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

Schiebernadel für Flachstrickmaschinen

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Description

[Technical Field]

[0001] The present invention relates to a compound needle, which is accommodated in a needle groove formed on a needle bed of the flatbed knitting machine and in which a slider for opening and closing an aperture of a hook is formed by two blades, according to the preamble of claim 1 and as known from EP 1178141 A1.

[Background Art]

[0002] Conventionally, in a flatbed knitting machine, a knitting needle accommodated in a needle groove formed on a needle bed is driven so as to slidingly move in the needle groove and moves a hook at a front end toward or away from a needle bed gap so that a knit fabric is knitted with knitting yarns supplied to the hook from the needle bed gap. In some case, as the knitting needle is used the compound needle, which is compounded with a needle body which has the hook at a front end thereof and a slider which is movable relatively with respect to the needle body and has a tongue for opening and closing an aperture of the hook at a front end thereof. A slider which is formed by two blades such that the slider is separated so as to sandwich both sides of the hook and can advance to the needle bed gap beyond the hook is also used for the compound needle (for example, see Patent Literatures 1, 2).

[0003] The two blades as disclosed in Patent Literatures 1, 2 or the like have tongues at front portions thereof and bending portions, which are curved in the direction of entirely seceding from each other, provided on an area from the tongues to rear portions, and are accommodated in a blade groove formed on a needle body having the hook at a front end thereof. By providing the bending portions, outside surfaces of the bending portions make slide contact with side wall surfaces of the blade groove so as to restrict the blades from expanding in the width direction in a state where the two blades are accommodated in the blade groove, and generating reaction force to make the tongues close to each other at positions in the vicinity of front ends. Plural bending sections are provided to the tongues such as to be separated at the front side with respect to the contacting portions. Even if the blades are slidingly moved in the blade groove, the contacting portions in the vicinity of the front ends of the tongues move on a center line of the blade groove by the slide contact of the bending portions with the side wall surfaces of the blade groove, then, when the contacting portions makes contact with an opening end of the hook, the contacting portions are separated into both sides of the hook. Thus, the bending portions of the blades are provided for obtaining a centering effect such as prevention of positional deviation of the contacting portions of the tongues with respect to the opening end of the hook and prevention of the lateral displacement of the contact-

ing portions of the tongues. It is to be noted that a technique of providing a partition wall having a thickness smaller than that of the hook of the needle body in the blade groove provided on the needle body and separating the blade groove into two so as to keep a space between the two blades has been known (for example, see Patent Literature 3).

[Citation List]

[Patent Literature]

[0004]

[Patent Literature 11 Japanese Patent No. 3379947
[Patent Literature 2] Japanese Patent No. 3232075
[Patent Literature 3] Japanese Patent No. 3532897

[Disclosure of the Invention]

[Technical Problem]

[0005] If two blades are curved so as to provide bending portions, the centering effect by the contacting portions of the tongues makes it possible to reliably perform operations to open and close the aperture of the hook and further to move the tongues forward beyond the hook. However, when a slider is moved with respect to a needle body, sliding resistance is increased so that a driving load is increased. Further, since the blades are curved on the bending portions, portions of the blades which are separated from side wall surfaces of the blade groove are generated, there arises a risk that sufficient rigidity is not obtained. Furthermore, bending shapes of the tongues and the bending portions become complex and there arises a risk that final shapes of the blades become unstable.

[0006] An object of the present invention is to provide a compound needle for a flatbed knitting machine in which sliding resistance can be made small and opening/closing accuracy to an aperture of a hook by a tongue can be enhanced with a simple structure.

[Technical Solution]

[0007] The present invention provides a compound needle for a flatbed knitting machine comprising:

a needle body which is suitable for being accommodated in a needle groove formed on a needle bed of the flatbed knitting machine in a state where the needle body is capable of sliding movement in a front-rear direction, and has a hook at a front portion, and on which a blade groove is formed at a rear side with respect to the hook, and
a slider having a lower portion accommodated in the blade groove of the needle body and provided with two blades in a state where arranged in parallel, the

blades having tongues at a front portion thereof to open and close an aperture of the hook, the tongues being capable of retaining a stitch loop and capable of moving relatively beyond the hook,

the two blades of the slider being arranged such that their outside surfaces make slide contact with both outside walls of the blade groove of the needle body respectively, and characterized in that the blades have contacting portions, being provided on a part of shoulder portions formed upward from rear portions of the tongues, this part being located outside of the blade groove, and getting close to each opposite blade to contact each other and keeping a state where a space is generated at least between the tongues.

[0008] In the present invention, each contacting portion of said blades is formed by bending a front end side of said shoulder portion to the side of said opposite blade.

[0009] In the present invention, the two blades of said slider are formed such that a space between them becomes larger toward the front ends on front portions of said tongues.

[Advantageous Effects]

[0010] According to the present invention, outside surfaces of two blades of a slider make slide contact with both outside walls of a blade groove of a needle body, respectively, so that stable move of the blades in the blade groove can be performed. The blades have contacting portions which is got close to and to contact with each other where a part of shoulder portions, formed upward from rear portions of the tongues, come out of the blade groove, so that even if lower portions of the blades are not curved in the blade groove, rigidity in the vicinity of the tongues can be kept. Since the rigidity in the vicinity of the tongues is kept, even if the blades are moved with respect to the needle body, positional deviation and lateral displacement can be prevented. Contact between the contacting portions each other keeps a state where a space is generated between the tongues, therefore, resistance when the blades are moved forward and the tongues are separated by the hook can be made small. With a simple structure in which the contacting portions are provided on the shoulder portions at the rear portions of the tongues, the sliding resistance can be made small and opening/closing accuracy of the aperture of the hook by the tongues can be enhanced without curving the lower positions of the blades in the blade groove of the needle body.

[0011] Further, according to the present invention, each contacting portion can be formed on each blade of the slider with a simple structure in which a front end of the blade which comes out of the blade groove of the needle body is bent toward the other blade.

[0012] Further, according to the present invention, the two blades of the slider are formed such that a space between the blades becomes larger toward front ends

on front portions of the tongues, so that, resistance received when the blades move forward beyond a front end of the hook can be made small.

5 [Brief Description of Drawings]

[0013]

[Fig. 1] Figs. 1 are partial plan views and partial front views illustrating a structure of a compound needle 5 and two blades 1, 2 as an embodiment of the present invention.

[Fig. 2] Figs. 2 are partial plan views and partial front views illustrating operation states of the compound needle 5 in Figs. 1.

[Fig. 3] Figs. 3 are partial plan views illustrating operations of the blades 1, 2 in Fig. 1.

[Description of Embodiments]

[0014] Hereinafter, Figs. 1 illustrate structures of a compound needle 5 and two blades 1, 2 as an embodiment of the present invention. Figs. 2 illustrate operation states of the compound needle 5 in Figs. 1. Figs. 3 illustrate operations of the blades 1, 2 in Fig. 1. The blade 1 and the blade 2 are symmetric about a surface which is provided between the blade 1 and the blade 2 so as to be in parallel with the blade 1 and the blade 2. Parts corresponding to the blade 1 are also provided on the blade 2 even if the parts are not illustrated on the blade 2.

[0015] It is to be noted that in the description with reference to the drawings, parts which are not denoted with reference numerals in the drawing to be referred but denoted with the reference numerals in the drawing referred before, might be described with the reference numerals in some case. Further, although the compound needle 5 is illustrated in a state where the compound needle 5 is accommodated in a needle groove formed on a needle bed of a flatbed knitting machine, the needle groove itself is not illustrated in the drawings. Note that the needle bed of the flatbed knitting machine is inclined upward toward a needle bed gap located at the front side of the needle groove and downward away from the needle bed gap, but the compound needle 5 is illustrated so as to be in a horizontal posture. In such posture, a right side indicates a front side as the needle bed gap side and a left side indicates a rear side away from the needle bed gap. Further, an upper side in the drawings indicates a direction that the compound needle 5 floats from the needle groove and a lower side in the drawings indicates a direction that the compound needle 5 sinks in the needle groove.

[Examples]

[0016] Fig. 1(a) and Fig. 1(b) illustrate a plan structure and a front structure of a main part as the compound needle 5, respectively. In a state as illustrated in the draw-

ings, a slider formed by coupling the two blades 1, 2 and a base body 4 is moved backward at the most level relatively with respect to the needle body 3. It is to be noted that although the blades 1, 2 and the base body 4 are coupled to each other at the left side in the drawings and the blades 1, 2 are moved by driving the base body 4, a coupling portion thereof is not illustrated.

[0017] Fig. 1(c) and Fig. 1(d) illustrate plan structures of the blades 1, 2 at the front side thereof and a front structure of the blade 1 at the front side thereof, respectively. The blades 1, 2 according to the present embodiment have tongues 1a, 2a with no bending, and linear shaped portions 1b, 2b which are not curved are provided at the rear side of the tongues 1a, 2a, so that finishing shapes of the blades 1, 2 are stable and manufacturing thereof is easily performed.

[0018] As for the tongues 1a, 1b, a stitch loop is retained on portions which extend to approximately horizontal direction in Fig. 1(d), shoulder portions 1c, 2c are provided above the portions. On a rear side of the shoulder portions 1c, 2c, guiding portions 1d, 2d are provided to expand to outside. At a position where the guiding portion 1d is guided when the blade 1 is moved backward with respect to the needle body 3 as illustrated in Fig. 1(b), the guiding portion 1d is pressed to the lower side by a guiding portion presser 3c provided on the needle body 3. At a rear side of the guiding portion 1d, an engaging protrusion 1e is vertically provided on the blade 1. The engaging protrusion 1e is inserted into an engaging concave 4a provided on the base body 4 in a state where the blade 1 and the base body 4 are coupled to each other. When a lower portion of the blade 1 slides to move in the blade groove 3b of the needle body 3, an upper portion of the blade 1 can be restricted from displacing to outside with the coupling. There is the similar situation for the blade 2, but illustration thereof is omitted.

[0019] Contacting portions 1f, 2f are also provided on the shoulder portions 1c, 2c at the front end side. The contacting portions 1f, 2f which are opposed to each other are bent inward such that front ends thereof make close to and contact with each other and a state where a space is generated between the tongues 1a, 2a is kept. The linear shaped portions 1b, 2b make slide contact with side walls of the blade groove 3b and the front ends of the contacting portions 1f, 2f make contact with each other at a position in the vicinity of the tongues 1a, 2a, so that a centering effect can be obtained even if the tongues 1a, 2a are not made contact with each other.

[0020] A space between the tongues 1a, 2a can be made larger toward the front ends thereof by providing inclination on the inner sides of the front ends of the tongues 1a, 2a, such that thicknesses of the tongues 1a, 2a are made smaller toward the front ends. Further, if the tongues 1a, 2a are curved outward, the space between the tongues 1a, 2a can be further made larger toward the front ends thereof. Increase in the space between the tongues 1a, 2a on the front ends thereof makes it possible to enhance opening/closing accuracy of the

hook 3a.

[0021] Fig. 1(e) illustrates a plan structure of a front portion of the needle body 3. The single blade groove 3b of the present embodiment accommodates the two blades 1, 2, however, two grooves may be provided and each of the blades 1, 2 may be individually accommodated in each of the grooves as in Patent Literature 3. In such case, outside surfaces of the blades 1, 2 can be made slide contact with outside walls of the blade grooves and spaces can be generated between inside surfaces and inside walls, therefore sliding resistance can be made small and opening/closing accuracy of the hook 3a can be enhanced even with a simple structure.

[0022] Fig. 2(a) and Fig. 2(b) illustrate a state where the blades 1, 2 are moved forward with respect to the needle body 3 from the backward state as illustrated in Fig. 1(a) and Fig. 1(b) and an aperture of the hook 3a is closed with the front ends of the tongues 1a, 2a. When a stitch loop is formed in the flatbed knitting machine, the aperture of the hook 3a is opened and the needle body 3 is moved forward with respect to the blades 1, 2 such that knitting yarns are supplied to the hook 3a advancing to the needle bed gap. If the stitch loop has been already formed on the hook 3a, the stitch loop is relatively moved backward with the forward movement of the needle body 3 and moves onto the tongues 1a, 2a. With the retreating of the needle body 3, if the tongues 1a, 2a of which front ends close the aperture of the hook 3a has retained the stitch loop, the stitch loop retained on the tongues 1a, 2a is knocked over and separated from the tongues 1a, 2a. In the present embodiment, when the blades 1, 2 and the needle body 3 are relatively moved, the front ends of the contacting portions 1f, 2f are made contact with each other, so that the front ends of the tongues 1a, 2a make contact with the opening end of the hook 3a so as to reliably close the aperture of the hook 3a without positional deviation and lateral displacement.

[0023] Fig. 2(c) and Fig. 2(d) illustrate a state where the tongues 1a, 2a are moved forward beyond the position of the hook 3a. As illustrated in Fig. 2(c), the front portions of the blades 1, 2 on which the tongues 1a, 2a are formed are separated into both sides of the hook 3a and are moved forward. The lower portions of the blades 1, 2 which are accommodated in the blade groove 3b correspond to the linear shaped portions 1b, 2b having no curved portions, so that the blades 1, 2 can be moved forward in a state where sliding resistance between the linear shaped portions 1b, 2b and the side walls of the blade groove 3b is small.

[0024] Fig. 3 illustrates operation states of the blades 1, 2 in the present embodiment. That is to say, Fig. 3(a) illustrates a state where the blades 1, 2 are arranged in parallel. Fig. 3(b) illustrates a state immediately before the blades 1, 2 close the aperture of the hook 3a. Fig. 3(c) illustrates a state where the blades 1, 2 close the aperture of the hook 3a and are further moved forward to open between the tongues 1a, 2a.

[0025] As illustrated in Fig. 3(a), the blades 1, 2 are

arranged in parallel in an approximately linear form, and only the contacting portions 1f, 2f are bent inward and the front ends thereof make contact with each other, therefore the entire rigidity is kept so as to prevent the positional deviation and the lateral displacement. A space W between the outside surfaces of the blades 1, 2 is kept to be equivalent to the width of the blade groove 3b.

[0026] As illustrated in Fig. 3(b), even if the blades 1, 2 are accommodated in the blade groove 3b of the needle body 3, the blades 1, 2 are not bent because the linear shaped portions 1b, 2b are provided. The outside surfaces of the linear shaped portions 1b, 2b make contact with the side wall surfaces of the blade groove 3b so as to keep rigidity. The front ends of the contacting portions 1f, 2f made contact with each other and no space is generated therebetween so as to keep rigidity. The tongues 1a, 2a accommodated in the blade groove 3b are not precompressed so as to bend inward, so that a space X between the front ends can be kept large, and positional deviation with respect to a center line 5a is not caused. Accordingly, even if the blades 1, 2 are moved forward with respect to the needle body 3, the opening end of the hook 3a surely enters the space X so that deviation can be avoided.

[0027] As illustrated in Fig. 3(c), the insides of the tongues 1a, 2a and the outsides of the hook 3a make contact with each other by a length L in a state where the tongues 1a, 2a on the blades 1, 2 are opened by the hook 3a. On the blades 1, 2, precompression in the direction of closing between the tongues 1a, 2a is small and the contact length L is ensured sufficient so that resistance does not become large when opening between the blades 1, 2.

[0028] In the above description, the contacting portions 1f, 2f are formed by bending the front ends of the shoulder portions 1c, 2c, however, the contacting portions can be provided by using another method such as embossing.

[Reference Signs List]

[0029]

- 1, 2. Blade
- 1a, 2a. Tongue
- 1b, 2b. Linear shaped portion
- 1f, 2f. Contacting portion
- 3. Needle body
- 3a. Hook
- 3b. Blade groove
- 5. Compound needle

Claims

1. A compound needle (5) for a flatbed knitting machine comprising:

a needle body (3) which is suitable for being accommodated in a needle groove formed on a needle bed of the flatbed knitting machine in a state where the needle body (3) is capable of sliding movement in a front-rear direction, and has a hook (3a) at a front portion, and on which a blade groove (3b) is formed at a rear side with respect to the hook (3a), and

a slider having a lower portion accommodated in the blade groove (3b) of the needle body (3) and provided with two blades (1, 2) in a state where arranged in parallel, the blades (1, 2) having tongues (1a, 2a) at a front portion thereof to open and close an aperture of the hook (3a), the tongues (1a, 2a) being capable of retaining a stitch loop and capable of moving relatively beyond the hook (3a),

the two blades (1, 2) of the slider being arranged such that their outside surfaces make slide contact with both outside walls of the blade groove (3b) of the needle body (3) respectively, and **characterised in that** the blades have contacting portions (1f, 2f), being provided on a part of shoulder portions (1c, 2c) formed upward from rear portions of the tongues (1a, 2a), this part being located outside of the blade groove (3b), and get close to each opposite blade (1, 2) to contact each other and keep a state where a space is generated at least between the tongues (1a, 2a).

2. The compound needle (5) for the flatbed knitting machine according to claim 1, wherein each contacting portion (1f, 2f) of said blades (1, 2) is formed by bending a front end side of said shoulder portion (1c, 2c) to the side of said opposite blade (1, 2).
3. The compound needle (5) for the flatbed knitting machine according to claim 1 or 2, wherein the two blades (1, 2) of said slider are formed such that a space between them becomes larger toward the front ends on front portions of said tongues (1a, 2a).

Patentansprüche

1. Schiebernadel (5) für eine Flachstrickmaschine, umfassend:

einen Nadelkörper (3), der in einem Nadelbett der Flachstrickmaschine ausgebildete Nadelrille in einem Zustand aufnehmbar ist, in dem der Nadelkörper in einer Vorder-Rück-Richtung gleitend beweglich ist und einen Haken (3a) am vorderen Teil aufweist, an dem eine Blattnut (3b) an der rückwärtigen Seite bezüglich des Hakens

- (3a) ausgebildet ist, und einen Schieber mit einem in der Blattnut (3b) des Nadelkörpers (3) aufgenommenen unteren Teil und mit zwei Blättern (1, 2) in einem Zustand versehen ist, bei dem die Blätter (1, 2), parallel angeordnet, Zungen (1 a, 2a) an dessen vorderen Teil aufweisen, um eine Öffnung des Hakens (3a) zu öffnen und zu schließen, wobei die Zungen (1a, 2a) eine Masche zurückhalten können und relative über den Haken (3a) bewegt werden können, wobei die beiden Blätter (1, 2) des Schiebers so angeordnet sind, dass ihre Außenflächen in gleitendem Kontakt mit den beiden äußeren Wänden der Blätternut (3b) des Nadelkörpers (3) stehen, **dadurch gekennzeichnet, dass** die Blätter (1, 2) Kontaktteile (1f, 2f) aufweisen, die auf einem Teil von Schulterbereichen (1c, 2c), die nach oben von den hinteren Teilen der Zungen (1 a, 2a) ausgebildet sind, vorgesehen sind, wobei dieser Teil außerhalb der Blattnut (3b) angeordnet ist und nahe zu jedem gegenüberliegendem Blatt (1, 2) kommen, um einander zu berühren und einen Zustand aufrecht zu erhalten, in dem ein Zwischenraum wenigstens zwischen den Zungen (1 a, 2a) erzeugt wird.
2. Schiebernadel (5) für eine Flachstrickmaschine nach Anspruch 1, wobei jeder Kontaktteil (1f, 2f) der Blätter (1, 2) durch Biegen einer vorderen Endseite des Schulterteils (1c, 2c) zur Seite des gegenüberliegenden Blatts (1, 2) gebildet ist.
3. Schiebernadel (5) für eine Flachstrickmaschine nach Anspruch 1 oder 2, wobei die beiden Blätter (1, 2) des Schiebers so ausgebildet sind, dass ein Zwischenraum zwischen ihnen zu den vorderen Enden hin an den vorderen Teilen der Zungen (1 a, 2a) größer wird.

(3) et muni de deux lames (1,2) dans un état où elles sont agencées en parallèle, les lames (1, 2) comportant des languettes (1a, 2b) au niveau d'une portion avant pour ouvrir et fermer une ouverture du crochet (3a), les languettes (1a, 2a) étant capables de retenir une boucle de maille et capables de se déplacer relativement au-delà du crochet (3a), les deux lames (1, 2) du coulisseau étant agencées de telle sorte que leurs surfaces extérieures réalisent un contact coulissant avec les deux parois extérieures de la gorge de lame (3b) du corps d'aiguille (3) respectivement, et **caractérisée en ce que** les lames comportent des portions de contact (1f, 2f), prévues sur une partie de portions d'épaulement (1c, 2c) formées vers le haut à partir de portions arrière des languettes (1a, 2a), cette partie étant située à l'extérieur de la gorge de lame (3b), et viennent à proximité de chaque lame opposée (1, 2) pour se contacter entre elles et conservent un état où un espace est généré au moins entre les languettes (1a, 2a).

2. Aiguille composée (5) pour la machine à tricoter à plat selon la revendication 1, dans laquelle chaque portion de contact (1f, 2f) des lames (1, 2) est formée en courbant un côté d'extrémité avant de la portion d'épaulement (1c, 2c) vers le côté de la lame opposée (1, 2).
3. Aiguille composée (5) pour la machine à tricoter à plat selon la revendication 1 ou 2, dans laquelle les deux lames (1, 2) du coulisseau sont formées de telle sorte qu'un espace s'élargit entre elles en direction des extrémités avant sur des portions avant des languettes (1a, 2a).

Revendications

1. Aiguille composée (5) pour une machine à tricoter à plat comprenant :
- un corps d'aiguille (3) qui est approprié pour être logé dans une gorge d'aiguille formée sur une fonture de la machine à tricoter à plat dans un état où le corps d'aiguille (3) est capable d'un mouvement coulissant dans une direction orientée avant-arrière, et comporte un crochet (3a) au niveau d'une portion avant, et sur lequel une gorge de lame (3b) est formée au niveau d'un côté arrière par rapport au crochet (3a), et un coulisseau ayant une portion inférieure logée dans la gorge de lame (3b) du corps d'aiguille

Fi. 1
(a)

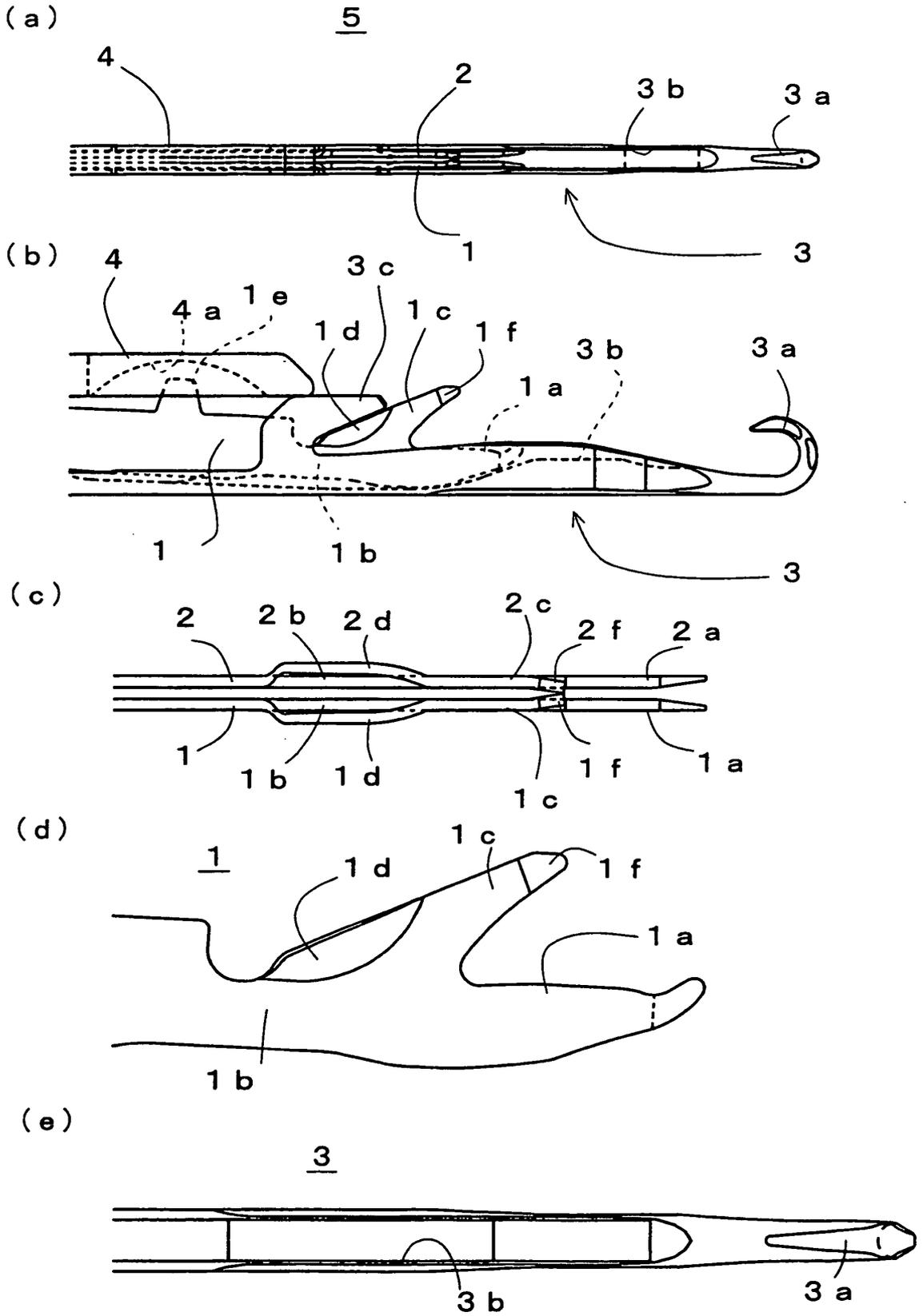


Fig. 2

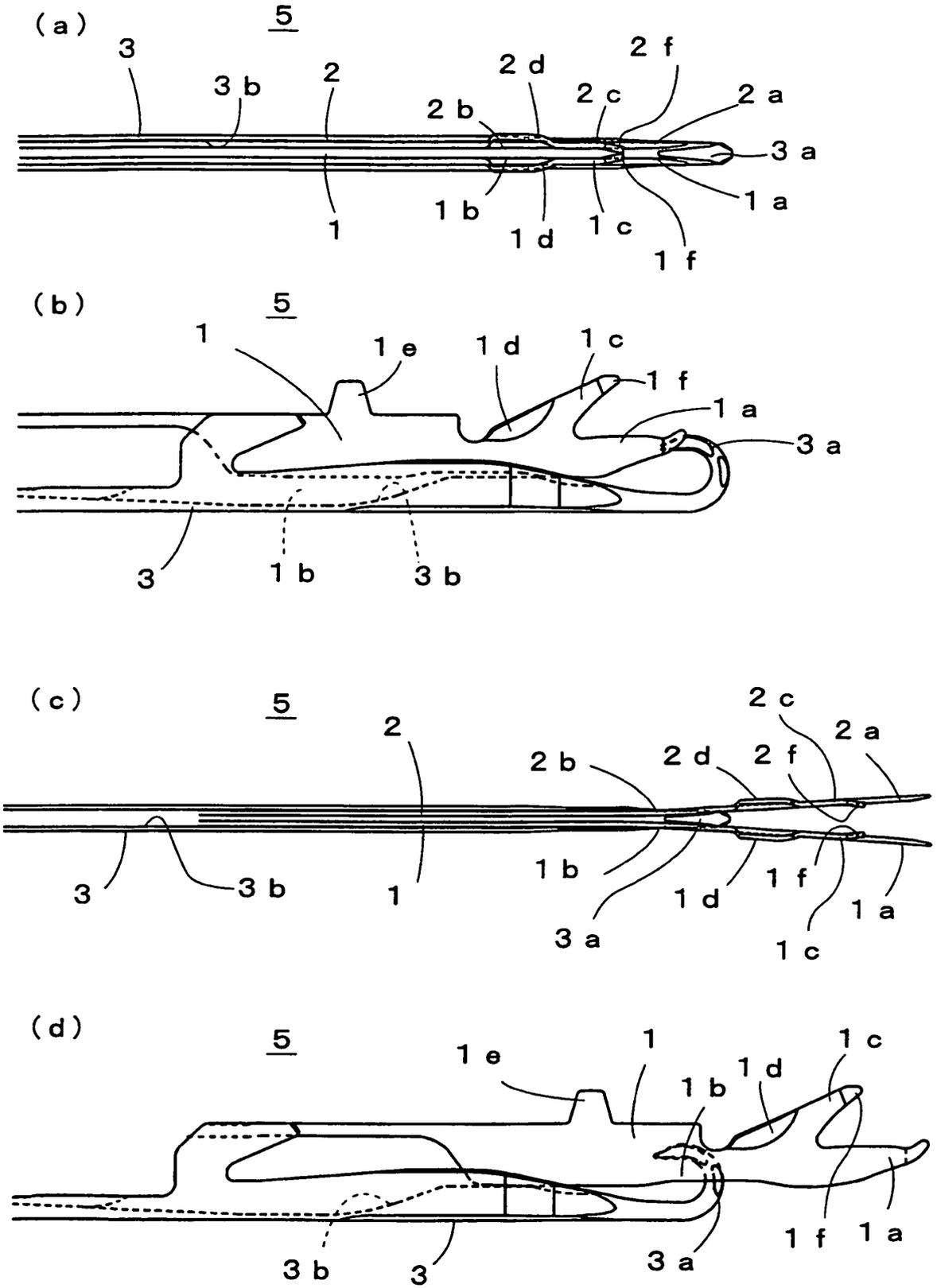
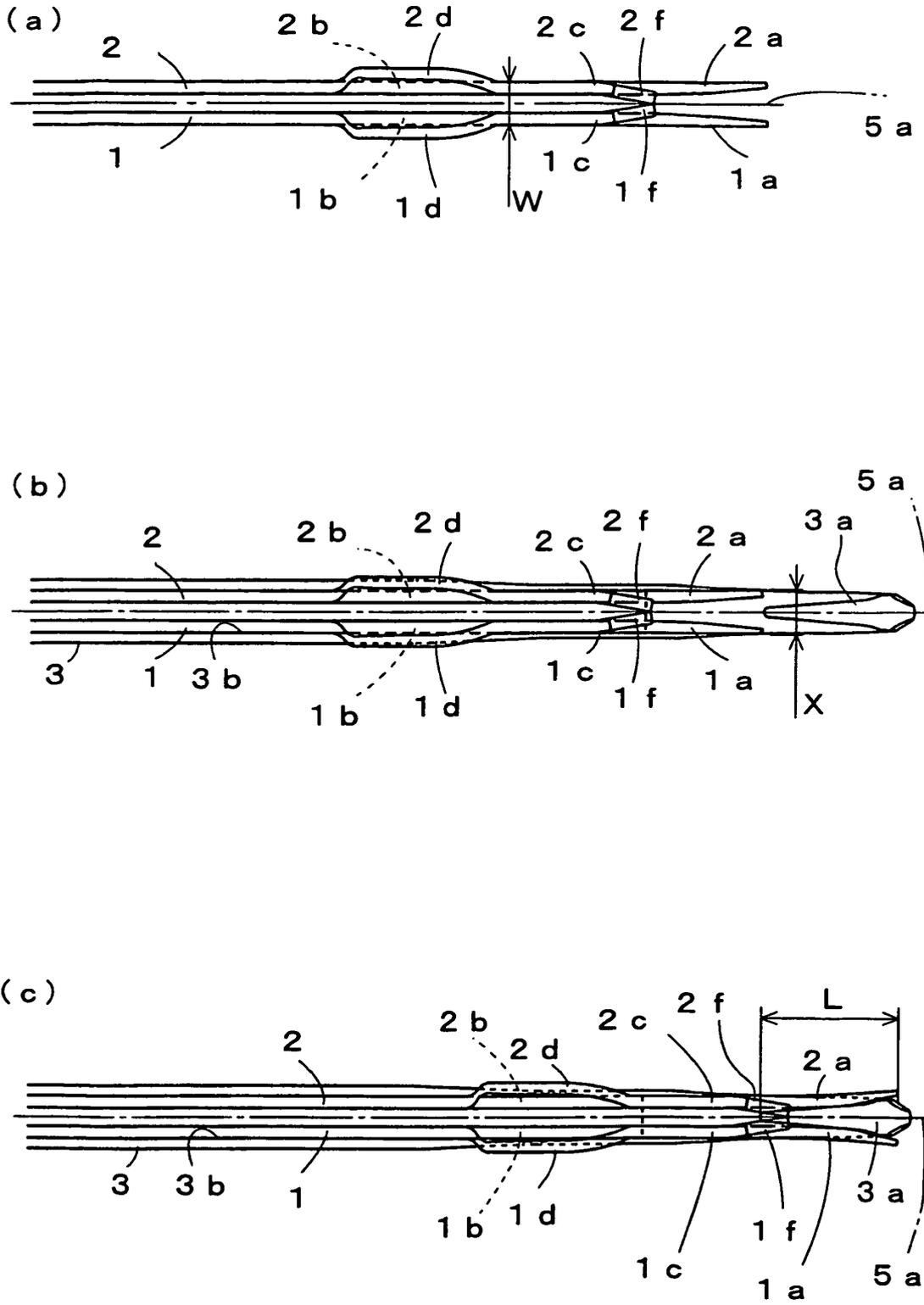


Fig. 3



REFERENCES CITED IN THE DESCRIPTION

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