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(54) **KNITTING NEEDLE**

STRICKNADEL

AIGUILLE A TRICOTER

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Description

Technical Field

[0001] The present invention relates to a knitting needle that is used while being accommodated in a needle groove of a flatbed knitting machine, and a needle jack is coupled to the needle body having a hook on a front end side.

Background Art

[0002] As is conventional, in a flatbed knitting machine, needle grooves are juxtaposed in parallel to a needle bed and a knitting needle is accommodated in each needle groove, a hook on a front end side of the knitting needle advances to and retreats from a needle bed gap formed on the edge side of the needle bed and knitting is performed. For the knitting needle, a latch needle which has a latch for opening and closing a hook on a needle body, to which the hook is disposed on the front end side (for example, see Patent Citation 1), a compound needle for opening and closing a hook by a slider separately located from a needle body (for example, see Patent Citations 2 and 3), and the likes of various type are used.

[0003] Fig. 6 schematically shows a construction of a compound needle 1 as one example of a knitting needle. This kind of compound needle 1 is shown as a slider needle in Fig. 1 of Patent Citation 3 and the like. Figs. 6(a) and (b) correspond to B and C of Fig. 1 of Patent Citation 3, respectively. The compound needle 1 has a needle body 2 and a slider 3. The needle body 2 has a hook 2a on the front end side. To the slider 3, two elastic plates 4 are installed so that they nip the hook 2a and the elastic plates 4 are able to be made sliding shift with respect to the needle body 2 by the drive of a slider butt 5a to be installed to a slider body 5. On the front end side of the elastic plate 4, a tongue 4a is formed. Moving the elastic plate 4 relatively to the needle body 2 enables the tongue 4a to open and close the hook 2a. In addition, advancing the tongue 4a of the elastic plate 4 to the needle bed gap beyond the hook 2a enables stitch transfer or stitch split, plating knit, pile knit, and other various movements described in Patent Citation 3.

[0004] On the tail end side of the needle body 2, a concave portion 2b is disposed, to which a needle jack 6 is coupled. The needle jack 6 is able to move the needle body 2 to be advancing to and retreating from the needle bed gap by driving of a needle jack butt 6a by a cam. The needle jack 6 is coupled to the needle body 2 by setting a convex portion 6b disposed on the front end side of the needle jack 6 into the concave portion 2b of the needle body 2. Constructing a knitting needle by coupling the needle body 2 with the needle jack 6 in this way is popularly practiced in various types of knitting needles as shown in Fig. 2 of Patent Citation 1 and Fig. 2 of Patent Citation 2.

[0005] The needle jack 6 has a tail portion 6c which bends to have the end portion come in contact with the bottom face of the needle groove and elastically levitates other portions in the needle groove. With the surface side of the tail portion 6c, the front end portion of a select jack whose illustration is omitted comes in contact. Sinking the select jack in the needle groove can sink the needle jack 6 in the needle groove, too, as shown in Fig. 6(b). Under the condition in which the needle jack 6 sinks in the needle groove, the needle jack butt 6a does not protrude from the needle groove, either, and driving to the needle body 2 does not take place. The needle jack 6 has the front end side makes oscillating shift displaced about the convex portion 6b between Fig. 6(a) and Fig. 6(b).

[0006] Fig. 7 is an enlarged view showing the construction of the coupled portion between the needle body 2 and the needle jack 6 of Fig. 6. The concave portion 2b of the needle body 2 and the convex portion 6b of the needle jack 6 must have the fitted portion to prevent dropping off under the condition with walls by the needle plates on both sides of the needle groove and at the same time must be possible to make oscillating shift as shown in Fig. 6(a), (b). Consequently, the concave portion 2b and the convex portion 6b have shapes nearly symmetrical with respect to the center line 2c of the concave portion 2b. In addition, the concave portion 2b has spacing between the front side end portion 2d of the opening portion and the tail side end portion 2e smaller than the length of the bottom portion. The convex portion 6b has a front end side boring 6d and a tail end side boring 6e in the condition corresponding to the front side end portion 2d and the tail side end portion 2e of the concave portion 2b, respectively. On the surface side of the needle groove from the front side end portion 2d of the concave portion 2b, a groove 2f is formed halfway of thickness. To the groove 2f, the topmost front end portion of the needle jack 6 is inserted to prevent the coupled portion from coming off in the direction perpendicular to the paper surface.

Patent Citation 1: Japanese Examined Patent Application Publication No. H2-10262

Patent Citation 2: Japanese Examined Patent Application Publication No. H6-84583

Patent Citation 3: Japanese Patent No. 2917146

Disclosure of the Invention

Technical Problem

[0007] In order to increase productivity with the flatbed knitting machine, speeding up of knitting must be achieved. In the course of carrying forward investigation of speeding up, it has been recognized that under the coupled portion of the construction as shown in Fig. 7, the convex portion 6b of the needle jack 6 may break due to the stress concentration generated in the vicinity of the tail end side boring 6e. It is prescribed that the shape of the convex portion 6b should secure the strength at

the foot with the front end side boring 6d and the tail end side boring 6e set as the minimum. Consequently, at these boring portions, the curvature radius R becomes reduced in size.

[0008] The needle jack 6 is produced by punching out a metal sheet by precision press working called fine blanking or the like. The edges or the like formed at the time of punching out are removed by finishing by barrel working, for example. Since for barrel working, particulate substances called media are used, the portion of the boring with small curvature radius R is unable to be sufficiently polished and edges may remain. If edges remain, stress might be further concentrated on the edges so that partial crack should be generated and breakage should be possibly reached. In order to sufficiently remove edges, the curvature radius R of the boring portion should be increased. However, in order to increase the boring and at the same time secure the strength of the convex portion 6b at the foot of the needle jack 6, the coupled portion should be increased in size.

[0009] With the compound needle 1 as shown in Fig. 6, since a slider 3 must be disposed, too, and the coupled portion cannot be increased. Furthermore, in general, increasing the needle jack 6 increases inertia weight, so that it is disadvantageous for speeding up.

[0010] It is an object of the present invention to provide a knitting needle having a construction of a coupled portion suited for speeding up.

Technical Solution

[0011] This and other objects are solved by a knitting needle having the features as set forth in claim 1. Preferred embodiments of the knitting needle are stated in the subclaims.

[0012] In accordance with an aspect of the present invention, a knitting needle is provided, having a needle body and a needle jack, suitable to be accommodated in a needle groove of a flatbed knitting machine and coupled to each other capable of sliding shift,

the needle body having a hook on a front end side and a concave portion disposed in the needle groove depth direction on the tail end side, and the needle jack having a convex portion protruding from the front end side in the depth direction of the needle groove to be fitted into the concave portion of the needle body characterized in that borings disposed on both sides of the foot of the convex portion of the needle jack in such a manner as to form a clearance between the edges of both ends of the concave portion of the needle body, the boring of the tail end side is larger than the boring of the front end side, and

the shape of the tail end side boring provided with:

an extension part being formed in a curved line of a comparatively large curvature radius or straight line so that the extension part extends from the vicinity of the location facing a tail side end of the concave portion to the inside of the opening,

a curved part continuing from the extension part, on the tail end side of a center line of the concave portion, along the extending direction via the depth direction of the needle groove, and returning to the tail end side direction; and

a width enlarging part continuing the curved part so that the width in the length direction of the needle groove is enlarged to be equal to that of the bottom head end in the halfway between the bottom head end and the foot of the convex portion.

[0013] In the present invention, the needle jack has a width adding part in which the width in the depth direction of the needle groove increases in the vicinity of the bottom head end having the extension part.

[0014] In the present invention, the convex portion of the needle jack has the width enlarging part provided with a straight-line shape nearly parallel to the bottom head end.

Advantageous Effects

[0015] According to the present invention, the convex portion of the needle jack has borings of shapes including an extension part, curved part, and width enlarging part on the tail end side which may be subject to large impact force. The shape of the tail end side boring continues from the extension part of the tail end side via the depth direction of the needle groove at the curved part after extending inside an opening of the concave portion from the vicinity of the location facing the edge on the tail end side of the concave portion at the extension part and returns to the tail end side. Since the curved part is located inside the foot of the convex portion by the extension part, the curved part is able to be provided in a space wider than the vicinity of the location of the end of the foot facing to the end of the concave portion. Increasing the curvature radius of the curved part by the use of the wide space allows to get rid of the remainder such as edges, after processing and can disperse stress and avoid stress concentration even when a load is applied. The tail end side boring does not arrive on the front end side from the center line of the concave portion, and therefore large strength drop is able to be avoided. The coupled portion of the knitting needle according to the present invention can avoid stress concentration and is free of large strength drop, and therefore, is suited for speeding up.

[0016] In addition, according to the present invention, a width adding part is provided to the needle jack to compensate for strength drop by formation of a large tail end side boring.

[0017] Furthermore, according to the present invention, having a large tail end side boring facilitates punching press of the convex portion of the needle jack.

Brief Description of Drawings

[0018]

[Fig. 1] Fig. 1 is a side view showing a construction of a compound needle 11 as one embodiment of the present invention by the vicinity of a coupled portion.
[Fig. 2] Fig. 2 is a side view showing a condition in which coupling between the needle body 2 and the needle jack 16 of Fig. 1 is released.
[Fig. 3] Fig. 3 is a side cross-sectional view showing a condition in which the needle jack 16 sinks in the needle groove 20 together with the slider substrate 15 by the pressing force to the slider body 15 of Fig. 1.
[Fig. 4] Fig. 4 is a side view showing dimensional examples of the main portion of the coupled portion between the needle body 2 and the needle jack 16 with respect to the compound needle 11 of Fig. 1.
[Fig. 5] Fig. 5 is a side view showing a construction of the needle jack 26 in the vicinity of the front end as another embodiment of the present invention.
[Fig. 6] Fig. 6 is a side view showing a construction of a conventional compound needle 1.
[Fig. 7] Fig. 7 is a side view showing a construction of the compound needle 1 of Fig. 6 in the vicinity of the coupled portion.

Explanation of References

[0019]

2.	Needle body
2b.	Concave portion
11.	Compound needle
15.	Slider body
16, 26.	Needle jack
16b, 26b.	Convex portion
16d, 26d.	Front end side boring
16e, 26e.	Tail end side boring
16f.	Width adding part
16g, 26g.	Extension part
16h, 26h.	Curved part
16i, 26i.	Width enlarging part

Best Mode for Carrying Out the Invention

[0020] Fig. 1 shows a construction of a compound needle 11 as one embodiment of the present invention by the vicinity of a coupled portion. In the compound needle 11, a needle body 2 equivalent to that of the compound needle 1 of Fig. 6 is used. A slider body 15 also has the basic function equivalent to that of the slider body 5 of the compound needle 1 of Fig. 6, except for a main butt 15a shown in Fig. 3 corresponding to a butt 5a and having a sub butt 15b separately. That is, the compound needle 11 has the construction other than the needle jack 16 basically equivalent to that of the compound needle 1 of Fig. 6. Hereinafter, the portions equivalent to and corresponding to Fig. 6 are given same reference characters and redundant description may be omitted.

[0021] In the compound needle 11, at the foot of a convex portion 16b of a needle jack 16, a front end side boring 16d and a tail end side boring 16e are provided. The front end side boring 16d and the tail end side boring 16e form a clearance with a front side end portion 2d on the front end side and a tail side end portion 2e on the tail end side of a concave portion 2b of the needle body 2, respectively. When the front end side boring 16d is compared with the tail end side boring 16e, the tail end side boring 16e is larger than the front end side boring 16d. However, even if the tail end side boring 16e becomes large, the tail end side boring is formed on the tail end side from the center line 2c of the concave portion 2b. Providing this kind of large tail end side boring 16e can relax stress concentration and is able to make the convex portion 16b difficult to break even when an impact load is applied. The width of the convex portion 16b decreases between the front end side boring 16d and the tail end side boring 17e, but if the width at the foot as shown in the figure is secured, strength against a load associated with knitting operation can be sufficiently secured.

[0022] Fig. 2 shows a condition in which coupling between the needle body 2 and the needle jack 16 of Fig. 1 is released. The upper side of the portion where the tail end side boring 16e of the needle jack 16 is provided, that is, the portion which becomes the surface side in the needle groove, has the width adding part 16f added and the width is partially increased. Consequently, the needle jack 16 does not have the width H constant as in the case of the needle jack 6 shown in Fig. 7, but has the width adding part 16f added to increase the width to compensate for the strength.

[0023] The tail end side boring 16e includes an extension part 16g, curved part 16h, and width enlarging part 16i. The extension part 16g is formed in a curved line of a comparatively large curvature radius or straight line so that the extension part 16g extends from the vicinity of the location facing the tail side end portion 2e of the concave portion 2b to the inside of the opening. The curved part 16h continues to the extension part 16g and curves from the extension direction to the front end side in the extension part 16g to return in the direction to the tail end side via the depth direction of the needle groove. The curved part 16h curving in this way is formed on the tail end side from the center line 2c of the concave portion 2b. Since the curved part 16h is located not at the foot of the convex portion 16b but at the halfway between the foot and the head end, the curvature radius is increased to avoid stress concentration by the use of a space wider than that at the foot.

[0024] The width enlarging part 16i is formed to be continuous with the curved part 16h so that the width becomes equal to that of the head end at the halfway between the head end and the foot of the convex portion 16b. Incidentally, the head end of the convex portion 16b

is divided into a bottom front end side 16j with which the needle jack 16 comes in contact in the floating condition in the needle groove as in the case of Fig. 6(a) and a bottom tail end side 16k with which the needle jack 16 comes in contact in a slanting condition as in the case of Fig. 6(b). The bottom of the concave portion 2b is flat whereas the bottom tail end side 16k to the bottom front end side 16j at the head end of the convex portion 16b is tilted so that it corresponds to the oscillating shift angle. The shape on the head end side of this kind of convex portion 16b is same in the convex portion 6b of the needle jack 6 of Fig. 6. In the needle jack 16, the width enlarging part 16i is nearly parallel to the bottom tail end side 16k.

[0025] Fig. 3 shows a condition in which the needle jack 16 sinks in the needle groove 20 together with the slider body 15 by the pressing force to the main butt 15a of the slider body 15. The needle groove 20 accommodates the compound needle 11 and guides sliding shift of the compound needle 11 in the right and left direction of Fig. 3. The needle groove 20 is formed between adjacent needle plates 21 by installing needle plates 21 upright on a needle bed substrate 22 at regular intervals. Under a condition in which the needle jack 16 is floating in the needle groove 20, the slider body 15 is also floating, and the main butt 15a and the sub butt 15b protrude on the upper side from the upper edge of the needle plate 21. A cam that drives the compound needle 11 is mounted to a carriage. When the cam 23 depresses, for example, the main butt 15a, the slider body 15 sinks in the needle groove 20 and the needle jack 16 also sinks in the needle groove 20. A width adding part 16f shown in Fig. 2 is able to be installed within a range not interfering with the action as shown in Fig. 3. The sub butt 15b is installed on the slider body 15 to sink it in the needle groove 20 by pressing force and to stop action of the cam 23 on the main butt 15a.

[0026] Fig. 4 shows a dimensional example of the coupled portion between the needle body 2 and the needle jack 16 with respect to a compound needle 11 for use in a 12-gauge machine. The needle body 2 and the needle jack 16 are formed with steel sheet of about 0.8 mm thick. In processing of this kind of raw material, the minimum curvature radius becomes about 0.3 mm. The tail end side of the upper edge on the front end side to which the convex portion 16b is provided in the needle jack 16 is a straight line in which the curvature radius R reaches an infinitely great value ∞, and the part of a curvature radius R = 200 mm continues on the head end side. In the lower edge on the front end side of the needle jack 16, the part of a curvature radius R = 1000 mm continues to the part of a curvature radius R = 181 mm in a direction from the tail end side to the front end side. These curved parts are formed concurrently with the curvature center located above. On the upper edge side of the needle jack 16, the width adding part 16f is added so that the curvature center located below at curvature radius R = 8 mm. The extension part 16g continuing to the lower edge on the front end side of the needle jack 16 is formed in such a manner that the curvature radius R becomes 3 mm from the lower center. The curved part 16h has the curvature radius R of 0.4 mm, which is larger than the minimum curvature radius of 0.3 mm. The center of the curvature of the curved part 16h is located inside the concave portion 2b.

[0027] Fig. 5 shows a construction of a needle jack 26 in the vicinity of the front end as the other embodiment of the present invention. The needle jack 26 is able to form a knitting needle by coupling with the needle body 2 as in the case of the needle jack 16 of Fig. 1. In the needle jack 26, nothing that corresponds to the width adding part 16f such as needle jack 16 is provided.

[0028] As shown in Fig. 5(a), in the convex portion 26b, the front end side boring 26d, bottom front end side 26j and bottom tail end side 26k are equivalent to the front end side boring 16d, bottom front end side 16j, and bottom tail end side 16k of the needle jack 16, respectively. Same as the tail end side boring 16e, the tail end side boring 26e has an extension part 26g, a curved part 26h, and a width enlarging part 26i. The curvature radius of the curved part 26h becomes larger than the curvature radius of the curved part 16 h and is 0.5 mm.

[0029] In Fig. 5(b), the shape of the needle jack 6 is shown by a broken line. That is, the needle jack 26 has a shape that can be formed by post-machining, too, so that a tail end side boring 26e is able to be added to the needle jack 6. However, as shown in Fig. 5(a), the shape of the width enlarging part 26i becomes a curved boring to the protruded head end of the convex portion 26b, which is difficult to manufacture by punching press.

[0030] The needle jack 16 of Fig. 1, the needle jack 26 of Fig. 5, and the needle jack 6 of Fig. 6 are able to be compared by simulation in the stress concentration condition at the time of impact load. The knitting needle is subject to the maximum impact load when the knitting yarn supplied to a hook advanced to the needle bed gap is drawn in by allowing the stitch cam to work on the butt. Simulating this kind of condition by the use of the finite element method indicates that stress is dispersed to the extension part 16g, 26g and the curved part 16h, 26h. It has been identified that by the stress dispersion, the maximum stress is reduced by about 20% in the needle jack 16 and by about 14% in the needle jack 26 as compared to the needle jack 6. Furthermore, the curvature radius of the curved part 16h and 26h increases thus, the edge tends not to remain. Consequently, even when the knitting operation speed is increased, applying the present invention can reduce the impact force, can avoid stress concentration, and can make the convex portion 6b of the needle jack 6 difficult to break.

[0031] In the foregoing embodiments, the present invention is applied to a compound needle as described in Patent Citation 3. Incidentally, to the slider body 15, two slider butts of the main butt 15a and the sub butt 15b are provided, but this is equivalent with respect to the coupled portion even when one slider butt 5a is provided as in the case of the slider body 5 of Patent Citation 3. In addition, the preset invention is not limited to these com-

pound needles but is able to be applied to other types of knitting needles, such as the latch needle of Patent Citation 1 and the compound needle of Patent Citation 2.

Claims

1. A knitting needle (1), having a needle body (2) and a needle jack (16, 26) (16j, 16k, 26j, 26k) of the convex portion (16b, 26b), suitable to be accommodated in a needle groove of a flatbed knitting machine and capable of sliding shift,
the needle body (2) having a hook on a front end side and a concave portion (2b) disposed in the needle groove depth direction on the tail end side, and the needle jack (16, 26) having a convex portion (16b, 26b) protruding from the front end side in the depth direction of the needle groove to be fitted into the concave portion (2b) of the needle body (2), wherein
borings (16d, 26d; 16e, 26e) are disposed on both sides of the foot of the convex portion (16b, 26b) of the needle jack (16, 26) in such a manner as to form a clearance between the edges of both ends of the concave portion (2b) of the needle body (2), **characterized in that** the boring (16e, 26e) of the tail end side is larger than the boring (16d, 26d) of the front end side, and the shape of the tail end side boring is provided with:

   an extension part (16g, 26g) being formed in a curved line of a comparatively large curvature radius or straight line so that the extension part (16g, 26g) extends from the vicinity of the location facing a tail side end portion (2e) of the concave portion (2b) to the inside of the opening,
   a curved part (16h, 26h) continuing from the extension part (16g, 26g), on the tail end side of a center line of the concave portion (2b), along the extending direction via the depth direction of the needle groove, and returning to the tail end side direction; and
   a width enlarging part (16i, 26i) continuing the curved part (16h, 26h) so that the width in the length direction of the needle groove is enlarged to be equal to that of a head end coupled to each other in the halfway between the head end and the foot of the convex portion (16b,26b).

2. The knitting needle according to claim 1,
wherein the needle jack (2) has a width adding part (16f) on its upper edge side in which the width in the depth direction of the needle groove increases in the vicinity of where the tail end side boring has the extension part (16g, 26g).

3. The knitting needle according to claims 1 or 2,
wherein the convex portion (2b) of the needle jack (2) has the width enlarging part (16i, 26i) provided with a straight-line shape nearly parallel to the head end.

Patentansprüche

1. Stricknadel (1) mit einem Nadelkörper (2) und einem Nadelstößer (16, 26), die aneinander gekoppelt sind, die geeignet ist, um in einer Nadelrille einer Flachstrickmaschine aufgenommen zu werden und geeignet ist für eine Gleitverschiebung,
wobei der Nadelkörper (2) einen Haken an einer vorderen Endseite und einen konkaven Bereich (2b) aufweist, der in der Tiefenrichtung der Nadelrille an der Seite des Fußendes angeordnet ist, und der Nadelstößer (16, 26) mit einem konvexen Teilbereich (16b, 26b) von der vorderen Endseite in der Tiefenrichtung der Nadelrille hervorsteht, um in den konkaven Teilbereich (2b) des Nadelkörpers (2) hinein zu passen, wobei
Ausbohrungen (16d, 26d; 16e, 26e) auf beiden Seites des Fußes des konvexen Bereichs (16b, 26b) des Nadelstößers (16, 26) so angeordnet sind,
dass sie einen Freiraum zwischen den Kanten von beiden Enden des konkaven Bereichs (2b) des Nadelkörpers (2) bilden, **dadurch gekennzeichnet, dass**
die Ausbohrung (16e, 26e) der Seite des Fußendes größer ist als die Ausbohrung (16d, 26d) der vorderen Endseite, und die Gestalt der Ausbohrung der Seite des Fußendes ausgestattet ist mit:

   einem Verlängerungsteil (16g, 26g), das in einer Bogenlinie eines vergleichsweise großen Kurvenradius oder einer geraden Linie ausgebildet ist, so dass das Verlängerungsteil (16g, 26g) sich von der Umgebung der Stelle, die einem Fußseitenendbereich (2e) des konkaven Bereichs (2b) zugewandt ist, zu dem Inneren der Öffnung erstreckt,
   einem gebogenen Teil (16h, 26h), das sich von dem Verlängerungsteil (16g, 26g) auf der Fußendeseite einer Mittellinie des konkaven Bereichs (2b) entlang der Erstreckungsrichtung über die Tiefenrichtung der Nadelrille fortsetzt, und zu der Fußendeseitenrichtung zurückkehrt; und
   einem Breitenvergrößerungsteil (16i, 26i), das das gebogenen Teilstück (16h, 26h) so fortsetzt, dass die Breite in der Längsrichtung der Nadelrille vergrößert wird, so dass sie gleich ist mit der eines Kopfendes (16j, 16k, 26j, 26k) des konvexen Bereichs (16b, 26b) auf halber Strecke zwischen dem Kopfende und dem Fuß des konvexen Bereichs (16b, 26b).

2. Stricknadel nach Patentanspruch 1,

wobei der Nadelstößer (2) ein breitehinzufügendes Teil (16f) an seiner oberen Kantenseite aufweist, in dem sich die Breite in der Tiefenrichtung der Nadelrille in der Umgebung von der Stelle erhöht, wo die Fussendeseitenausbohrung den Verlängerungsteilabschnitt (16g, 26g) aufweist.

3. Stricknadel nach Patentanspruch 1 oder 2, wobei das Breitenvergrößerungsteil (16i, 26i) des konvexen Bereichs (2b) des Nadelstößers (2) mit einer geradlinigen Form annähernd parallel zu dem Kopfende ausgestattet ist.

Revendications

1. Aiguille à tricoter (1), comportant un corps d'aiguille (2) et un levier d'aiguille (16, 26) couplés entre eux, apte à être accueillie dans une gorge d'aiguille d'une machine à tricoter à plat et pouvant se déplacer en coulissant,
le corps d'aiguille (2) comportant un crochet sur le côté d'extrémité avant et une portion concave (2b) disposée dans la direction de la profondeur de la gorge d'aiguille sur le côté d'extrémité arrière, et le levier d'aiguille (16, 26) comportant une portion convexe (16b, 26b) faisant saillie à partir du côté de l'extrémité avant dans la direction de la profondeur de la gorge d'aiguille pour s'adapter dans la portion concave (2b) du corps d'aiguille (2), dans laquelle des alésages (16d, 26d ; 16e, 26e) sont disposés sur les deux côtés du pied de la portion convexe (16b, 26b) du levier d'aiguille (16, 26) de façon à former un jeu entre les bords des deux extrémités de la portion concave (2b) du corps d'aiguille (2), **caractérisé en ce que** l'alésage (16e, 26e) du côté de l'extrémité arrière est plus grand que l'alésage (16d, 26d) du côté de l'extrémité avant, et la forme de l'alésage du côté de l'extrémité arrière est munie :
d'une partie d'extension (16g, 26g) ayant une forme en ligne courbe ayant un rayon de courbure relativement grand ou en ligne droite afin que la partie d'extension (16g, 26g) s'étende à partir du voisinage de l'emplacement opposé à la portion d'extrémité du côté arrière (2e) de la portion concave (2b) jusqu'à l'intérieur de l'ouverture,
d'une partie courbe (16h, 26h) continuant à partir de la partie d'extension (16g, 26g), sur le côté de l'extrémité arrière d'une ligne centrale de la portion concave (2b), suivant la direction d'extension via la direction de la profondeur de la gorge d'aiguille, et revenant vers la direction du côté de l'extrémité arrière ; et
une partie d'élargissement (16i, 26i) continuant la partie courbe (16h, 26h) de telle sorte que la largeur dans la direction de la longueur de la gorge d'aiguille s'élargit pour être égale à celle d'une extrémité de tête (16j, 16k, 26j, 26k) de la portion convexe (16b, 26b) à mi-chemin entre l'extrémité de tête et le pied de la portion convexe (16b, 26b).

2. Aiguille à tricoter selon la revendication 1, dans laquelle le levier d'aiguille (2) comporte une partie d'ajout de largeur (16f) sur son côté de bord supérieur dans laquelle la largeur dans la direction de la profondeur de la gorge d'aiguille augmente au voisinage de l'endroit où l'alésage du côté de l'extrémité arrière comporte la partie d'extension (16g, 26g) .

3. Aiguille à tricoter selon les revendications 1 ou 2, dans laquelle la portion convexe (2b) du levier d'aiguille (2) a sa partie d'élargissement (16i, 26i) en forme de ligne droite presque parallèle à l'extrémité de tête.

Fig. 1

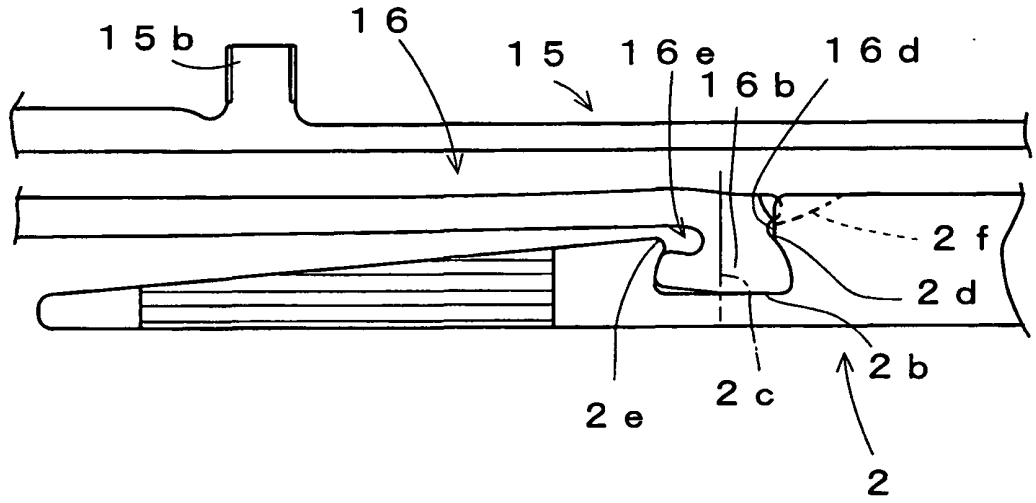
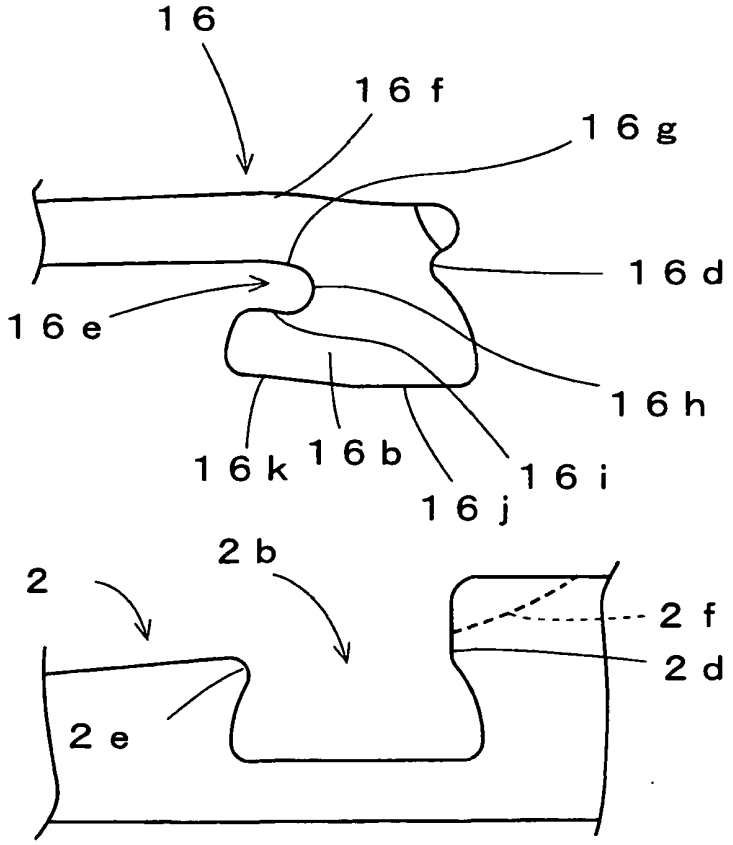

11
15b
16
15
16e
16b
16d
2f
2d
2b
2c
2e
2

Fig. 2


16
16f
16g
16d
16e
16h
16k
16b
16i
16j
2
2b
2f
2d
2e

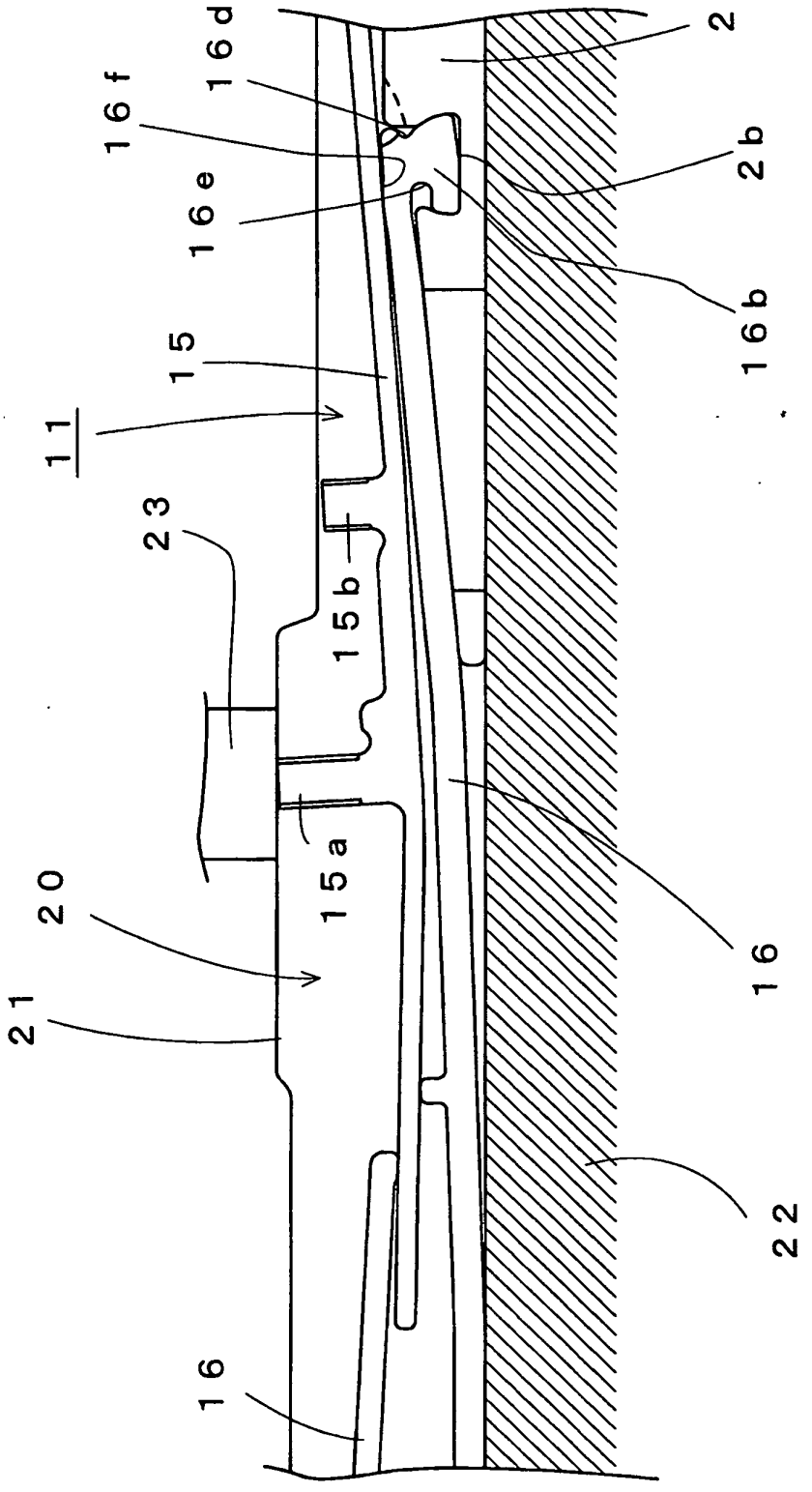


Fig. 3

Fig. 4

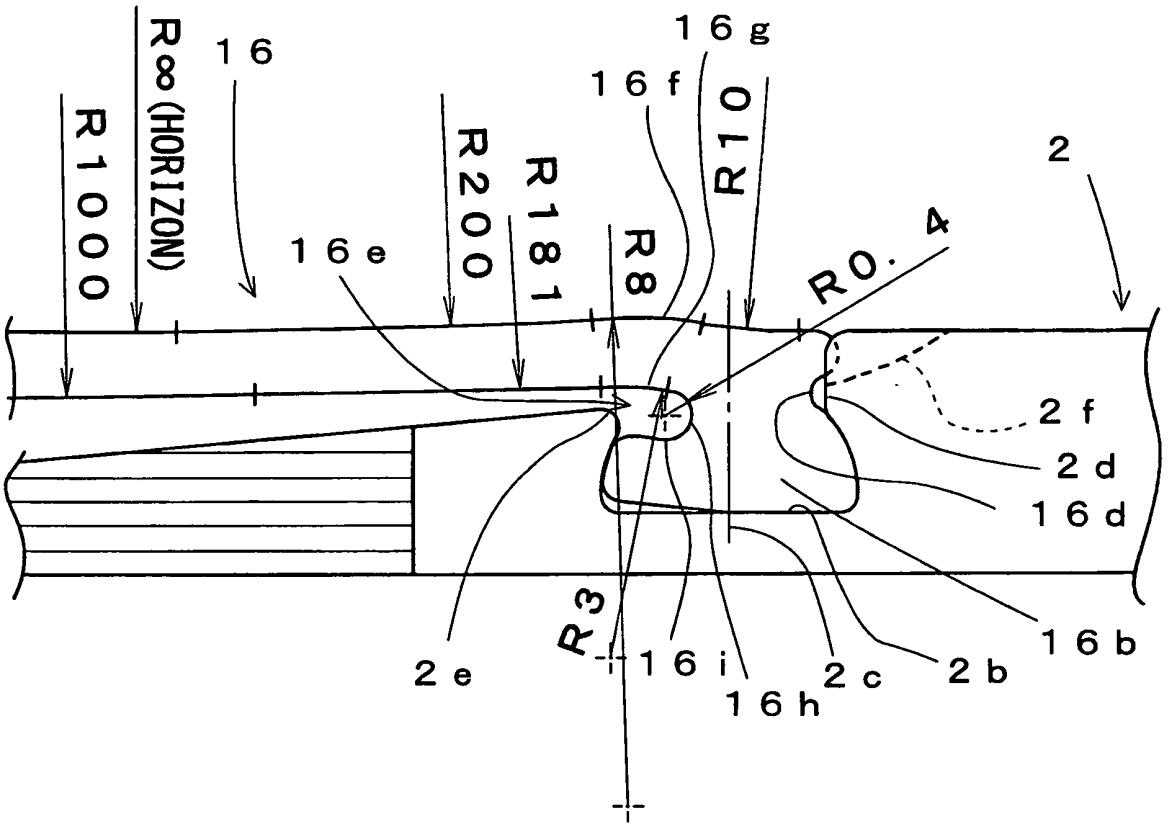

R∞ (HORIZON)
16
16g
16f
R1000
R200
R181
R8
R10
2
16e
R0.4
2f
2d
16d
16b
R3
2e
16i
2c
2b
16h

Fig. 5

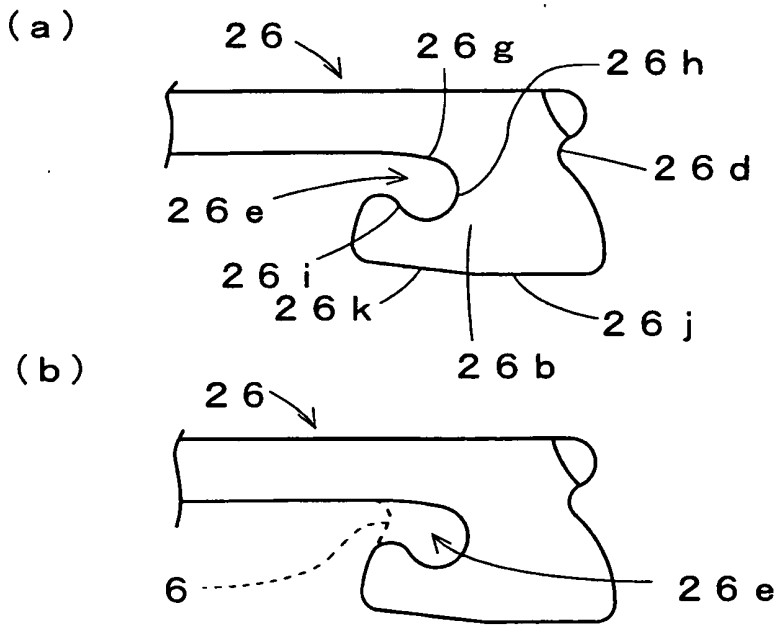
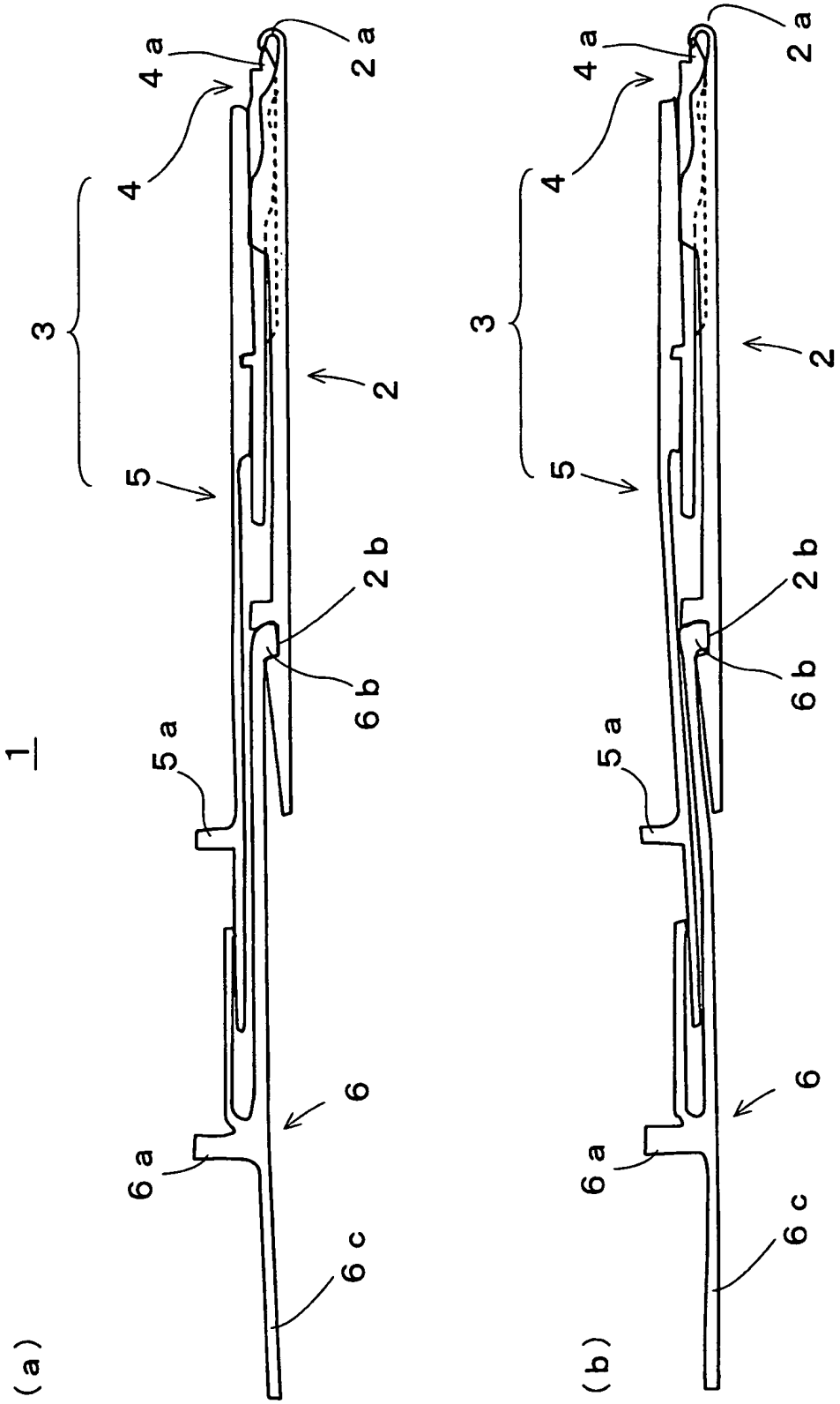

(a)
26
26g
26h
26d
26e
26i
26k
26j
26b
(b)
26
6
26e

Fig.6



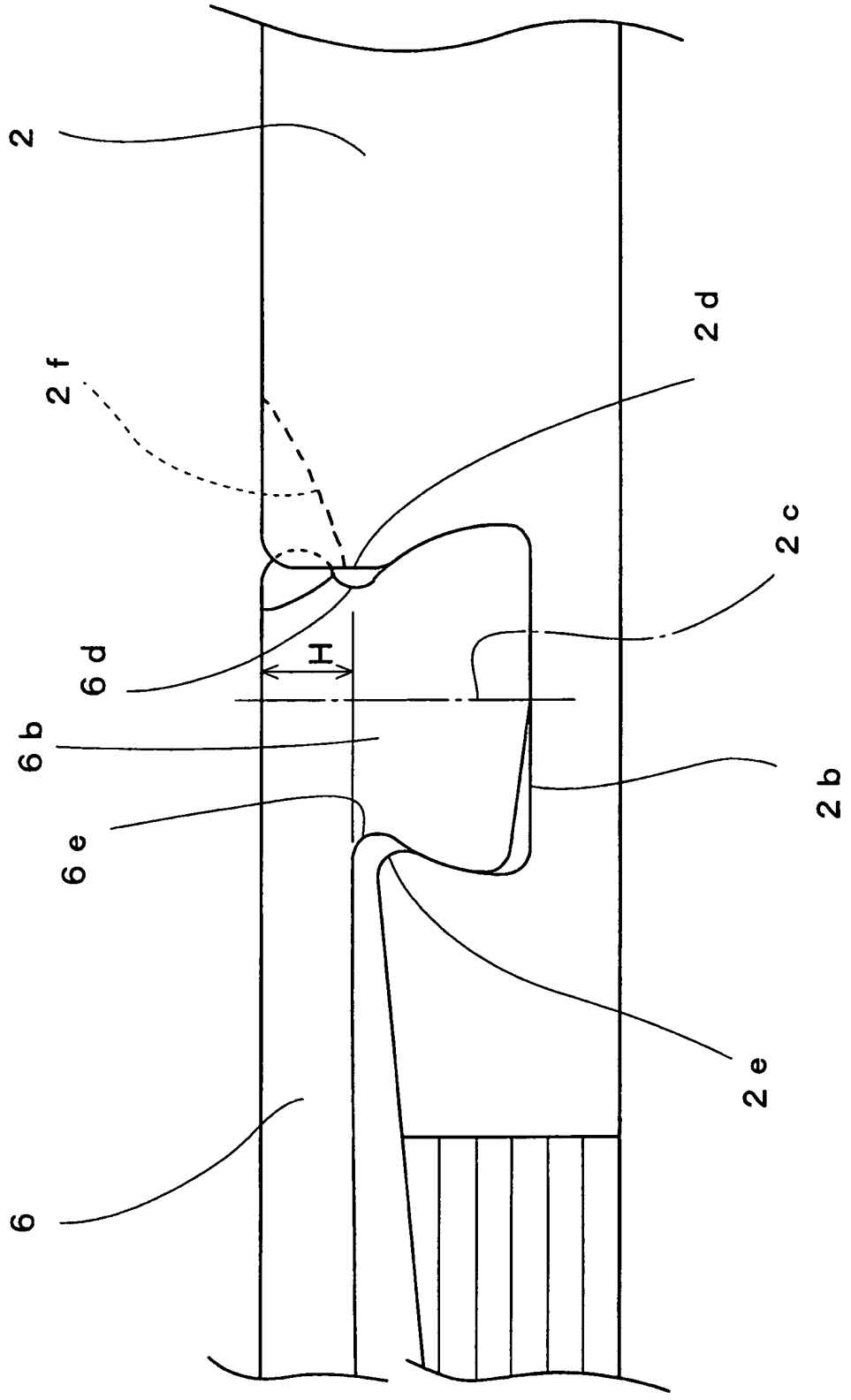


Fig. 7

REFERENCES CITED IN THE DESCRIPTION

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