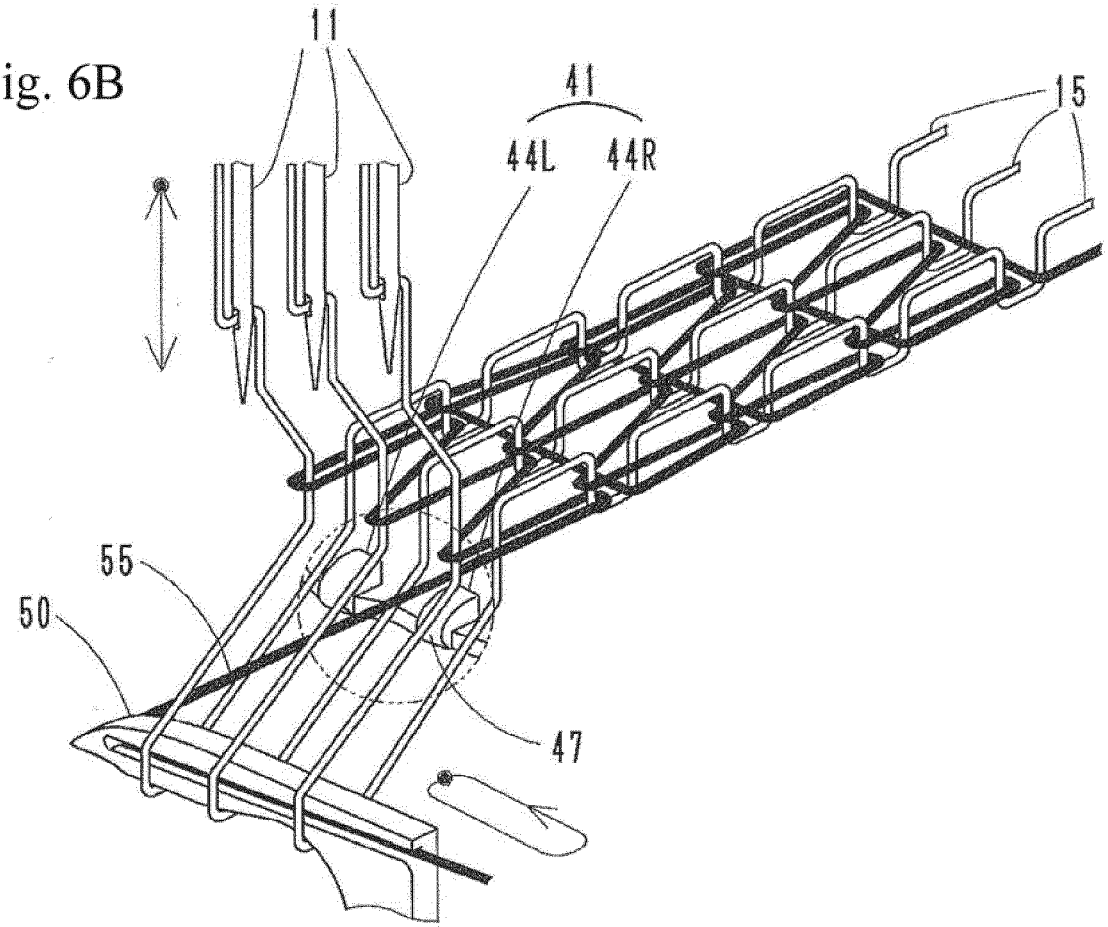

11
41
44L
44R
15
55
50
47

Fig. 7A

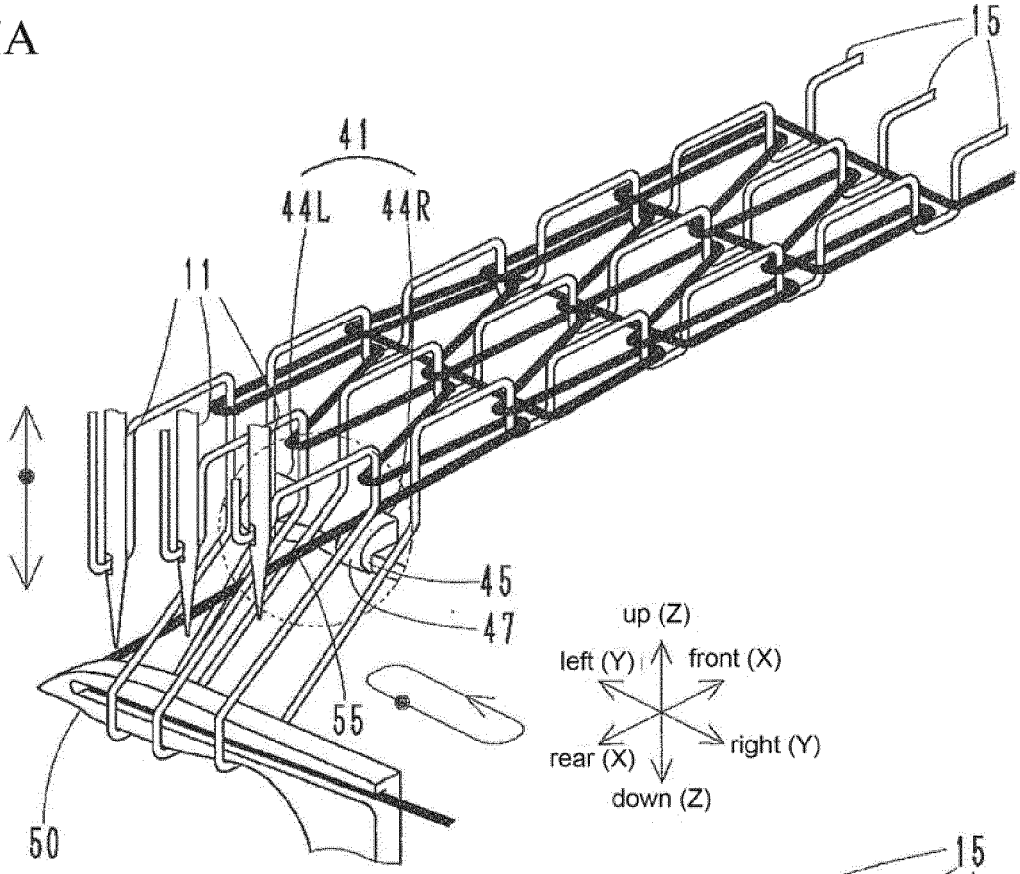

15
41
44L
44R
11
45
47
55
50
up (Z)
left (Y)
front (X)
rear (X)
right (Y)
down (Z)

Fig. 7B

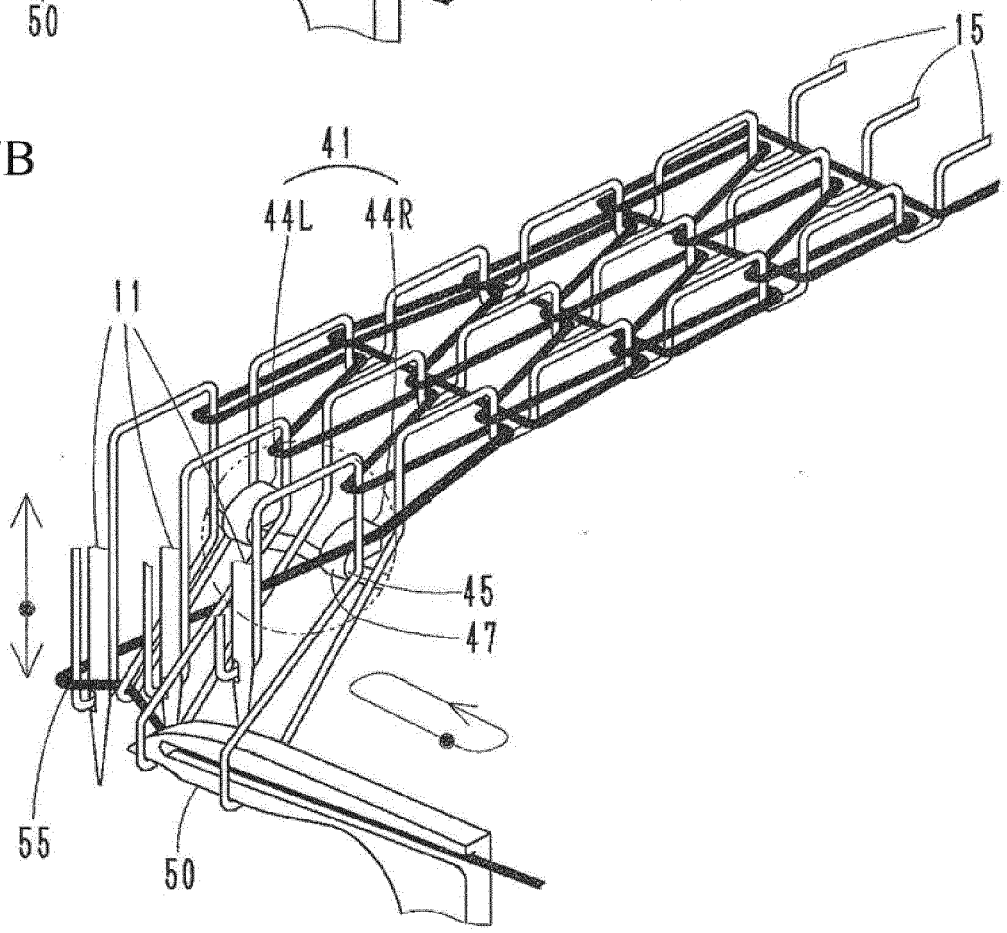

15
41
44L
44R
11
45
47
55
50

Fig. 8A

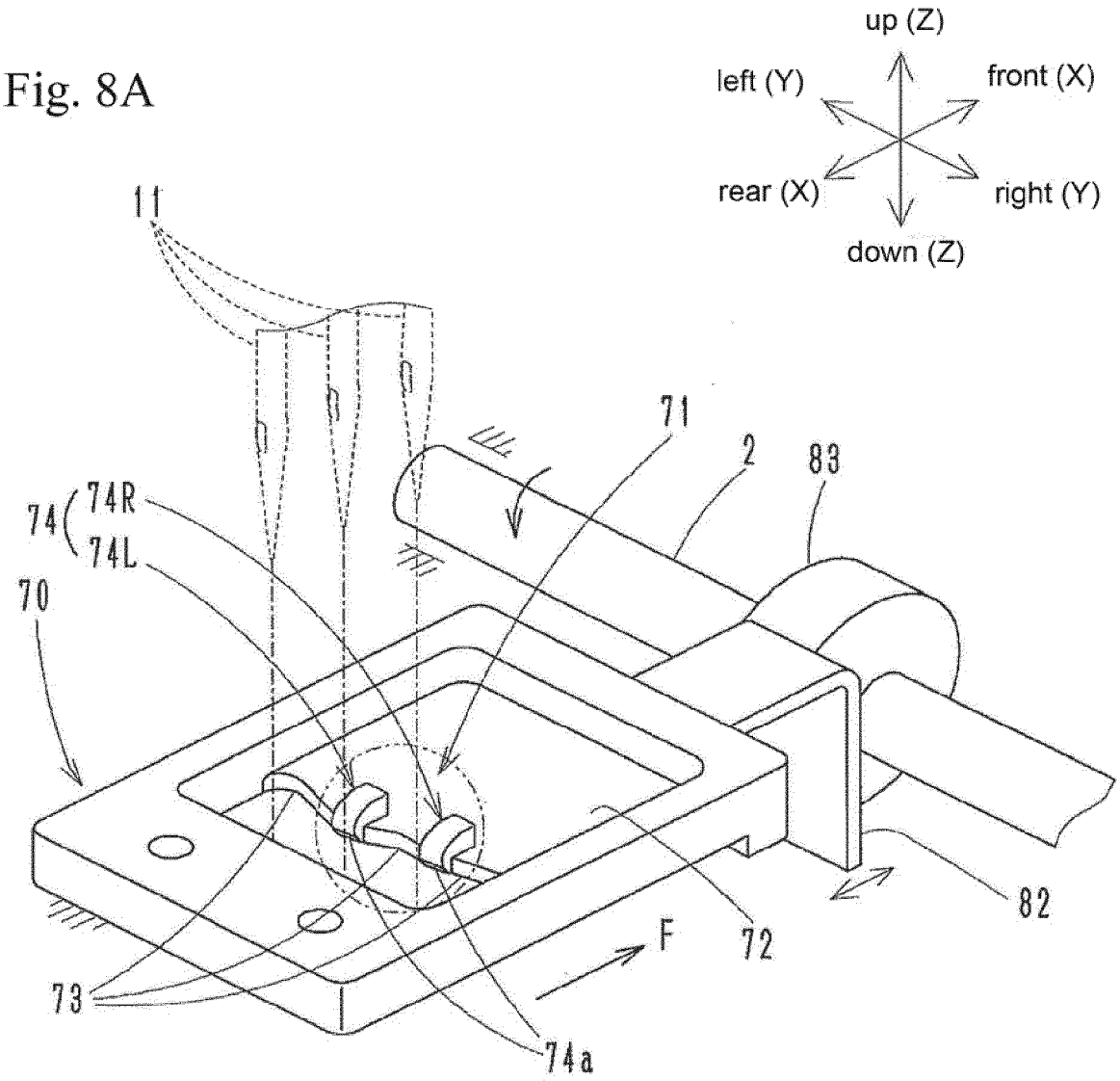

up (Z)
left (Y)
front (X)
rear (X)
right (Y)
down (Z)
11
71
2
83
74
74R
74L
70
82
F
72
73
74a

Fig. 8B

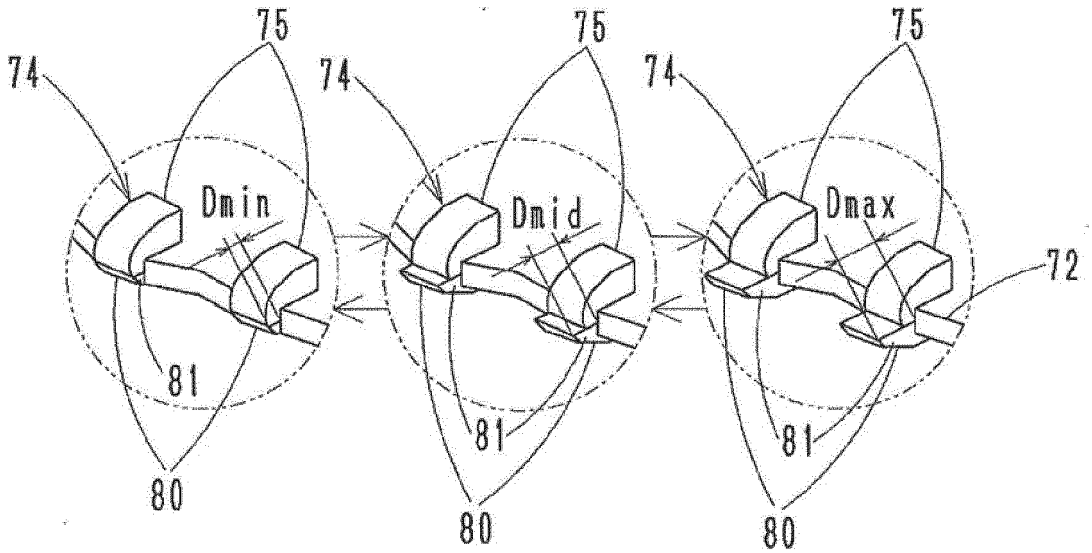

75
74
Dmin
81
80
Dmid
Dmax
72

Fig. 9

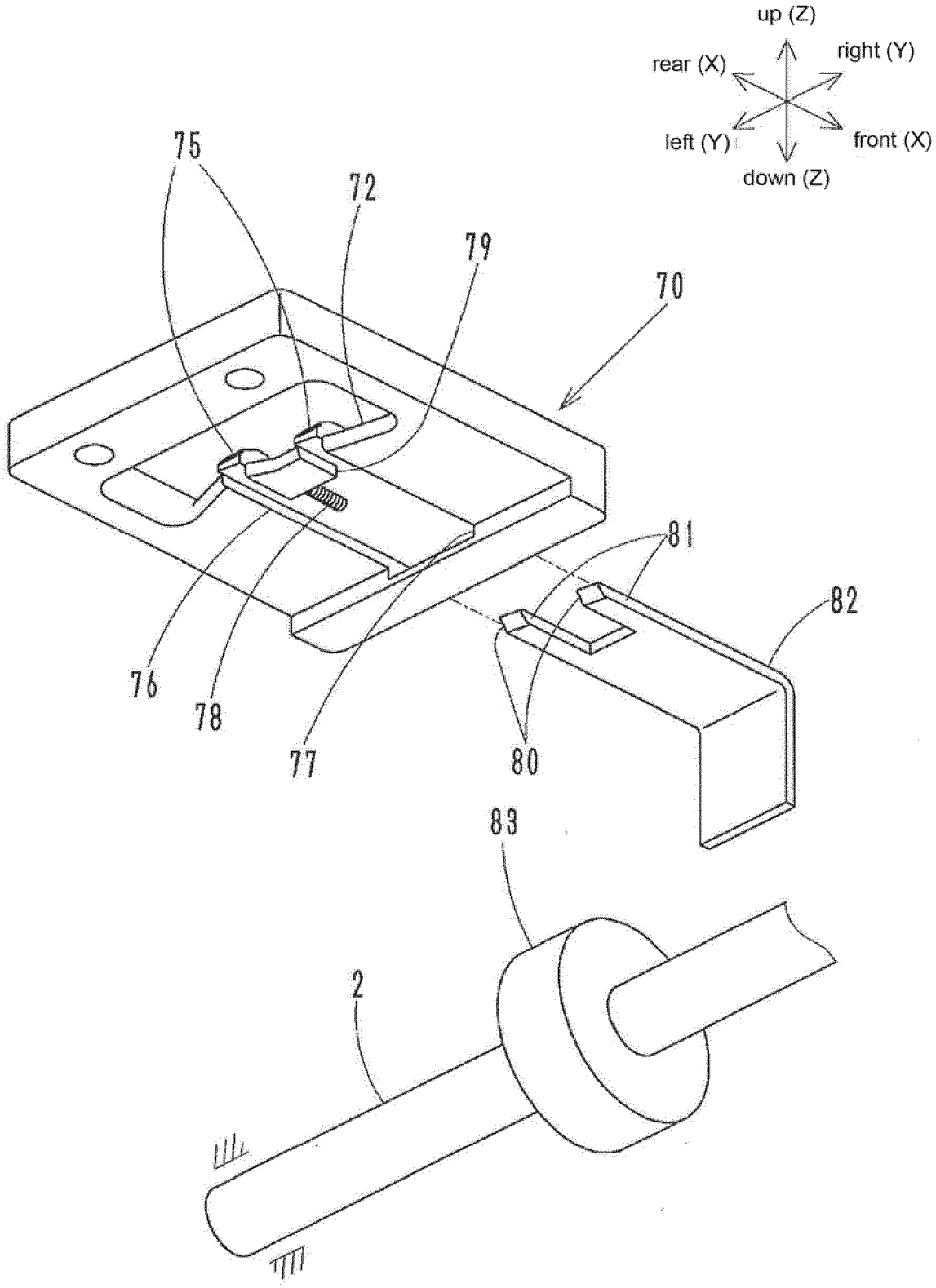

up (Z)
rear (X)
right (Y)
left (Y)
front (X)
down (Z)
75
72
79
70
81
82
76
78
77
80
83
2

Fig. 10A

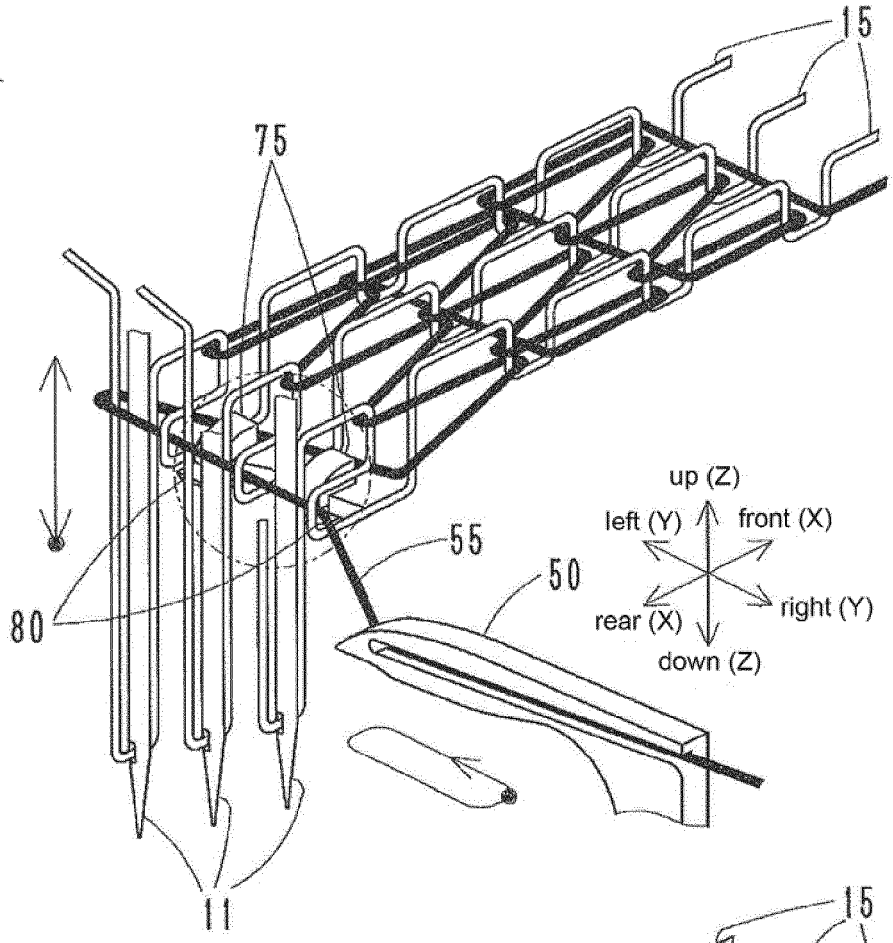


Fig. 10B

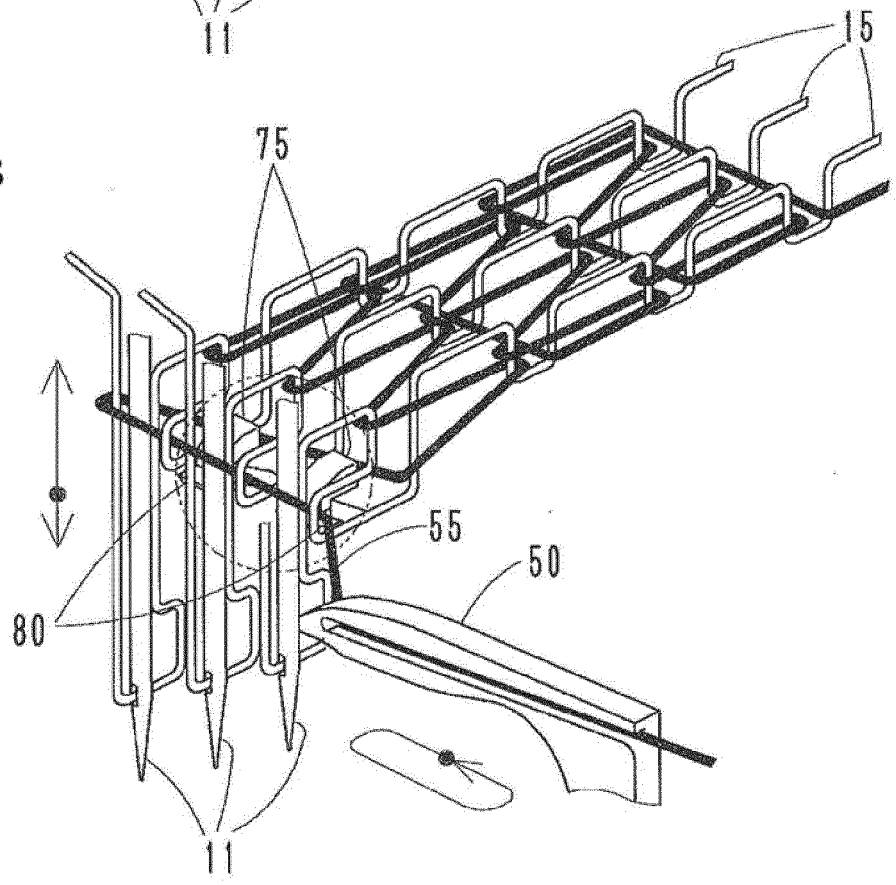


Fig. 11A

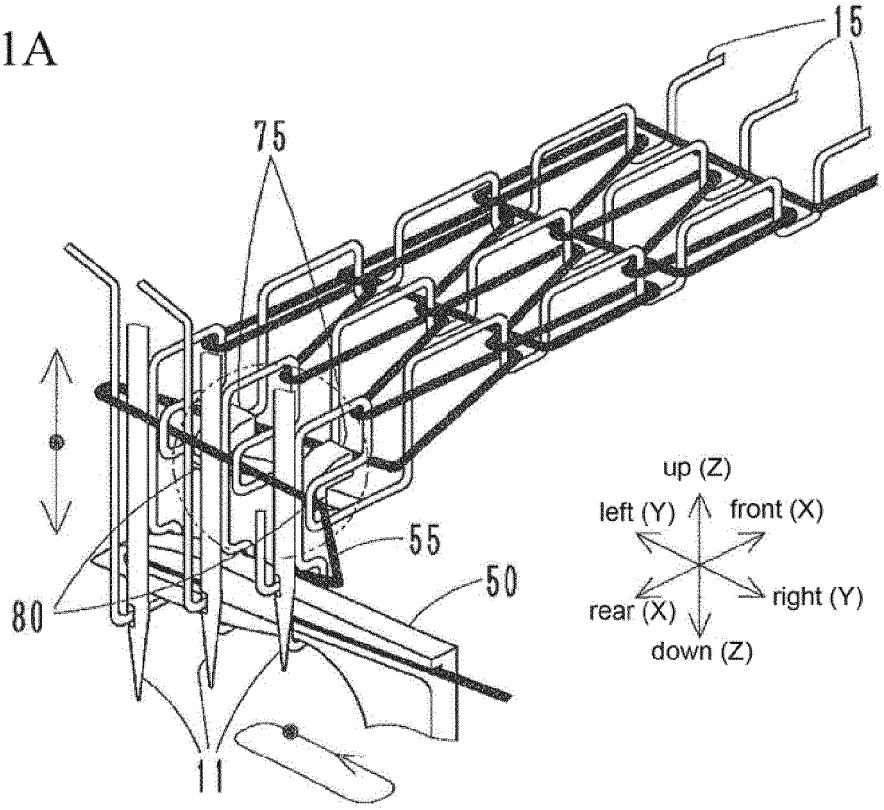


Fig. 11B

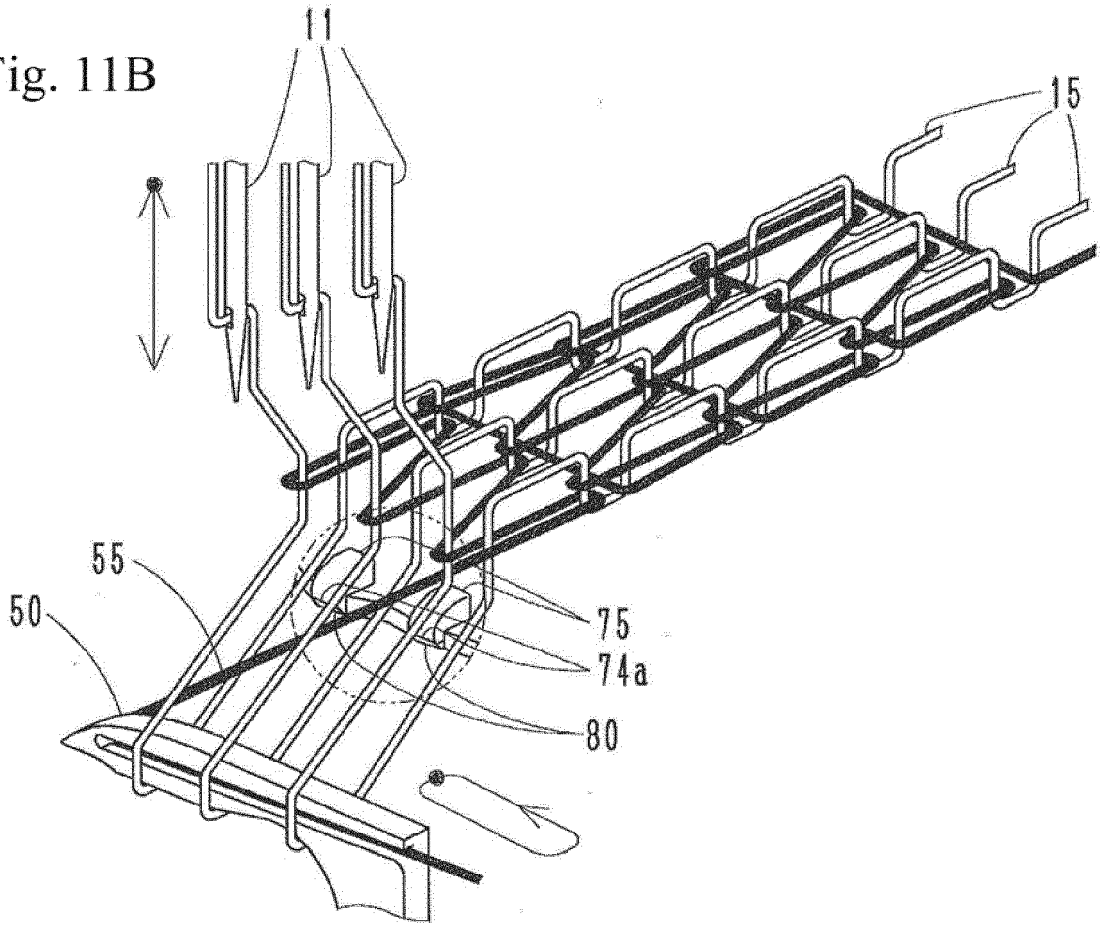


Fig. 12A

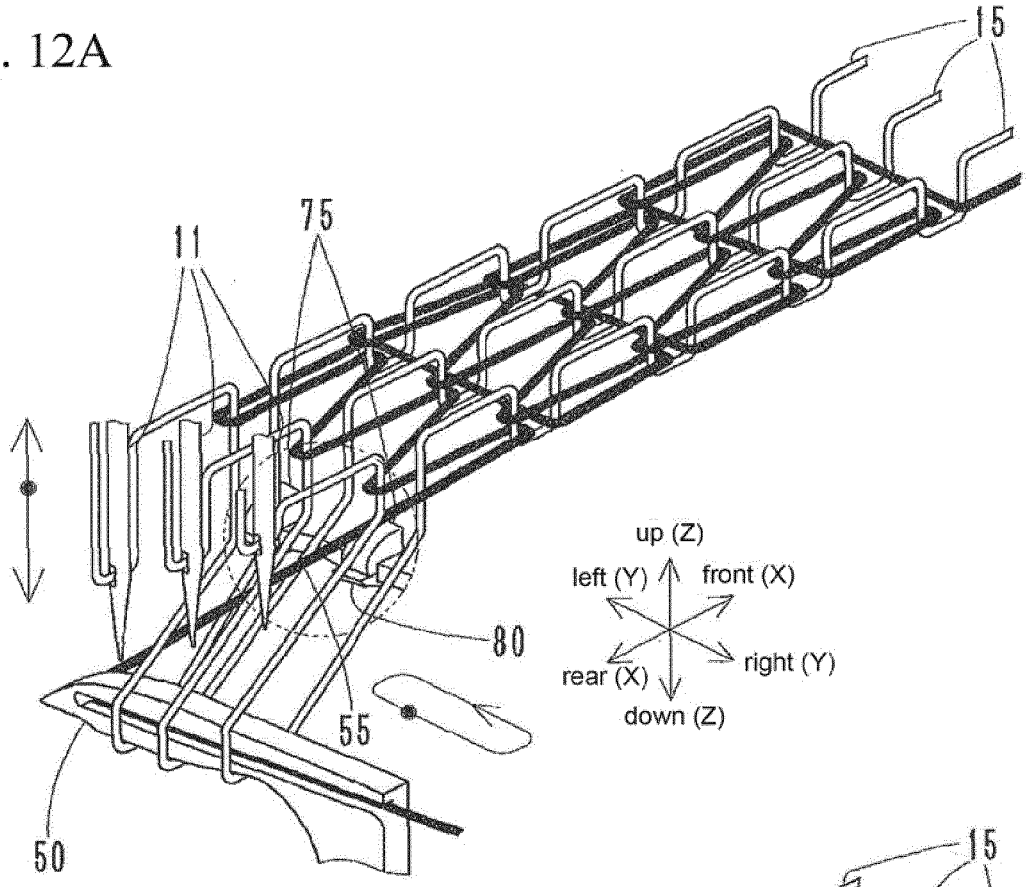
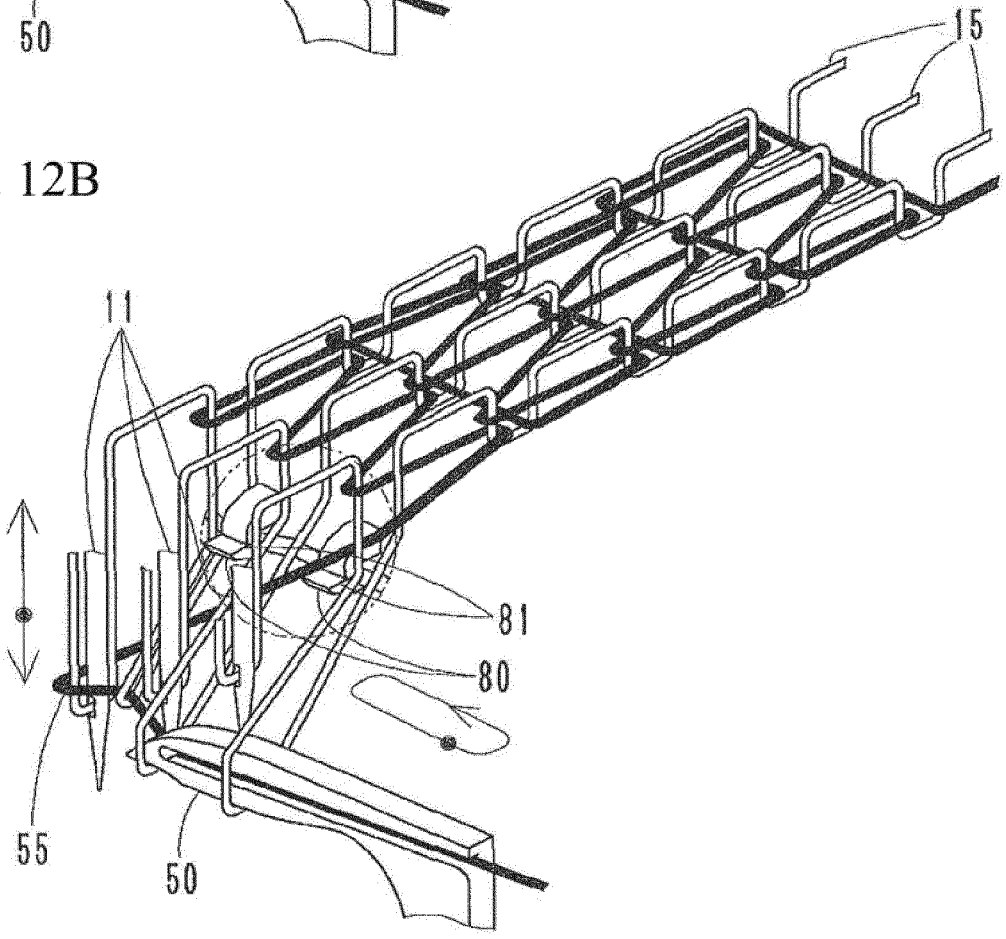


Fig. 12B



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EUROPEAN SEARCH REPORT

Application Number
EP 22 16 5589

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 A	JP 2003 260286 A (SUZUKI MFG) 16 September 2003 (2003-09-16) * paragraphs [0025], [0026]; figures 1, 2, 3, 4, 5, 15, 16 *	1-3,5 4	INV. D05B73/12
X,D A	JP 2000 093671 A (SUZUKI MFG) 4 April 2000 (2000-04-04) * paragraph [0025] - paragraph [0042]; figures 3-5 *	1-3,5 4	
A	US 2002/195036 A1 (SADASUE KAZUYA [JP]) 26 December 2002 (2002-12-26) * paragraph [0053] - paragraph [0059]; figures 3-5 *	1-5	
			TECHNICAL FIELDS SEARCHED (IPC)
			D05B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	23 August 2022	Braun, Stefanie

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23-08-2022

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2003260286 A	16-09-2003	NONE	
JP 2000093671 A	04-04-2000	CN 1248649 A	29-03-2000
		IT RM990579 A1	21-03-2001
		JP 3364164 B2	08-01-2003
		JP 2000093671 A	04-04-2000
		KR 20000023363 A	25-04-2000
		TW 440624 B	16-06-2001
		US 6098555 A	08-08-2000
US 2002195036 A1	26-12-2002	CN 1386924 A	25-12-2002
		JP 2002346269 A	03-12-2002
		US 2002195036 A1	26-12-2002

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Patent documents cited in the description

- JP 2000093671 A **[0006]**