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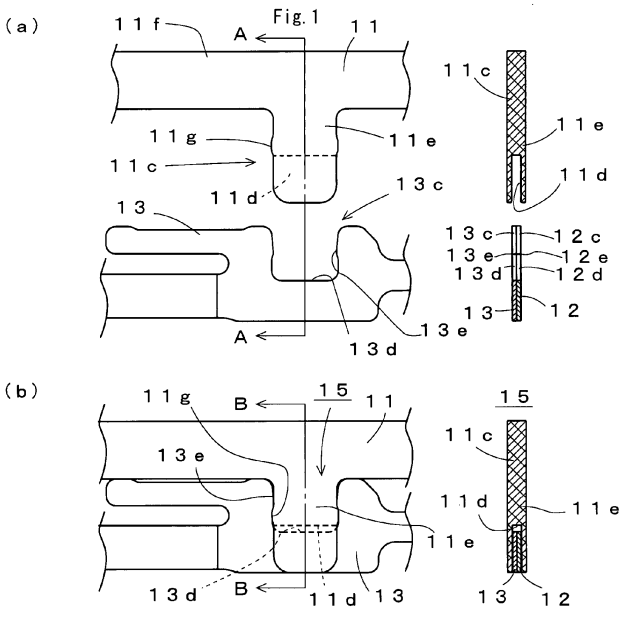
(54) **Compound needle for flatbed knitting machine**

(57) [Problem to be solved] There is provided a compound needle for a flatbed knitting machine with no need to strongly fix a joining part as a slider in post-process operations.

[Solution] An upper joining part (11c) of a base body (11) shown in (a) is joined to lower joining parts (12c, 13c) of the blades (12, 13) to form a joining part (15) shown in (b). Concave parts (12d, 13d) are respectively provided with narrowing parts (12e, 13e) in which the width between side walls is narrower than the width of an opening, and a convex part (11e) is provided with a widening part (11g) having the wider width than that of the narrowing parts (12e, 13e). The concave parts (12d, 13d) are elastically deformed midway through the insertion in the vertical direction, and the widening part (11g) is allowed to pass through the narrowing parts (12e, 13e). Thus, it is possible to join the two blades (12, 13) to the base body (11) as similar to the snap fitting of synthetic resin products. A groove (11d) provided at the tip end of the convex part (11e) sandwiches the blades (12, 13) below the concave parts (12e, 13e), so that it is possible to prevent the blades (12, 13) from coming off in the plate thickness direction.

Fig. 1



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Description

[Technical Field]

[0001] The present invention relates to a compound needle for a flatbed knitting machine, the compound needle being put in a needle groove formed in a needle bed of the flatbed knitting machine to open and close a hook with a slider.

[Background Art]

[0002] Conventionally, in a flatbed knitting machine, a large number of needle grooves are arranged in line on a needle bed, and a knitting needle put in each of the needle grooves is driven in such a way that a hook at a front end moves to and back from a needle bed gap at a tip end of the needle bed, and a fabric is knitted with a knitting yarn supplied to the hook in the needle bed gap. For the knitting needle, there is a compound needle that opens and closes a hook with a slider. More particularly, if a tongue, which is a portion to open and to close a hook with a slider, would be formed of two blades, the tongue might be capable of moving beyond the hook, and transferring using the slider is also might be possible (for example, see Patent Literature 1).

[0003] The needle bed of the flatbed knitting machine is tilted in such a way that its needle bed gap side is high and becomes lower as apart from the needle bed gap. In the following explanation, for convenience of explanation, the longitudinal direction is determined in such a way that the needle bed gap side is the front and the side where the needle bed is apart from the needle bed gap is the back. The vertical direction, vertical to the longitudinal direction, is determined in such a way that the direction in which a tongue floats in the needle groove is the upper side and the direction in which the tongue sinks in the needle groove is the lower side. The widthwise direction of the needle groove seen from the front is the lateral direction. Moreover the needle bed and the needle groove are omitted in the drawings.

[0004] Figs. 3 show partial structures of a slider of a compound needle having a tongue formed at a front end of two blades, as disclosed in Patent Literature 1, for example. Fig. 3(a) shows a structure on a left side of a base body 1 and a cross sectional structure of the base body 1 seen on a cutting surface line A-A. The cross sectional structure of this part is asymmetric to a center line 1a. A butt 1b is projected from a rear portion of the base body 1, and guided by a cam mounted on a carriage moved along a needle bed. An upper joining part 1c, provided between a forward portion and the rear portion of the base body 1, has a longitudinal groove 1d faced on a left side and a concave positionle opening to both right and left lateral side to make a continuous connection. Between the upper joining part 1c and the butt 1b, an arm 1f is formed to be capable of elastic bending to deform. It is noted that the arm 1f is shown to be shortened in the longitudinal direction thereof.

[0005] Fig. 3(b) shows a plan structure of a right side blade 2 and a left side structure thereof. Fig. 3(c) shows a plan structure of a left side blade 3 and a left side structure thereof. Fig. 3(d) shows a plan structure of a slider 4 and a left side structure thereof. Fig. 3(e) shows with enlargement the joining portion 5 for the base body 1 and the blades 2, 3 shown in Fig. 3(d).

[0006] Namely, the slider 4 of the compound needle is formed by joining the base body 1, formed of a metal plate by press working, to the two blades 2, 3 using the joining portion 5. The blades 2, 3 have tongues 2a, 3a, respectively, at front portions. The lower portions of the blades 2, 3 are put in a slider groove, not shown in the drawing, the slider groove being formed in a needle body. The blades 2, 3 relatively move forward and back in the slider groove to open and close a hook of the needle body with the tongues 2a, 3a. The blades 2, 3 are formed with curving portions 2b, 3b subsequent to the tongues 2a, 3b, respectively, upper ends of the curving portions 2b, 3b being opened to the outside of the slider groove. Lower joining part 2c, 3c are provided on rear portions of the blades 2, 3, respectively. The lower joining parts 2c, 3c respectively have joining butts 2d, 3d and tail portions 2e, 3e extending to rearward. Between the front portions, on which provided with the tongues 2a, 3a and the curving portions 2b, 3b, and the rear portions, on which provided with the lower joining parts 2c, 3c, arms 2, 3f are provided and forward portions thereof are capable of rocking by elastic deformation. The tail portion 3e of the blade 3 swells to the lateral side in such a way that the tail portion 3e to make slide contact with a side wall of the needle groove in an elastic manner to provide sliding resistance. At the joining part 5, the concave position 1e of the base body 1 and the joining butts 2d, 3d of the blades 2, 3 are joined to each other, and swaging positions 5a, 5b, 5c are provided circumferentially to form strong joint so as not to allow the removal of the components.

[Citation List]

[Patent literature]

[0007] [Patent Literature 1] Japanese Patent No. 2946323

[Summary of Invention]

[Technical Problem]

[0008] At the joining part 5 of the slider 4 shown in Figs. 3, it is necessary to accurately join the base body 1 to the two blades 2, 3, however, the longitudinal groove 1d and the concave position 1e of the upper joining part 1c are formed slightly larger than the joining butts 2d, 3d of the lower joining parts 2c, 3c, and the tail portions 2e, 3e. Therefore, the joining butts 2d, 3d and the tail portions

2e, 3e being joined to the longitudinal groove 1d and the concave position 1e, and then it is necessary to perform post-process, in which after the joining butts 2d, 3d and the tail portions 2e, 3e are inserted into the longitudinal groove 1d and the recess 1e, they are again positioned and fixed to each other. Positioning is performed in which the top surfaces of the tail portions 2e, 3e, for example, are contacted with the upper wall surface of the longitudinal groove 1d. The front ends of the blades 2, 3 are rocked by an undulation, formed on the bottom surface of the slider groove, becoming as a cam while moving in relative displacement to the needle body. This rocking might apply a large bending moment to the joining part 5 enough for joining components to be removed, so that it is necessary to strongly fix the components by providing the swaging positions 5a, 5b, 5c or the like.

[0009] It is an object of the present invention to provide a compound needle for a flatbed knitting machine with no need to strongly fix a joining part as a slider in a post-process.

[Solution to Problem]

[0010] The present invention is a compound needle for a flatbed knitting machine, being a combination of:

a needle body, being put in a needle groove arranged side by side in a needle bed of a flatbed knitting machine, having a hook at a front end, and being capable of moving back and forth in a longitudinal direction along the needle groove; and
a slider, having a tongue to open and close a hook at a front portion, being capable of relatively moving in the longitudinal direction with respect to the needle body, and provided with:

an opening and closing body, disposed downside in the needle groove, having the tongue at a front portion and a lower joining part on a rear portion; and
a base body, disposed upward over the opening and closing body in the needle groove, having an upper joining part to be joined to the lower joining part of the opening and closing body,

characterized in that:

the compound needle includes:

a concave part, provided one of the lower joining part or the upper joining part, opening on the other side, having a side wall extending from both ends of an opening end to the one side, provided with a narrowing part in which a width between the side walls is narrower than a width of the opening end in the longitudinal direction; and
a convex part, provided on the other of the lower joining part or the upper joining part, provided with a widening part in which a width in the longitudinal direction is wider than the narrowing part of the concave part, inserted into the concave part from the other side and joined thereto, capable of passing through the narrowing part of the concave part midway through insertion by an elastic deformation of the concave part; and
in a joining part of the concave part to the convex part, a groove is provided at a midpoint of a thickness of either the concave part or the convex part, and the other of the concave part or the convex part is inserted into the groove.

[0011] Moreover, in the present invention, said opening and closing body of said slider consists of two blades, having said tongues separated on both sides of said hook and being capable of moving forward beyond the hook.

[0012] Furthermore, in the present invention, said concave part is formed as said lower joining part on a portion where said two blades are laid on each other; and
said groove, provided at a lower end of said convex part as said upper joining part, sandwiches a portion below a lower part of the concave part in the portion where the two blades are laid on each other in said joining state.

[Advantageous Effects of Invention]

[0013] According to the present invention, in the slider, joining between the lower joining part of the opening and closing body and the upper joining part of the base body is performed in such a way that, to the concave part provided on the one of the lower joining part or the upper joining part, the other of the lower joining part or the upper joining part is inserted. The concave portion is provided with the narrowing part in which the width between the side walls is narrower than the width of the opening end, and the convex part is provided with the widening part having wider width than that of the narrowing part. The concave part is elastically deformed midway through the insertion in the vertical direction, and the widening part is allowed to pass through the narrowing portion, so that it is possible to join the opening and closing body to the base body at the joining part. At the joining part, the narrowing part prevents the widening part from passing through in the vertical direction, so that it is possible to fix the opening and closing body to the base body only by insertion. The concave part and the convex part are joined to each other also in the widthwise direction in such a way that into the groove on one of the concave part or the convex part, the other of the concave part or the convex part is inserted, so that it is possible to prevent the opening and closing body and the base body from coming off from each other. Accordingly, it is possible to eliminate the necessity of post-process for strongly fixing the opening and closing body to the base body after form-

ing the joining part.

[0014] Moreover, according to the present invention, even though the opening and closing body of the slider is formed of two blades, it is possible to join and fix the opening and closing body to the base body only by inserting.

[0015] Furthermore, according to the present invention, the concave part is provided on the lower joining part of each of the two blades at the joining part of the base body of the slider to the two blades. The lower part of the concave part, where the two blades are laid on each other, is sandwiched by the groove at the front end of the convex part of the upper joining part provided on the base body side, so that it is possible to prevent the blade from coming off from the joining part in the widthwise direction.

[Brief Description of Drawings]

[0016]

[Fig. 1] Figs. 1 are a partial left side view and a front cross sectional view showing a joining part 15 for joining a base body 11 to a blade 13 to structure a compound needle according to an example of the present invention.

[Fig. 2] Figs. 2 are left side views showing the base body 11 and the blade 13 shown in Figs. 1, and partial left side views showing a needle body 16 and a compound needle 17.

[Fig. 3] Figs. 3 are left side views, plan views, and a cross sectional view showing a joining part 5 of a slider 4 in a conventional compound needle.

[Description of Embodiments]

[0017] In the following, Figs. 1 show a partial structure of a joining part 15 of a compound needle according to an example of the present invention. Figs. 2 show a structure of a compound needle 17 provided with a joining part 15 shown in Figs. 1. In all these drawings, overlapping explanations are sometimes omitted for matters explained on ahead with attaching the identical reference marks or matters corresponding to those explained in Figs. 3 with attaching the identical numerals except a different tens digit. In addition, in some cases, matters not described in the drawings are mentioned with the reference marks previously explained.

[Example]

[0018] Fig. 1(a) shows a state in which a base body 11 is apart from a blade 13 as an opening and closing body. An upper joining part 11c of the base body 11 has a convex part 11e projecting downward, the convex part 11e being provided with a groove 11d at a tip end. An arm 11f is formed so as to extend beyond rear side of the upper joining part 11c. The width of the convex part 11e in the longitudinal direction is the maximum at a widening part 11g. The blade 13 has a lower joining part 13c that is joined to the upper joining part 11c. The lower joining part 13c is provided with a convex part 13d opening upward. The concave part 13d is provided with a narrowing part 13e in which the width between side walls extending downward from both sides of an opening end is narrower than the width at the opening end. The front end of the blade 13 is laid on a different blade 12 for use, as similar to the blades 2, 3 shown in Figs. 3. A cross sectional structure, seen on a cutting surface line A-A, is shown on the right side of Fig. 1(a). The blade 12 is provided with a lower joining part 12c and a concave part 12d as similar to the blade 13.

[0019] Fig. 1(b) shows a state in which the base body 11 is joined to the blades 12, 13 to form a joining part 15. A cross sectional structure of the joining part 15 seen on a cutting surface line B-B is shown on the right side. The concave parts 12d, 13d are respectively provided with narrowing parts 12e, 13e having the width between the side walls narrower than the width of the opening end, and the convex part 11e is provided with the widening part 11g having wider width than that of the narrowing parts 12e, 13e. The concave parts 12d, 13d are elastically deformed midway through the insertion in the vertical direction, and the widening part 11g is allowed to pass through the narrowing parts 12e, 13e. Thus, it is possible to join the opening and closing body to the base body 11 using the upper joining part 11c and the lower joining parts 12c, 13c. By this joining, the narrowing parts 12e, 13e prevent the widening part 11g from passing through in the vertical direction, so that it is possible to fix the opening and closing body to the base body 11 only by insertion. Below the concave parts 12d, 13d, the portion where the two blades 12, 13 are laid on each other is inserted into the groove 11d at the tip end of the convex part 11e, and the two blades 12, 13 are joined to each other, it is possible to prevent the two blades 12, 13 from coming off in the widthwise direction only by insertion in the vertical direction. Consequently, it is possible to eliminate the necessity of post-process for strongly fixing the opening and closing product to the base 11 after forming the joining part 15.

[0020] Figs. 2 show a structure of a compound needle 17 according to an example of the present invention and the base body 11, the blade 13, and the needle body 16, which are main components. The base body 11 shown in Fig. 2(a) has the upper joining part 11c described in Figs. 1 and a longitudinal groove 11h at the front lower portion. The longitudinal groove 11h is formed at a midpoint in the widthwise direction in a state to open downward. On rear side of the base body 11, the arm 11f is extended, and having a butt similar to the butt 1b shown in Fig. 3(a) projected thereon, which is omitted to be shown in the drawing.

[0021] The blade 13 shown in Fig. 2(b) has a tongue 13a and a curving portion 13b at the front portion as well as a sloping portion 13f. The tongue 13a and the curving

portion 13b are the same as the tongue 3a and the curving portion 3b shown in Fig. 3(c), respectively. The sloping portion 13f is provided for sinking the tongue 13a in clearing time. In clearing time, the needle body moves forward, the tongue 13a relatively moves back to open the hook of the needle body, and the tongue 13a receives a stitch retained in the hook. While this clearing time, it is necessary to sink the tongue 13a in the slider groove of the needle body in order that the tongue 13a does not become an obstacle to transfer a stitch. The same is applied to the blade 12, which is omitted to bet shown in the drawing.

[0022] The needle body 16 shown in Fig. 2(c) has a hook 16a at the front end, and a slider groove 16b is formed on a needle shank subsequent to the hook 16a. A cam part 16c is provided on a bottom surface in a front side of the slider groove 16b. The cam portion 16c causes the tongue 13a to float out of the slider groove 16b during closing the leading end of the hook 16a with the tongue 13a of the blade 13. In clearing time, the tongue 13a moves back in the slider groove 16b, the sloping portion 13f is pressed by a pressing portion 16d provided on the needle body 16, and the tongue 13a is sunk in the slider groove 16b.

[0023] The compound needle 17 shown in Fig. 2(d) includes a slider 14, in which the base body 11 and the blade 13 form the joining part 15 and combined with each other, and the needle body 16. The compound needle 17 is put in a needle groove arranged in line on a needle bed of a flatbed knitting machine and has the hook 16a at the front end for functioning as a knitting needle to move back and forth in the longitudinal direction along the needle groove.

[0024] In addition, although the two blades 12, 13 form the opening and closing body to be combined with the base body 11, the blade 13 having the tongue 13a to open and close the hook 16a of the needle body 16, the blade 12 being the same as the blade 13, the opening and closing body may be formed of a single blade. Even though the number of blades is single or plural, the opening and closing body can be exchanged by removing the base body and the opening and closing body in such a case where the opening and closing body is damaged after forming the joining part 15.

[0025] Moreover, although the convex part 11e is formed on the upper joining part 11c of the base body 11, and the concave part 12d, 13d are formed on the lower joining parts 12c, 13c of the blades 12, 13, it is also possible to form convex parts on the blades 12, 13 and a concave part on the base body 11. In case an opening and closing body is constructed with one piece, it is possible that a groove is provided on a base body on which a concave part is formed and a tip end of a convex part of the opening and closing body is inserted into the groove. In case there is no difference in thickness between a base body and an opening and closing body, it is sufficient that one is partially made thinner and inserted into a groove provided on the other.

[Reference Signs List]

[0026]

11	Base body
11c	Upper joining part
11d	Groove
11e	Convex part
11g	Widening part
12, 13	Blade
12c, 13c	Lower joining part
12d, 13d	Concave part
12e, 13e	Narrowing part
14	Slider
15	Joining part
16	Needle body
17	Compound needle

Claims

1. A compound needle (17) for a flatbed knitting machine, being a combination of:

a needle body (16), being put in a needle groove arranged side by side in a needle bed of a flatbed knitting machine, having a hook (16a) at a front end, and being capable of moving back and forth in a longitudinal direction along the needle groove; and
a slider (14), having a tongue (13a) to open and close a hook (16a) at a front portion, being capable of relatively moving in the longitudinal direction with respect to the needle body (16), and provided with:

an opening and closing body (11, 12, 13), disposed downside in the needle groove, having the tongue (13a) at a front portion and a lower joining part (12c, 13c) on a rear portion; and
a base body (11), disposed upward over the opening and closing body (11, 12, 13) in the needle groove, having an upper joining part (11c) to be joined to the lower joining part (12c, 13c) of the opening and closing body

(11, 12, 13),

characterized in that:

the compound needle (17) includes:

a concave part (12d, 13d), provided one of the lower joining part (12c, 13c) or the upper joining part (11c), opening on the other side, having a side wall extending from both ends of an opening end to the one side, provided with a narrowing part (12e, 13e) in which a width between the side walls is narrower than a width of the opening end in the longitudinal direction; and
a convex part (11e) , provided on the other of the lower joining part (12c, 13c) or the upper joining part (11c), provided with a widening part (11g) in which a width in the longitudinal direction is wider than the narrowing part (12e, 13e) of the concave part (12d, 13d), inserted into the concave part (12d, 13d) from the other side and joined thereto, capable of passing through the narrowing part (12e, 13e) of the concave part (12d, 13d) midway through insertion by an elastic deformation of the concave part (12d, 13d); and
in a joining part (15) of the concave part (12d, 13d) to the convex part (11e), a groove (11d) is provided at a midpoint of a thickness of either the concave part (12d, 13d) or the convex part (11e), and the other of the concave part (12d, 13d) or the convex part (11e) is inserted into the groove (11d).

2. The compound needle (17) for a flatbed knitting machine according to claim 1, wherein
said opening and closing body (11, 12, 13) of said slider (14) consists of two blades (12, 13), having said tongues (13a) separated on both sides of said hook (16a) and being capable of moving forward beyond the hook (16a).

3. The compound needle (17) for a flatbed knitting machine according to claim 2, wherein:

said concave part (11e) is formed as said lower joining part (12c, 13c) on a portion where said two blades (12, 13) are laid on each other; and said groove (11d), provided at a lower end of said convex part (11e) as said upper joining part (11c), sandwiches a portion below a lower part of the concave part (12d, 13d) in the portion where the two blades (12, 13) are laid on each other in said joining state.

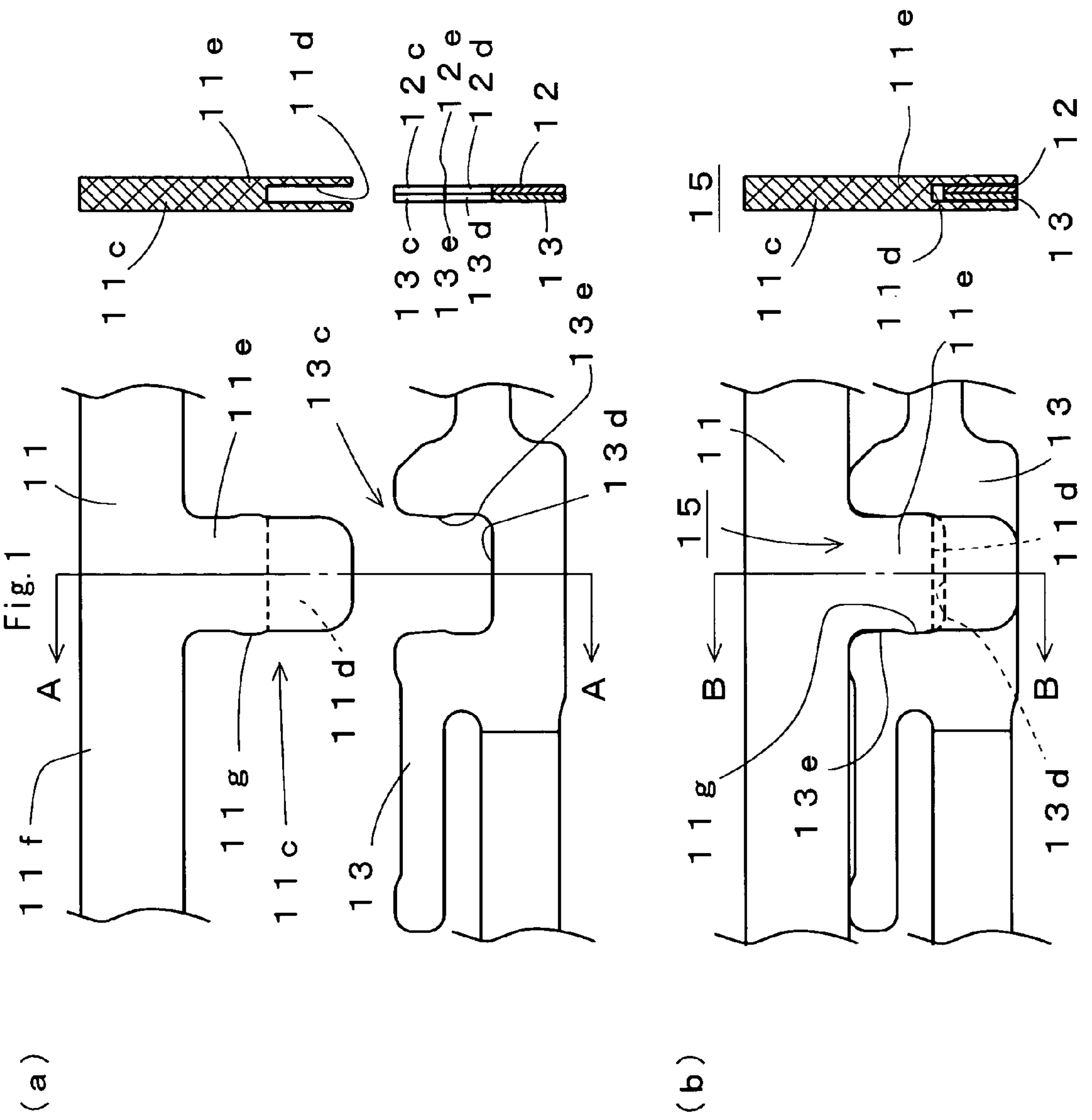

Fig. 1

Fig. 2

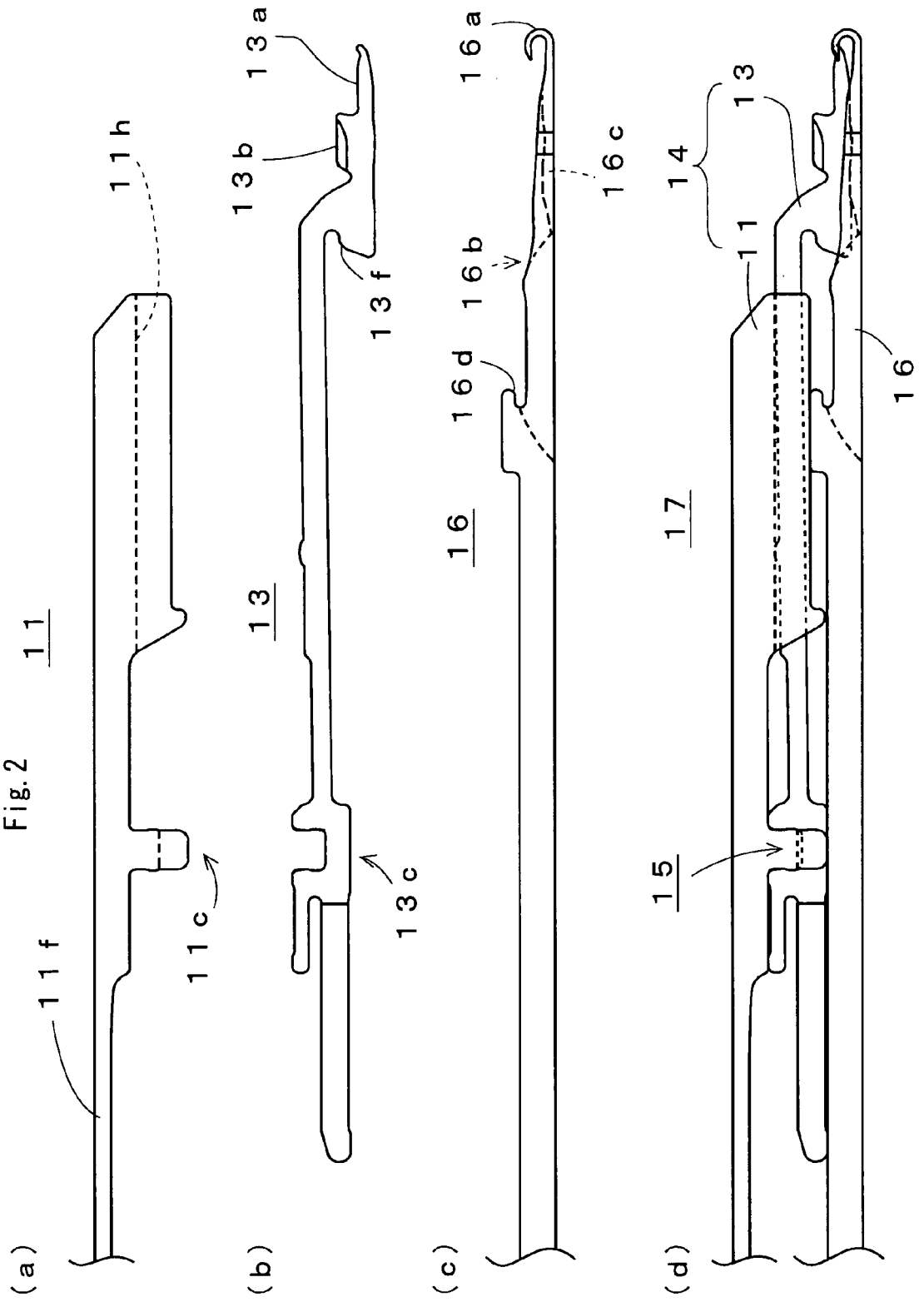
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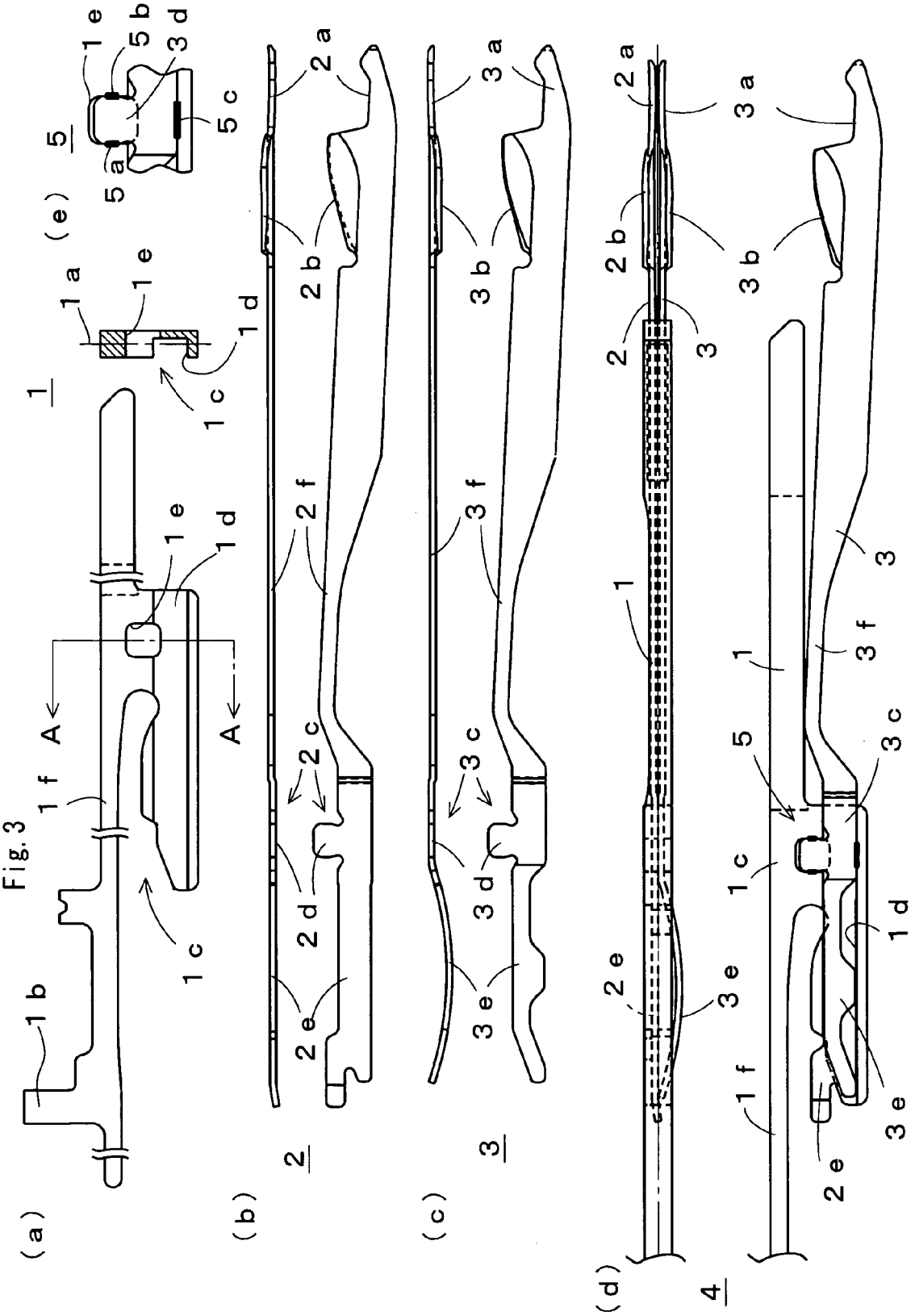
Fig.3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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2946323 B **[0007]**