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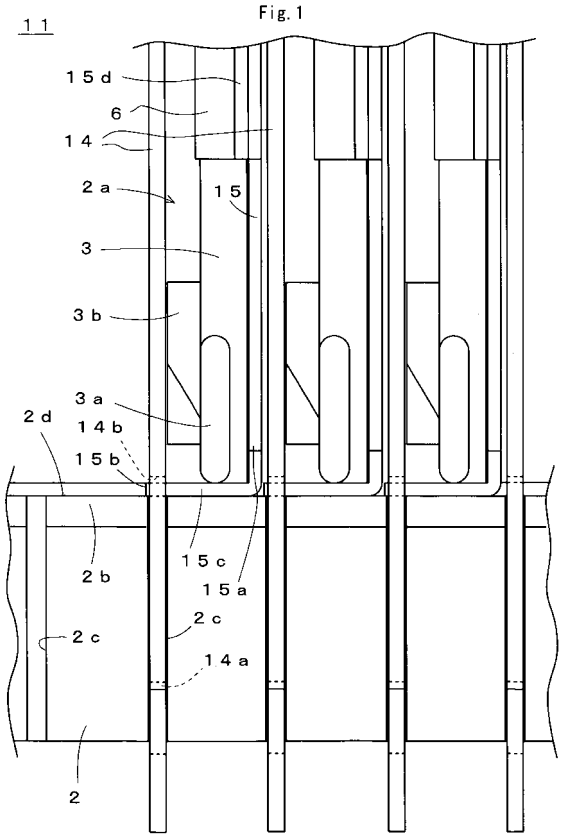
(54) WEFT KNITTING MACHINE EQUIPPED WITH MOVABLE SINKER

(57) There is provided a flatbed knitting machine provided with movable sinkers that can reliably prevent a knitting yarn from dropping into a space between the movable sinker and a sinker groove even though a front end of a needle bed is formed to be a top tooth.

A movable sinker (14) is provided with a elongated hole (14b) so as to be capable of rocking displacement in a state where a leading end of a yarn drop preventing portion (15b) extended from a yarn guide spacer (15) inserted into the elongated hole. The yarn drop preventing portion (15b) covers a space produced between a sinker groove (2c) and the movable sinker (14) on a side where the movable sinker (14) is disposed next to a knitting needle (3), so that it is possible to reliably prevent a knitting yarn from dropping. The yarn guide spacer (15) is formed of a metal plate-shaped material, and the yarn drop preventing portion (15b) is formed on the leading end side of an extended portion (15c) extended to cross the bottom part of a needle groove (2a).

Fig. 1



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Description

[Technical Field]

[0001] The present invention relates to a flatbed knitting machine, having at least a pair of front and back needle beds faced to each other across a needle bed gap and being provided with movable sinkers on a front end of the needle bed on the needle bed gap side, each movable sinker capable of moving to and back from the needle bed gap.

[Background Art]

[0002] Conventionally, a flatbed knitting machine is used, which is provided with movable sinkers capable of moving to and back from a needle bed gap in such a way that a fabric in knitting is pushed downward below the needle bed gap. This movable sinker is partially inserted into a sinker groove formed at a position close to the front end of a needle bed, and a yarn holding portion is formed on a head end projecting to the needle bed gap side. The movable sinker is supported at a position spaced from the needle bed gap in a way capable of rocking motion, and the yarn holding portion can push down the fabric to a deep position below the opening of the needle bed gap by the rocking motion. However, a space is produced between the movable sinker and the sinker groove in the portion where the movable sinker is inserted into the sinker groove. When a knitting yarn drops into this space, a malfunction is likely to occur such as cutting the knitting yarn. A technique is known, in which a yarn guide spacer or the like having a yarn drop preventing portion is disposed in a needle groove having a knitting needle put therein, in order to prevent a knitting yarn from dropping into a space, (for example, see Patent Literature 1).

[0003] Fig. 8 partially shows a schematic structure of a flatbed knitting machine 1, to which the technique disclosed in Patent Literature 1 is applied, in a vicinity of a front end of a needle bed 2, seen from a needle bed gap side. Needle plates, not shown in the drawing, are erected at regular intervals on the needle bed 2 along the longitudinal direction to be the lateral direction in the drawing, and a needle groove 2a is formed between the needle plates. A knitting needle 3, a movable sinker 4, a yarn guide spacer 5, a spacer 6, and so on are put in each of the needle grooves 2a. It is noted that only the needle bed 2 is shown on the left side of the drawing. The front end of the needle bed 2 is formed to be a top tooth 2b, and a sinker groove 2c is formed in the front end portion of the needle bed 2 including the top tooth 2b. The knitting needle 3 has a hook 3a at the front end, and has a transfer clip 3b at a position apart from the needle bed gap beyond the hook 3a. The knitting needle 3 performs sliding displacement to move the hook 3a or the transfer clip 3b to and back from the needle bed gap in the needle groove 2a. The movable sinker 4 is formed with a yarn holding portion 4a so as to project toward the needle bed gap side beyond the top tooth 2b for pushing down a fabric.

[0004] In forming stitches, the hook 3a is moved to the needle bed gap to receive a knitting yarn, and then the hook 3a is pulled into the needle groove 2a. The knitting yarn to be pulled by the hook 3a forms a needle loop in a stitch. The knitting yarn hooked on the portion above the yarn holding portion 4a of the movable sinker 4 forms a sinker loop in the stitch. In case where the stitch is retained by the hook 3a before the hook 3a pulls the knitting yarn to make the needle loop of a new stitch, the retained stitch is moved backward from the hook 3a and moved relatively to the back side of the knitting needle 3 when the hook 3a moves to the needle bed gap. When the hook 3a pulls the knitting yarn to form a new stitch, knock over occurs in which the stitch, moved on the back side of the knitting needle 3 relatively, returns to the hook 3a side, passes the hook 3a, and is removed to the needle bed gap side. The top tooth 2b becomes a portion at which the knitting yarn is hanged when the knitting yarn is pulled to form a new stitch on the hook 3a after the stitch is knocked over.

[0005] The yarn guide spacer 5 is disposed at a position to sandwich the knitting needle 3 with the movable sinker 4 in the needle groove 2a. A front end of the yarn guide spacer 5 also projects to the needle bed gap side, and a yarn guide portion 5a is formed on the lower side of the protruding portion. The yarn guide portion 5a is provided in order to guide a knitting yarn in such a way that the position of the knitting yarn extending from the hook 3a to a yarn feeder port becomes low, when pulling back the hook 3a fed with the knitting yarn in the needle bed gap into the needle groove 2a and that the knitting yarn is reliably fed to the hook 3a of the knitting needle 3 on the downstream side in knitting. The spacer 6 is provided above the knitting needle 3 in the needle groove 2a. A base portion 5d of the yarn guide spacer 5 is sandwiched between the spacer 6 and the movable sinker 4.

[0006] The movable sinker 4 is also provided with a portion inserted into the sinker groove 2c and guided to perform rocking displacement. It is likely that a knitting yarn drops into a space made between the movable sinker 4 and the sinker groove 2c. The yarn guide spacer 5 is provided with a yarn drop preventing portion 5b in order to prevent the knitting yarn from dropping into the space. The yarn guide spacer 5 is formed of a metal plate-shaped material, and the yarn drop preventing portion 5b has a crooked shape, in which the leading end of an extended portion 5c being extended to the movable sinker 4 side so as to cross the bottom part of the needle groove 2a and then being bent to stand along the movable sinker 4. A step processed portion 2d is formed in an up side of the top tooth 2b on the needle bed 2 by removing the portion corresponding to the thickness of the extended portion 5c of the yarn guide spacer 5.

[0007] The function of the top tooth 2b necessary to knock over in forming stitches can also be implemented by a wire or the like stretched in the longitudinal direction

of the needle bed 2 at the position of the top tooth 2b, not using the front end of the needle bed 2 itself (for example, see Patent Literature 2). In Patent Literature 2, in order to make it capable of rocking displacement for a movable sinker even though a wire is used as a top tooth, an arc-shaped elongated hole is provided on the movable sinker, and the movable sinker is used in such a way that the wire to be as a top tooth is penetrated through the elongated hole. The wire is supported by providing a supporting member on each of needle grooves, or by penetrating the wire through a yarn guide spacer or the like.

[Citation List]

[Patent literature]

[0008]

Patent Literature 1: Japanese Patent No. 2700204
Patent Literature 2: Japanese Patent Laid-Open Publication No. 2006. 188775

[Summary of Invention]

[Technical Problem]

[0009] As shown in Fig. 8, it is difficult for the yarn drop preventing portion 5b provided in parallel with the side surface of the movable sinker 4 to adequately serve the function of preventing a knitting yarn from dropping if the height from the bottom surface of the needle groove 2a is low. However, since the transfer flip 3b passes above the yarn drop preventing portion 5b to move into the needle bed gap, the height of the yarn drop preventing portion 5b has limitations. Moreover, even though the yarn drop preventing portion 5b has enough height, if the top end side of the yarn drop preventing portion 5b is tilted so as to separate from the movable sinker 4, an opening of the space, made between the yarn drop preventing portion 5b and the movable sinker 4, might increase so that the knitting yarn might be caused to enter this space.

[0010] In the case where a elongated hole is provided on a movable sinker and a wire to be as a top tooth is penetrated through the elongated hole like Patent Literature 2, the portion corresponding to the sinker groove can be separated from the needle bed gap, and the knitting yarn can also be prevented from dropping into the space between this portion and the movable sinker by using the wire. However, since the wire becomes the top tooth, it is necessary to reliably support the wire so as not to cause misalignment from the position. Furthermore, in case of repairing a certain needle groove, for example, it is necessary that a reliably supported wire must be pulled out from the entire needle bed. After finishing repairing the certain needle groove, for example, it is necessary that the wire must be again penetrated through the entire needle bed for reliably supporting the wire. Since a few hundreds knitting needles are arranged side by side on the needle bed of the flatbed knitting machine, even repairing a single knitting needle requires enormous time and effort.

[0011] It is an object of the present invention to provide a flatbed knitting machine provided with movable sinkers, that can reliably prevent a knitting yarn from dropping into the space between the movable sinker and a sinker groove even though a front end of a needle bed is formed to be a top tooth.

[Solution to Problem]

[0012] The present invention is a flatbed knitting machine provided with movable sinkers, in which knitting needles are put in a needle grooves arranged side by side on a needle bed and capable of sliding shift to advance to and retract from a needle bed gap, for each knitting needle, comprising:

a movable sinker, having

an intro-groove shifting portion, capable of shifting in a sinker groove formed near a top tooth provided to a needle bed gap side front end of the needle bed; and
a gap acting portion, for acting on a knitting yarn at the needle bed gap in association with displacement of the intro-groove shifting portion; and

a drop preventing member, provided to prevent the knitting yarn from dropping into a space between the intro-groove shifting portion of the movable sinker and the sinker groove,

characterized in that:

the drop preventing member has a yarn drop preventing portion extending toward the intro-groove shifting portion of the movable sinker near the top tooth and covering the space between the intro-groove shifting portion and the sinker groove; and
the movable sinker has a elongated hole in the intro-groove shifting portion to allow shifting in the sinker groove with a leading end of the yarn drop preventing portion of the drop preventing member inserted into the elongated hole.

[0013] Moreover, in the present invention,
said drop preventing member is a yarn guide spacer, which having a yarn guide portion provided on a head end portion of the needle bed gap side;
the head end portion and a base portion of the yarn guide spacer are disposed on a side facing one of lateral sides of the knitting needle; and
said yarn drop preventing portion is extended from the head end portion toward said movable sinker, and inserted into said elongated hole of said intro-groove shifting

portion to cover a space formed between the intro-groove shifting portion and said sinker groove on a side where the movable sinker faces the knitting needle.

[0014] Furthermore, in the present invention,
said yarn drop preventing portion of said yarn guide spacer crosses a bottom portion of said needle groove, and is inserted into said elongated hole of the movable sinker provided so as to sandwich the knitting needle on the other of the lateral sides of the yarn guide spacer.
the yarn drop preventing member is a yarn guide spacer having a yarn guide portion provided on a head end portion on the needle bed gap side, the head end portion and a base portion of the yarn guide spacer are disposed on a side facing one of lateral sides of the knitting needle, and the yarn drop preventing portion is extended from the head end portion toward the movable sinker, and inserted into the elongated hole of the intro-groove displacement portion to cover a space formed between the intro-groove displacement portion and the sinker groove on a side where the movable sinker faces the knitting needle.

[Advantageous Effects of Invention]

[0015] According to the present invention, a movable sinker has an intro-groove shifting portion capable of shifting in a sinker groove formed near a top tooth provided to a needle bed gap side front end of a needle bed, and a gap acting portion that acts on a knitting yarn at the needle bed gap in association with displacement of the intro-groove shifting portion. A drop preventing member has a yarn drop preventing portion extending toward the intro-groove shifting portion of the movable sinker near the top tooth and covering a space between the intro-groove shifting portion and the sinker groove. The intro-groove shifting portion of the movable sinker has a elongated hole to allow displacement in the sinker groove with a leading end of a yarn drop preventing portion of a drop preventing member inserted into the elongated hole. This space is covered for preventing a knitting yarn from dropping into the space between the intro-groove shifting portion of the movable sinker and the sinker groove, so that it is possible to more reliably prevent the knitting yarn from dropping than the case where the yarn drop preventing portion is provided in parallel with the side surface of the movable sinker like Patent Literature 1, for example.

[0016] Moreover, according to the present invention, the yarn drop preventing portion is provided on the yarn guide spacer having the head end portion and the base portion disposed on the side facing one of the lateral sides of the knitting needle. The yarn drop preventing portion is inserted into the elongated hole of the intro-groove shifting portion of the movable sinker, so that it is possible to prevent a knitting yarn from dropping into the space formed between the intro-groove shifting portion and the sinker groove on the side where the movable sinker faces the knitting needle.

[0017] According to the present invention, the yarn drop preventing portion of the yarn guide spacer crosses the bottom portion of the needle groove and is inserted into the elongated hole of the movable sinker, so that the yarn drop preventing portion keeps the state of covering the space between the intro-groove shifting portion of the movable sinker and the sinker groove of the needle bed on the side where the movable sinker is disposed next to the knitting needle even though the knitting needle is pulled into the needle groove, and it is possible to reliably prevent a knitting yarn from dropping.

[Brief Description of Drawings]

[0018]

[Fig. 1] Fig. 1 is a front view partially showing a schematic structure of a flatbed knitting machine 11 that is an example1 of the present invention, in a state in which a vicinity of a front end of a needle bed 2 is seen from a needle bed gap side.
[Fig. 2] Fig. 2 is a plan view showing a schematic structure of the vicinity of the front end of the needle bed 2 of the flatbed knitting machine 11 shown in Fig. 1.
[Fig. 3] Fig. 3 is a side cross sectional view omitting a knitting needle 3 and a spacer 6, in a state in which the movable sinker 14 shown in Fig. 2 comes on to surface.
[Fig. 4] Figs. 4 are a plan view, a left side view and a front view, showing the yarn guide spacer 15 to function as the drop preventing member of the flatbed knitting machine 11 shown in Fig. 1.
[Fig. 5] Figs. 5 are side views showing the components relating to those in the side cross sectional view of Fig. 2.
[Fig. 6] Fig. 6 is a side cross sectional view showing the state of rocking displacement in which the movable sinker 14 moves back from the needle bed gap 20 at the maximum in the flatbed knitting machine 11 shown in Fig. 1.
[Fig. 7] Fig. 7 is a plan view partially showing a schematic structure of a flatbed knitting machine 21 as an example2 of the present invention, with respect to a vicinity of a front end of a needle bed 22.
[Fig. 8] Fig. 8 is a front view partially showing a schematic structure of a conventional flatbed knitting machine 1 in a state in which a vicinity of a front end of a needle bed 2 is seen from a needle bed gap side.

[Description of Embodiments]

[0019] In the following, structures as embodiments of the present invention will be described for an example1 and an example2. In the examples, a matter corresponding to that described in Fig. 8 is designated the same reference numeral or sign, and the overlapping explanation is omitted. Furthermore, in the example2, only struc-

tured parts different from those in the example1 are explained, and explanations for common matters are omitted.

[Example 1]

[0020] Fig. 1 shows a schematic structure of a flatbed knitting machine 11 that is the example1 of the present invention, in a state in which a vicinity of a front end of a needle bed 2 is seen from a needle bed gap side. On the needle bed 2, needle grooves 2a are formed at regular intervals along the longitudinal direction to be the lateral direction in the drawing. A knitting needle 3, a movable sinker 14, a yarn guide spacer 15, and a spacer 6, and so on are put in each of the needle grooves 2a. The movable sinker 14 has a yarn holding portion 14a, as equivalent to the yarn holding portion 4a shown in Fig. 8, at a front end of a portion projecting to a needle bed gap, and an elongated hole 14b is formed at a portion displaced in a sinker groove 2c formed at the head end portion of the needle bed 2 including a top tooth 2b. A yarn guide portion 15a, as equivalent to the yarn guide portion 5a shown in Fig. 8, is formed on the lower part of the yarn guide spacer 15 projecting to the needle bed gap side.

[0021] The elongated hole 14b of the movable sinker 14 is provided so as to be capable of rocking displacement for the movable sinker 14 in a state where a yarn drop preventing portion 15b extended from the yarn guide spacer 15 is inserted into the elongated hole 14b. The yarn drop preventing portion 15b covers a space produced between the movable sinker 14 and the sinker groove 2c on the side where the knitting needle 3 is faced, so that it is possible to reliably prevent a knitting yarn from dropping into the space. The yarn guide spacer 15 is formed of a metal plate-shaped material, as similar to the yarn guide spacer 5 shown in Fig. 8, and the yarn drop preventing portion 15b is formed on the front end side of the extended portion 15c extended to the movable sinker 14 side so as to cross the bottom part of the needle groove 2a. A base portion 15d of the yarn guide spacer 15 is sandwiched between the spacer 6 and the movable sinker 14 above the knitting needle 3.

[0022] The leading end of the yarn drop preventing portion 15b is inserted into the elongated hole 14b of the movable sinker 14. The elongated hole 14b may be a groove with bottom, but in the case where the plate thickness of the movable sinker 14 is thin, a bottomless through hole makes it easy to manufacture the movable sinker 14 by press working. Moreover, the leading end of the yarn drop preventing portion 15b is penetrated through the elongated hole 14b with the accuracy of components or assembly allowance.

[0023] However, another yarn guide spacer 15 is disposed on the side where the leading end of the yarn drop preventing portion 15b is penetrated through the elongated hole 14b and projected from it. Since this yarn guide spacer 15 is disposed at a position near the space between the movable sinker 14 and the sinker groove 2c, the knitting yarn is difficult to drop into the space. Thus, it is also possible that at least the leading end of the yarn drop preventing portion 15b is inserted into the elongated hole 14b in such a way that the yarn drop preventing portion 15b remains in the thickness of the movable sinker 14, not penetrating the elongated hole 14b of the movable sinker 14.

[0024] Fig. 2 and Fig.3 schematically show structures of the vicinity of the front end of the needle bed 2 of the flatbed knitting machine 11. Fig. 2 shows a plane structure, and Fig. 3 shows a side cross-sectional structure in a state where the movable sinker 14 shown in Fig. 2 is on the front side. However, for convenience of explanation, some portions are shown only in one drawing either Fig. 2 or Fig.3, and the portions are not shown in the other drawing. For example, the knitting needle 3 is shown only in Fig. 2, whereas the spacer 6 or the like is shown only in Fig. 3.

[0025] A step processed portion 2d is formed near the top tooth 2b at the front end of the needle bed 2 on the bottom part of the needle groove 2a, and prevents troubles from occurring for a sliding displacement of the knitting needle 3 in the needle groove 2a even though the extended portion 15c crosses the bottom part of the needle groove 2a from the yarn guide spacer 15. The movable sinker 14 is provided with the yarn holding portion 14a and the elongated hole 14b on an arm portion 14c in an arc shape formed on the front end side. The portion where the elongated hole 14b is provided is included in an intro-groove shifting portion 14d that is displaced in the sinker groove 2c, and the yarn holding portion 14a is included in a gap acting portion 14e.

[0026] The movable sinker 14 has a pressure receiving portion 14f spaced from the arm portion 14c, and a rocking fulcrum portion 14g provided between the arm portion 14c and the pressure receiving portion 14f. A wire spring 17 is provided on the inner side of the arc-shaped rocking fulcrum portion 14g to urge the movable sinker 14 in such a way that the movable sinker 14 is rocked and displaced in the clockwise direction in the drawing about the rocking fulcrum portion 14g. When the pressure receiving portion 14f is pressed by a cam mounted on a carriage moving along the front surface side of the needle bed 2, the movable sinker 14 is rocked and displaced in the counterclockwise direction in the drawing against the spring bias of the wire spring 17. Moreover, when an upward force greater than the biasing force of the wire spring 17 is applied from a fabric to the yarn holding portion 14a, the movable sinker 17 is rocked and displaced in the counterclockwise direction to relax the upward force.

[0027] It is noted that the arm portion 14c of the movable sinker 14 most advances to the needle bed gap 20 caused by rocking displacement in the clockwise direction in the state shown in Fig. 3. Consequently, it is sufficient that the upper end of the elongated hole 14b is located at a position where the drop preventing portion 15b of the yarn guide spacer 15 is to be inserted into the elongated hole 14b in this state.

[0028] The needle groove 2a is formed between needle plates 18 erected on the needle bed 2. A thin wall portion 18a is provided on the upper part of the needle plate 18 on the front end side thereof. The middle portion, between the arm portion 14c and the pressure receiving portion 14f of the movable sinker 14, and the wire spring 17 are put in the thin wall portion 18a. One end of the wire spring 17 is held by an upper part 18b of the needle plate 18, and the other end of the wire spring 17 is coupled to the movable sinker 14. The rocking fulcrum portion 14g of the movable sinker 14 is put in a support concave portion 18c formed below the thin wall portion 18a of the needle plate 18, and the rocking support portion 14g is supported so as to be capable of rocking displacement. The needle bed 2 and the needle plate 18 are fixed to each other using wire-shaped penetrating materials 19a, 19b. The spacer 6 is held above the needle groove 2a using a wire-shaped penetrating material 19c and a metal band-shaped penetrating material 19d on the needle plate 18. Since the movable sinker 14 is not put in the surrounding area around the portion where the through hole for the penetrating material 19c is provided in the needle plate 18, the surrounding area is formed to be a shallow recess portion 18d. Advance and retreat of the hook 3a and the transfer clip 3b of the knitting needle 3, and action of the gap acting portion 14e of the movable sinker 14 are performed in the needle bed gap 20 to which the top tooth 2b of the needle bed 2 is faced.

[0029] In the flatbed knitting machine 11, the needle bed 2 is provided on the front and back side so as to make a pair in such a way that the top teeth 2b are faced to each other across the needle bed gap 20. However, in Fig. 2 and Fig. 3, only the needle bed 2 on one of the front and back side is shown, and the needle bed 2 on the other side is omitted in the drawing. Furthermore, although the needle bed 2 is tilted in such a way that the needle bed 2 is high at the top tooth 2b side facing the needle bed gap 20 and becomes lower as apart from the needle bed gap 20, the needle bed 2 is shown in a horizontal attitude in Fig. 3, for convenience of explanation.

[0030] When the knitting needle 3, including the portion of the transfer clip 3b, is caused to advance into the needle bed gap 20, a stitch transfer operation is made to be possible for a stitch retained on the transfer clip 3b to be shifted to the hook 3a of the knitting needle 3 of the opposite needle bed 2. The yarn drop preventing portion 15b extended from the yarn guide spacer 15 to the intro-groove displacement portion 14d side of the movable sinker 14 does not become an obstacle against the transfer blade 3b advancing even in the state in which the yarn drop preventing portion 15b covers the space between the intro-groove shifting portion 14d and the sinker groove 2c, so that it is possible to reliably prevent a knitting yarn from dropping into the space.

[0031] Figs. 4 show a structure of the yarn guide spacer 15 to function as the drop preventing member of the flatbed knitting machine 11 shown in Fig. 1. Figs. 4(a),(b) show the structures seen in plane and seen from the side, respectively, as similar to Figs. 2 and 3. Fig. 4(c) shows the structure seen from the front side as similar to Fig. 1. The yarn guide portion 15a, the yarn drop preventing portion 15b, and the extended portion 15c of the yarn guide spacer 15 are formed near the lower end of the front end portion 15e formed on the front end side of the base portion 15d. The base portion 15d is supported as sandwiched between the spacer 6 and the movable sinker 14 as shown in Fig. 1, and positioned by the penetrating materials 19c, 19d as shown in Fig. 3.

[0032] Figs. 5 show the structures of components relating to those in Fig. 2 seen from the side surface as well as the relative positional relationship in the direction of moving to and back from the needle bed gap. Fig. 5 (a) shows the structure of the spacer 6 and the knitting needle 3. Fig. 5(b) shows the structure of the needle plate 18 near the front end thereof. Fig. 5(c) shows the structure of the movable sinker 14 and the wire spring 17.

[0033] Although the knitting needle 3 is a latch needle to open and close the hook 3a with a latch 3c, in some case, a compound needle, which use a slider to open and close a hook 3a, might be used. Moreover, in the compound needle, the slider is formed of two elastic plates to sandwich the hook 3a from both sides, in which the slider is caused to move to the needle bed gap side beyond the hook 3a for transferring, without using the transfer clip 3b. In case of using any type of knitting needle 3, it is possible to reliably prevent a knitting yarn from dropping using the yarn guide spacer 15 shown in Figs. 4 while using the movable sinker 14 as shown in Fig. 5(c).

[0034] Fig. 6 shows a state of rocking displacement in which the arm portion 14c of the movable sinker 14 most retreats back from the needle bed gap 20 of the flatbed knitting machine 11 shown in Fig. 1. For the lower end of the elongated hole 14b provided on the intro-groove shifting portion 14d of the movable sinker 14, it is sufficient that the top end of the elongated hole 14b is located at a position where the yarn drop preventing portion 15b of the yarn guide spacer 15 is inserted into the elongated hole 14b in this state.

[Example 2]

[0035] Fig. 7 is a plan view partially showing a schematic structure of a flatbed knitting machine 21 that is the example 2 of the present invention, in a vicinity of a front end of a needle bed 22. As similar to Fig. 2, a needle groove 22a is formed between needle plates 18 erected on a needle bed 22, a top tooth 22b is formed at the leading end facing a needle bed gap 20, and a sinker groove 22c is formed near the top tooth 22b. A movable sinker 14, a knitting needle 3, and a yarn guide spacer 25 are accommodated in each of the needle grooves 22a. The yarn guide spacer 25 is provided with a yarn guide portion 25a like the yarn guide portion 15a of the yarn guide spacer 15 shown in Fig. 4(b) and others. It is noted that only three knitting needles 3 put in the needle grooves 22a are shown, and the others are omitted in

the drawing.

[0036] In the example2, a yarn drop preventing portion 25b extended from the yarn guide spacer 25 does not project on the movable sinker 14 side where the movable sinker 14 is provided on the left side next to the knitting needle 3 in the drawing. The yarn guide spacer 25 is to prevent a knitting yarn from dropping in such a way that the leading end of the drop preventing portion 25b is projected to the side where the movable sinker 14 is disposed next thereto on the right side in the drawing. Since it is not necessary for the drop preventing portion 25b to cross the bottom part of the needle groove 22a in which the knitting needle 3 advances and retreats, the step processed portion 2d, which is provided on the needle bed 2, is not to be necessary.

[Industrial Applicability]

[0037] In the example1 and the example2 of the present invention, the yarn drop preventing portions 15b, 25b provided on the yarn guide spacers 15, 25 put in the needle grooves 2a, 22a with the function of a yarn guide are inserted into the elongated hole 14b of the intro-groove shifting portion 14d of the movable sinker 14. A wire or the like penetrating in the longitudinal direction of the needle beds 2, 22 is not used for preventing a knitting yarn from dropping, so that it is possible to repair the knitting needle 3 and the movable sinker 14 for each needle groove 2a, 22a. In addition, although the yarn guide spacers 15, 25 are provided with the yarn drop preventing portions 15b, 25b for the drop preventing member, it is also possible to use a member having only the function of the yarn drop preventing portion, as shown in Fig. 14 of Patent Literature 1.

[Reference Signs List]

[0038]

2, 22	Needle bed
2a, 22a	Needle groove
2b, 22b	Top tooth
2c, 22c	Sinker groove
3	Knitting needle
11, 21	Flatbed knitting machine
14	Movable sinker
14b	Elongated hole
14d	Intro-groove shifting portion
15, 25	Yarn guide spacer
15b, 25b	Yarn drop preventing portion

Claims

1. A flatbed knitting machine (11, 21) provided with movable sinkers (14), in which knitting needles (3) are put in a needle grooves (2a, 22a) arranged side by side on a needle bed (2, 22) and capable of sliding shift to advance to and retract from a needle bed gap (20), for each knitting needle (3), comprising:

a movable sinker (14), having

an intro-groove shifting portion (14d), capable of shifting in a sinker groove (2c, 22c) formed near a top tooth (2b, 22b) provided to a needle bed gap side front end of the needle bed (2, 22); and
a gap acting portion (14e), for acting on a knitting yarn at the needle bed gap (20) in association with displacement of the intro-groove shifting portion (14d); and

a drop preventing member (15, 25), provided to prevent the knitting yarn from dropping into a space between the intro-groove shifting portion (14d) of the movable sinker (14) and the sinker groove (2c, 22c), **characterized in that**:

the drop preventing member (15, 25) has a yarn drop preventing portion (15b, 25b) extending toward the intro-groove shifting portion (14d) of the movable sinker (14) near the top tooth (2b, 22b) and covering the space between the intro-groove shifting portion (14d) and the sinker groove (2c, 22c); and
the movable sinker (14) has a elongated hole (14b) in the intro-groove shifting portion (14d) to allow shifting in the sinker groove (2c, 22c) with a leading end of the yarn drop preventing portion (15b, 25b) of the drop preventing member (15, 25) inserted into the elongated hole (14b).

2. The flatbed knitting machine (11, 21) provided with movable sinkers (14) according to claim 1, wherein:

said drop preventing member is a yarn guide spacer (15, 25), which having a yarn guide portion (15a, 25a) provided on a head end portion of the needle bed gap side;
the head end portion and a base portion (15d) of the yarn guide spacer (15, 25) are disposed on a side facing one of lateral sides of the knitting needle (3); and
said yarn drop preventing portion (15b, 25b) is

extended from the head end portion toward said movable sinker (14), and inserted into said elongated hole (14b) of said intro-groove shifting portion (14d) to cover a space formed between the intro-groove shifting portion (14d) and said sinker groove (2c, 22c) on a side where the movable sinker (14) faces the knitting needle (3).

3. The flatbed knitting machine (11) provided with movable sinkers (14) according to claim 2, wherein said yarn drop preventing portion (15b) of said yarn guide spacer (15) crosses a bottom portion of said needle groove (2a), and is inserted into said elongated hole (14b) of the movable sinker (14) provided so as to sandwich the knitting needle (3) on the other of the lateral sides of the yarn guide spacer (15).

Fig. 1

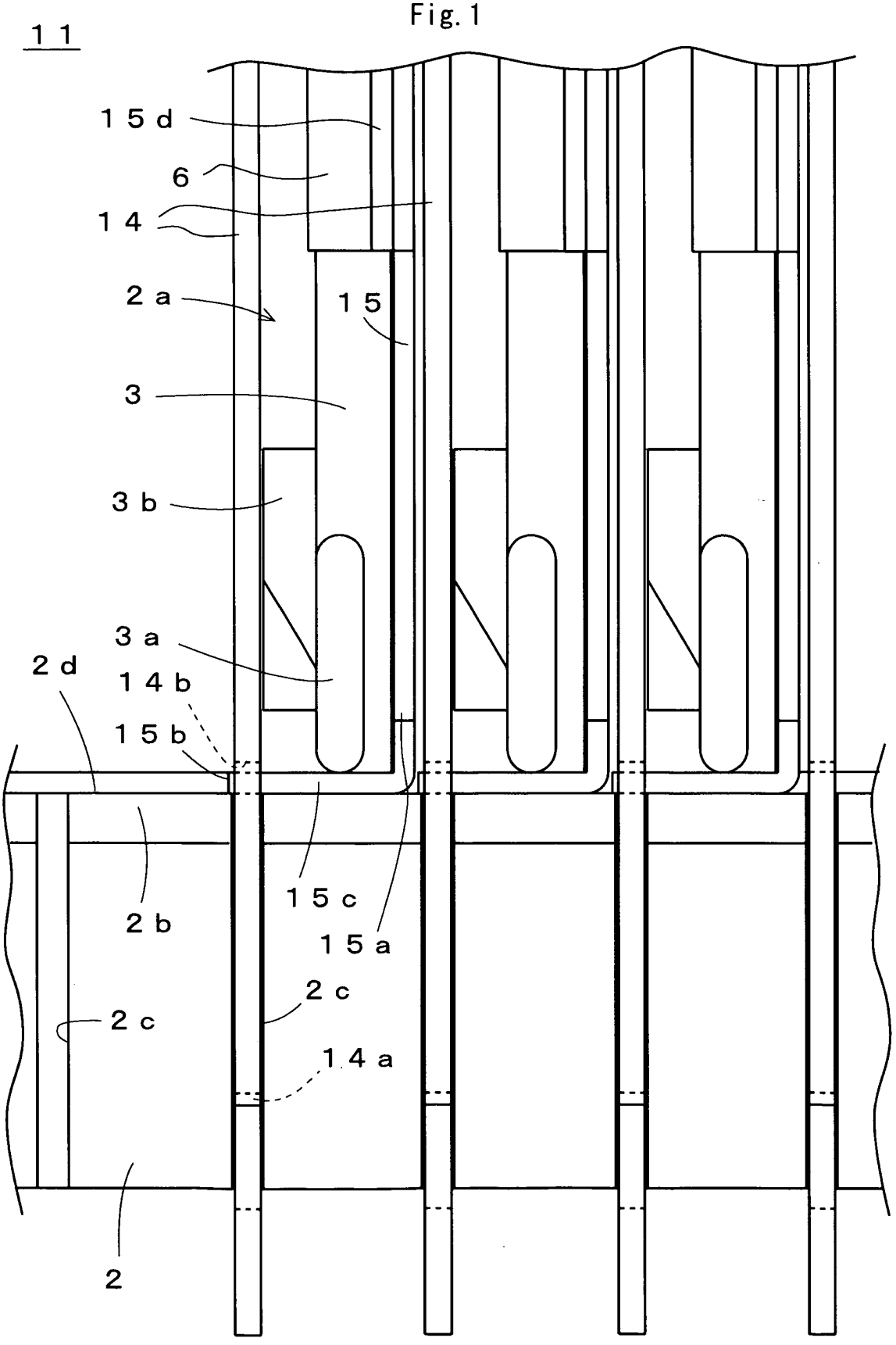


Fig. 2

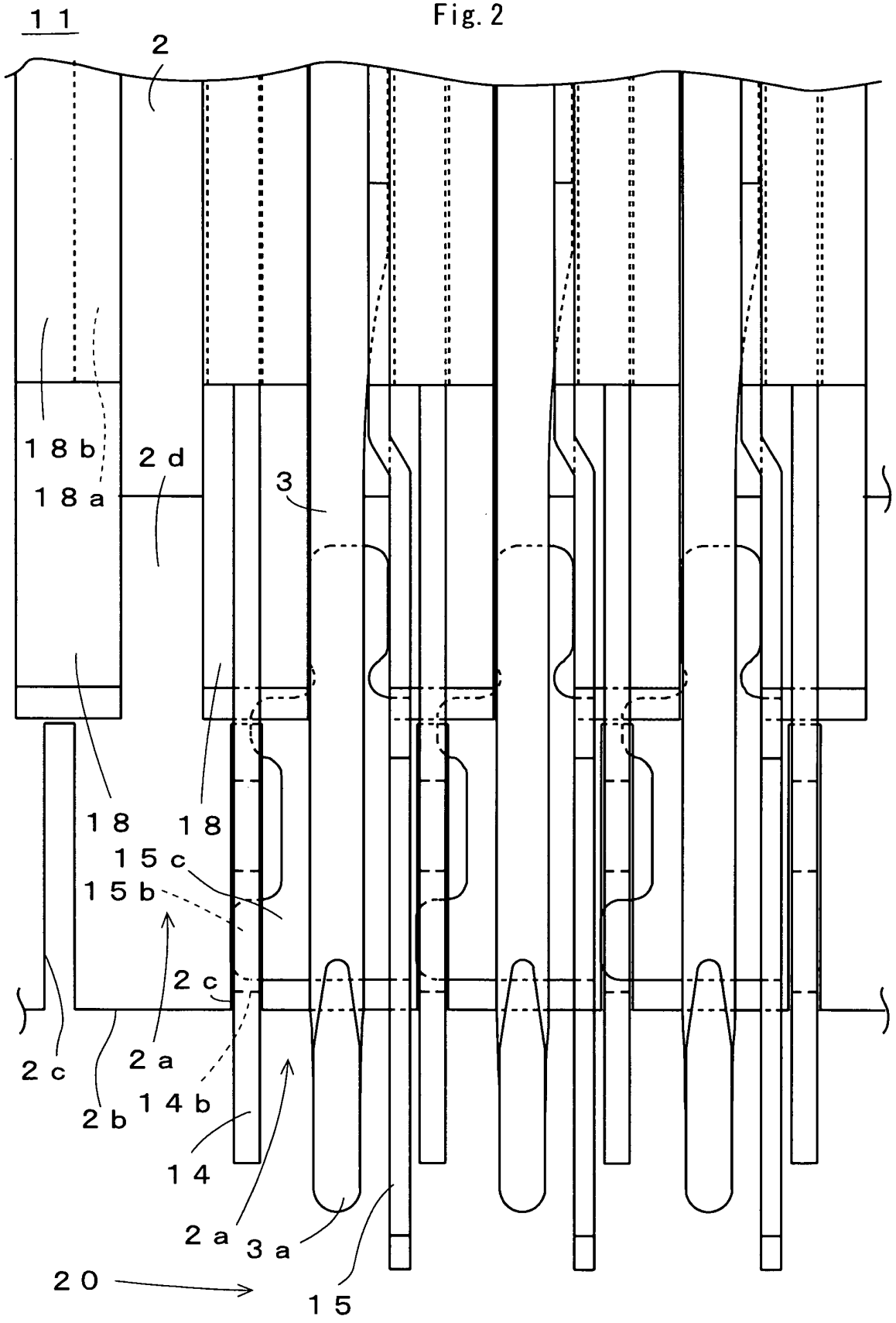


Fig.3

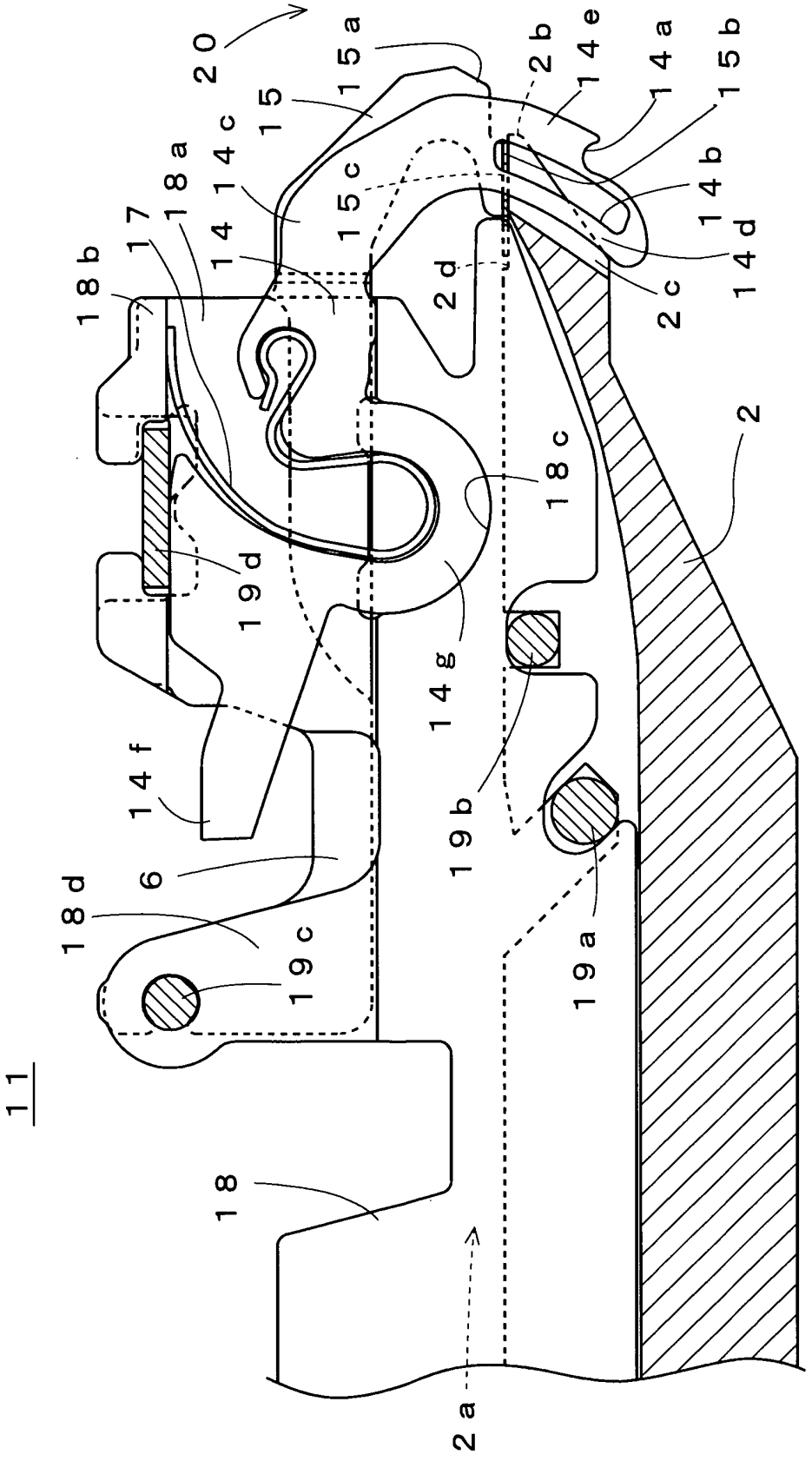

11
20
15a
15
14c
18a
17
14
18b
15c
2d
2b
14e
14a
15b
14b
14d
2c
2
18c
19d
14g
19b
14f
6
18d
19c
19a
18
2a

Fig. 4

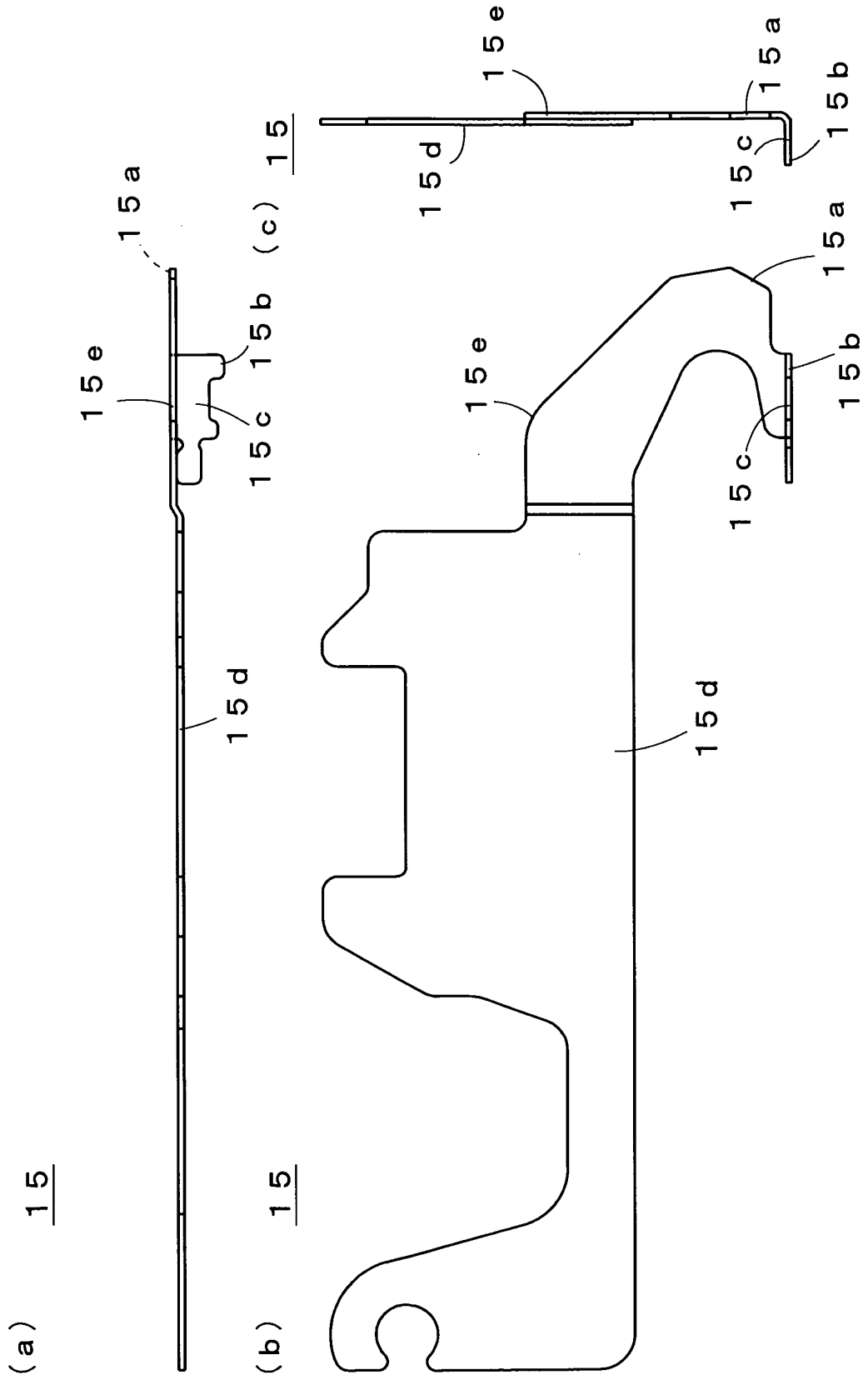

(a) 15
15a
15e
15b
15c
15d
(b) 15
15e
15a
15b
15c
15d
(c) 15
15e
15a
15b
15d
15c

Fig. 5

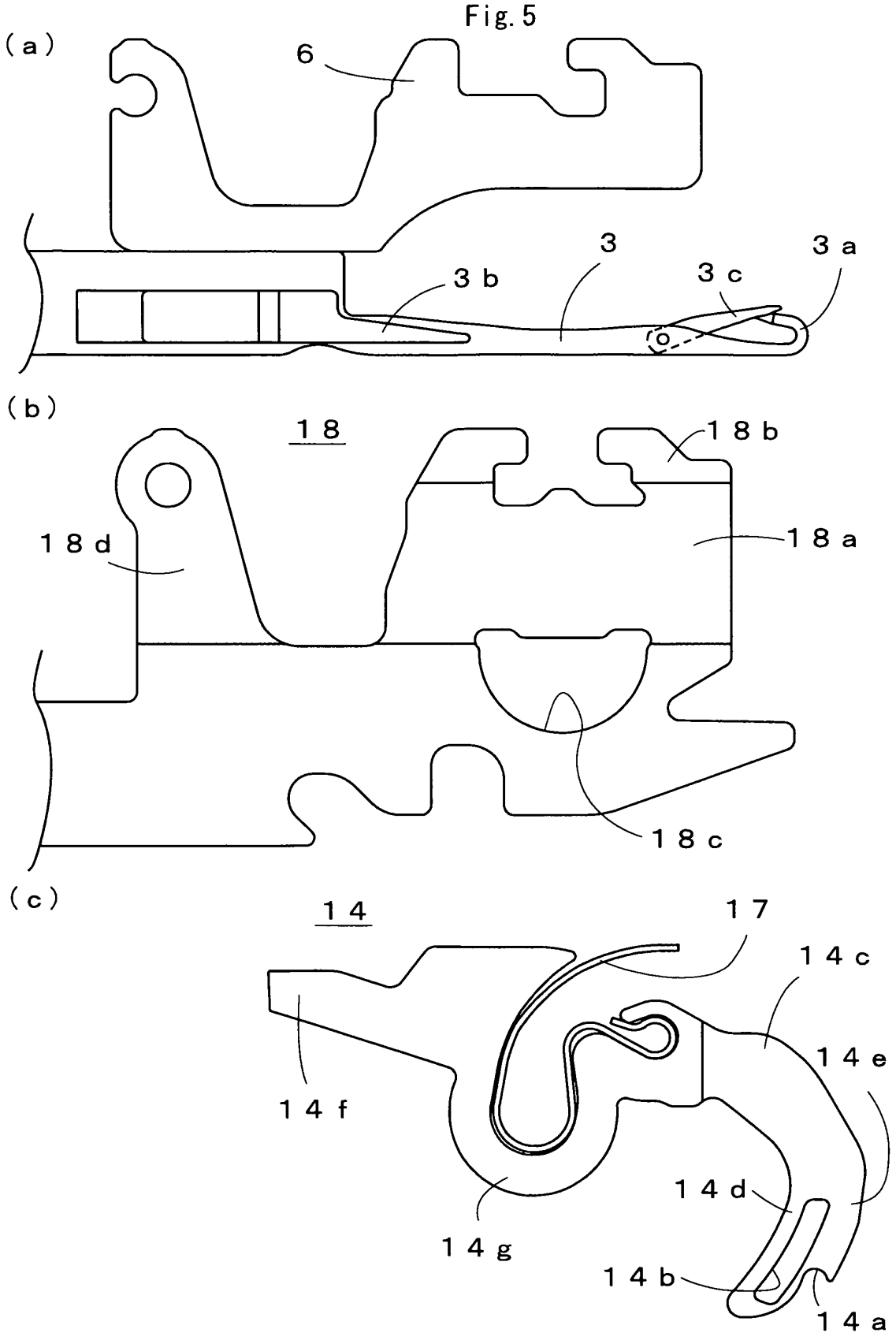
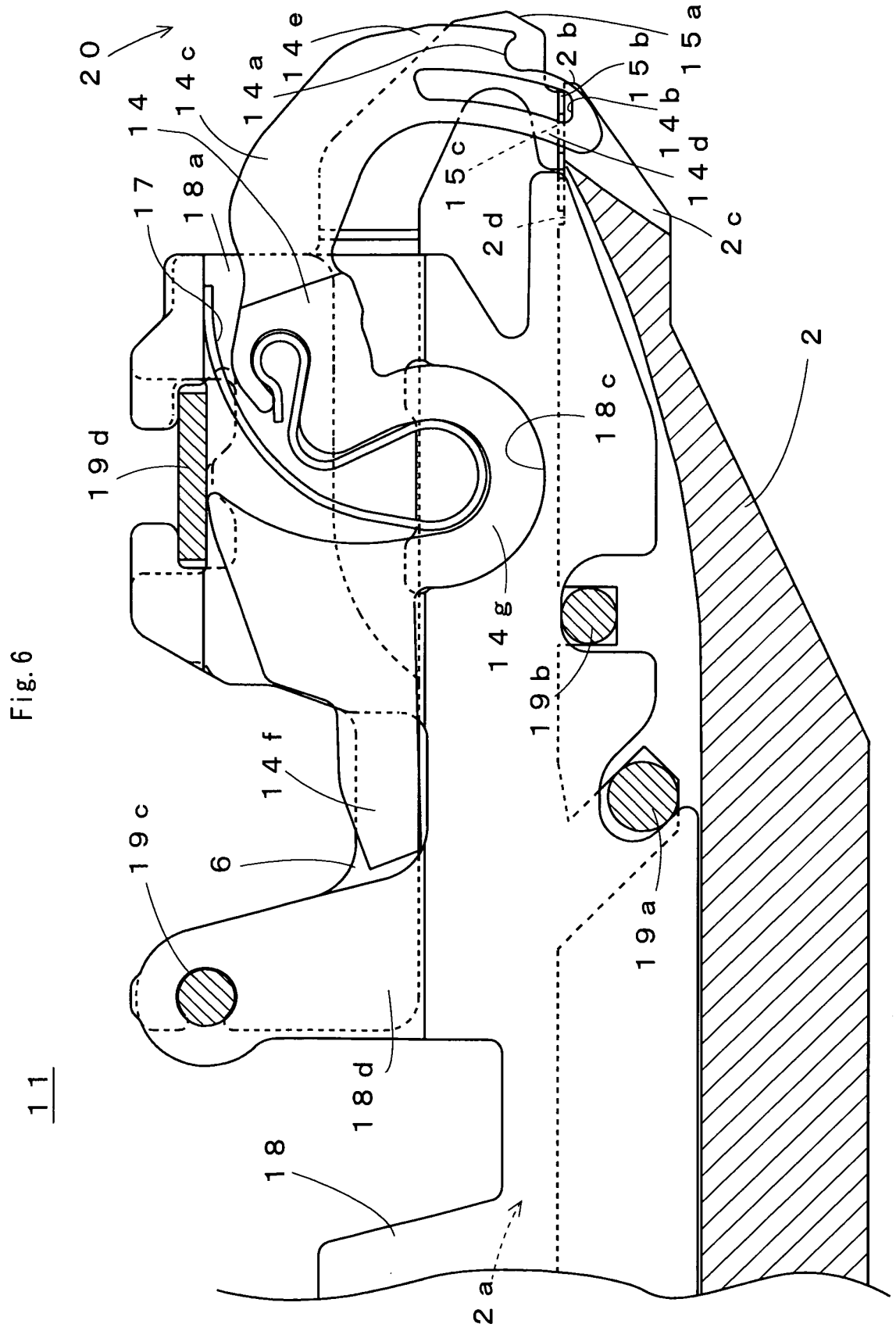

(a)
6
3
3 a
3 b
3 c
(b)
18
18 b
18 d
18 a
18 c
(c)
14
17
14 c
14 e
14 f
14 d
14 g
14 b
14 a

Fig.6


11
20
14
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14c
14d
14e
14f
14g
15a
15b
15c
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18d
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19b
19c
19d
2
2a
2b
2c
2d
6

Fig. 7

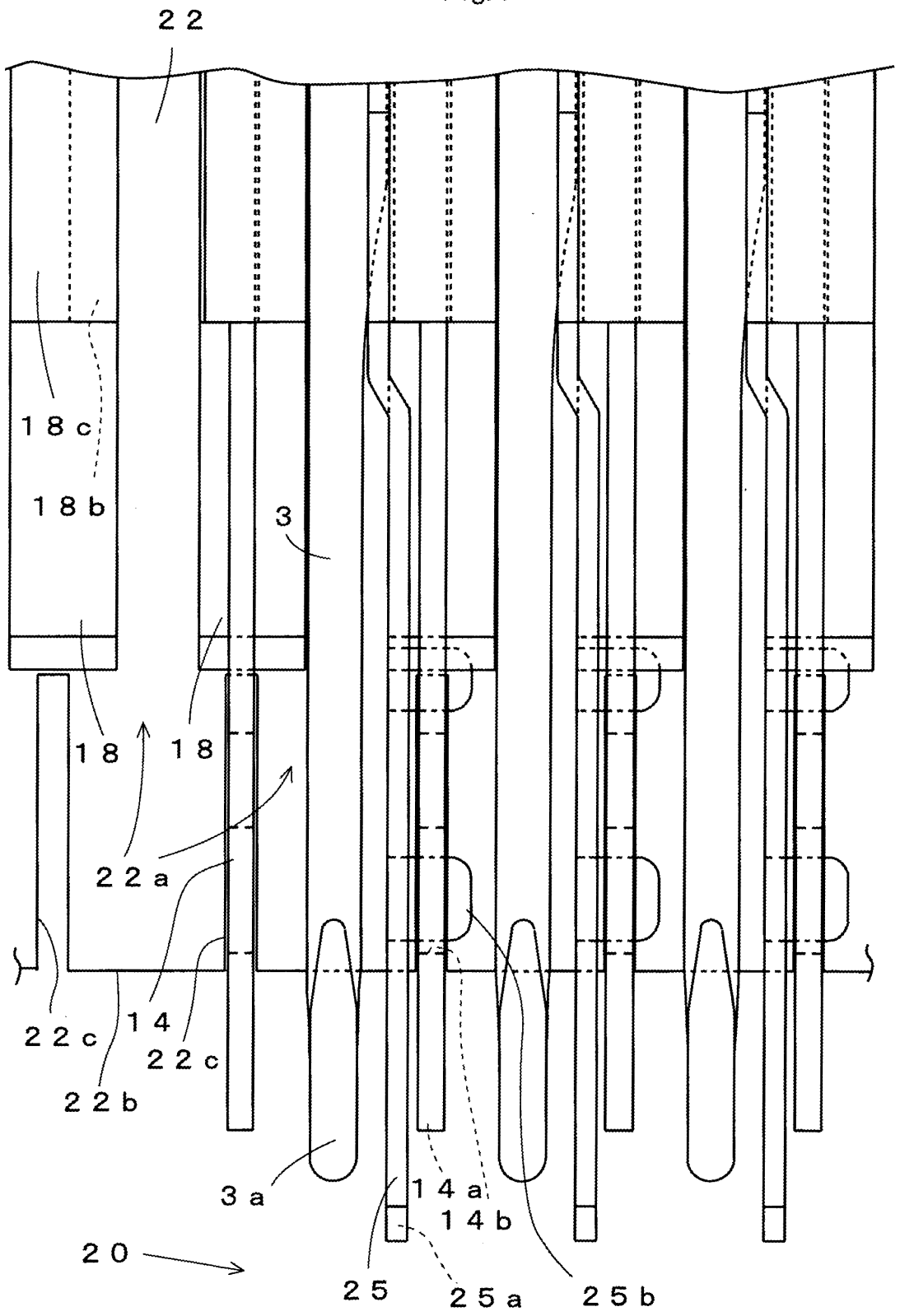
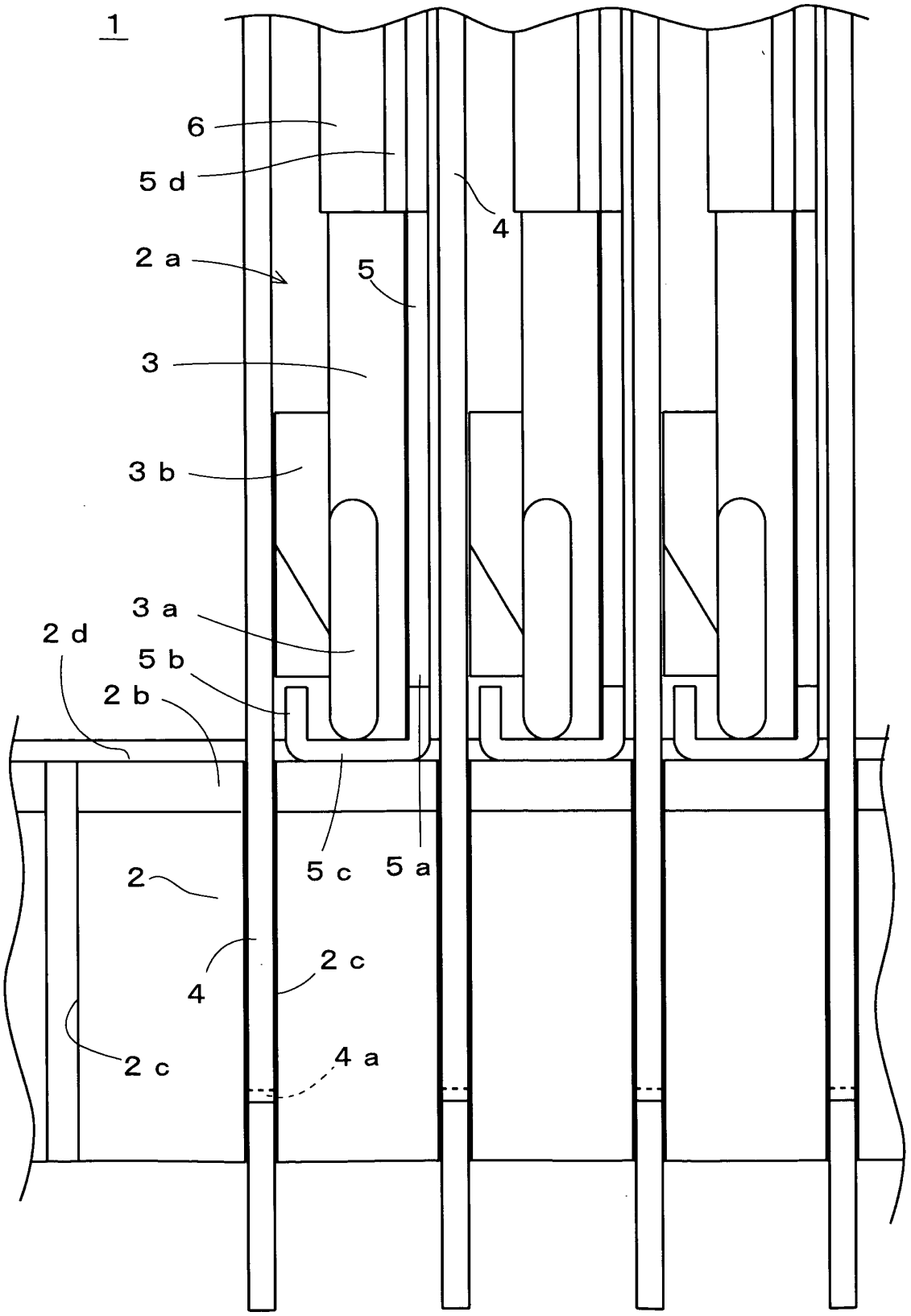


Fig. 8



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2010/002763

A. CLASSIFICATION OF SUBJECT MATTER
D04B15/06(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
D04B15/06

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho	1922-1996	Jitsuyo Shinan Toroku Koho	1996-2010
Kokai Jitsuyo Shinan Koho	1971-2010	Toroku Jitsuyo Shinan Koho	1994-2010

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	JP 2005-113366 A (H. Stoll GmbH & Co.), 28 April 2005 (28.04.2005), entire text; all drawings & EP 1522618 A1 & CN 1605672 A & TW 274796 B	1 2,3
X A	JP 3-504991 A (Universal Maschinenfabrik Dr. Rudolf Schieber GmbH & Co. KG.), 31 October 1991 (31.10.1991), entire text; fig. 1 to 6, 8 to 10, 12, 13 & EP 347011 A1 & WO 1989/012708 A1 & DE 3917934 A1	1 2,3

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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Date of the actual completion of the international search 10 May, 2010 (10.05.10)	Date of mailing of the international search report 18 May, 2010 (18.05.10)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2010/002763

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2700204 B2 (Shima Seiki Mfg., Ltd.), 19 January 1998 (19.01.1998), entire text; all drawings & US 5475991 A & EP 602622 A1 & DE 69314441 T	1-3
A	JP 2006-188775 A (Shima Seiki Mfg., Ltd.), 20 July 2006 (20.07.2006), entire text; all drawings & WO 2006/070763 A1 & DE 112005003287 T & CN 101091011 A	1-3
A	JP 2006-188774 A (Shima Seiki Mfg., Ltd.), 20 July 2006 (20.07.2006), entire text; all drawings & WO 2006/070840 A1 & DE 112005003301 T & CN 101094947 A	1-3

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Patent documents cited in the description

- JP 2700204 B **[0008]**
- JP 2006188775 A **[0008]**