

(19)



(11)

EP 2 805 750 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
01.02.2017 Bulletin 2017/05

(51) Int Cl.:
A63B 49/022 ^(2015.01)

(21) Application number: **14168889.5**

(22) Date of filing: **19.05.2014**

(54) **Racket**

Schläger

Raquette

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**

(30) Priority: **23.05.2013 JP 2013109183**

(43) Date of publication of application:
26.11.2014 Bulletin 2014/48

(73) Proprietor: **Yonex Kabushiki Kaisha**
Joint-stock company of Japan
Tokyo 113-8543 (JP)

(72) Inventors:
• **Yamanaka, Yosuke**
Tokyo, 113-8543 (JP)

• **Ohtani, Kazuya**
Niigata, 949-5123 (JP)

(74) Representative: **Heine, Christian Klaus**
KNH Patentanwälte Kahlhöfer Neumann
Rößler Heine PartG mbB
Postfach 10 33 63
40024 Düsseldorf (DE)

(56) References cited:
DE-A1- 4 115 502 DE-U1- 9 308 902
US-A- 1 470 878 US-A1- 2009 017 948
US-E- R E34 420

EP 2 805 750 B1

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

BACKGROUND

Technical Field

[0001] The present invention relates to rackets used for such as badminton.

Related Art

[0002] Rackets that are used for badminton and the like generally have a shaft, a frame joined to a tip end side in a longitudinal direction of the shaft, and a handle joined to a rear end side in the longitudinal direction of the shaft, and a plurality of holes for a string to pass through are provided along a circumferential direction of the frame (for example, refer to Patent Literature 1). Strings are strung so that within the frame a plurality of vertical strings that are a region of the strings extending in the longitudinal direction are aligned with intervals therebetween in a width direction orthogonal to the longitudinal direction, and a plurality of horizontal strings that are a region of strings extending in the width direction are aligned with intervals therebetween in the longitudinal direction. Thus, a net-like hitting surface is formed.

[0003] [Patent Literature 1] Japanese Laid-open Application No.2000-42145 Document DE-U-9308902 describes a racket wherein the string holes of the horizontal strings are parallel and extend in a width direction.

[0004] With the racket, the frame area is made small so that high-speed swing is possible, and the speed of a shuttlecock when smashing can be improved. But, when the frame area of the racket is made small, a sweet spot also becomes small, and controllability decreases. Further, it is well-known that the speed of the shuttlecock increases by smashing using an upper portion within the frame (a region to a tip end side in the longitudinal direction), and in particular an experienced player has a tendency to use the upper portion within the frame at the time of hitting.

SUMMARY

[0005] An advantage of some aspects of the present invention is that it is possible to expand the sweet spot to the tip end side in the longitudinal direction within the frame.

[0006] An aspect of the invention is a racket comprising:

a shaft;
a frame joined to a tip end side in a longitudinal direction of the shaft; and
a handle joined to a rear end side in the longitudinal direction of the shaft,
wherein the frame is provided with a plurality of through holes that penetrate from an inner peripheral

surface to an outer peripheral surface for a string to pass through,

a through hole has a first angle formed between a width direction and a penetrating direction of the through hole smaller than a second angle formed between the width direction and a normal direction to the inner peripheral surface in a position provided with the through hole, the through hole being for the string along the width direction orthogonal to the longitudinal direction on a hitting surface of the racket to pass through, the through hole being positioned to the tip end side in the longitudinal direction than a center of the frame.

[0007] Other features of the present invention will be made clear through the present specification with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] For a more complete understanding of the present invention and the advantages thereof, reference is now made to the following description taken in conjunction with the accompanying drawings wherein:

Fig. 1 is a front view and a perspective view of a badminton racket;

Fig. 2 is a front view of an upper half of a frame of the racket;

and

Fig. 3A and Fig. 3B are drawings showing a difference in a movable range of a horizontal string due to a difference in penetrating directions of string holes.

DESCRIPTION OF EXEMPLARY EMBODIMENTS

[0009] At least the following matters will become clear through the description of the present specification and the accompanying drawings.

[0010] From the description in this specification and the drawings, at least the below matters will become clear.

[0011] In other words, as claimed in claim 1 a racket includes:

a shaft;

a frame joined to a tip end side in a longitudinal direction of the shaft; and

a handle joined to a rear end side in the longitudinal direction of the shaft,

wherein the frame is provided with a plurality of through holes that penetrate from an inner peripheral surface to an outer peripheral surface for a string to pass through,

a through hole has a first angle formed between a width direction and a penetrating direction of the through hole smaller than a second angle formed

between the width direction and a normal direction to the inner peripheral surface in a position provided with the through hole, the through hole being for the string along the width direction orthogonal to the longitudinal direction on a hitting surface of the racket to pass through, the through hole being positioned to the tip end side in the longitudinal direction than a center of the frame.

[0012] With such a racket, a movable range of a string along a width direction strung in a region to the tip end side in the longitudinal direction within the frame can be made long. Therefore, a deformation amount of the string at the time of hitting in the region to the tip end side in the longitudinal direction within the frame can be made large, and the sweet spot to the tip end side in the longitudinal direction within the frame can be expanded.

[0013] With such a racket, the string along the longitudinal direction is not passed through the through hole, the through hole being for the string along the width direction to pass through, the through hole having the first angle smaller than the second angle.

[0014] According to such a racket, a drilling processing to the frame can be easily performed.

[0015] With such a racket, the first angle is zero degrees.

[0016] According to such a racket, the sweet spot to the tip end side in the longitudinal direction within the frame can be expanded more certainly.

[0017] With such a racket, the through hole is not provided to the rear end side in the longitudinal direction than the center of the frame, the through hole being for the string along the width direction to pass through, the through hole having the first angle smaller than the second angle.

[0018] According to such a racket, the sweet spot to the rear end side in the longitudinal direction within the frame can be suppressed from becoming wider than necessary.

[0019] With such a racket, the penetrating direction of the through hole is along the normal direction to the inner peripheral surface in the position provided with the through hole, the through hole being for the string along the longitudinal direction to pass through.

[0020] According to such a racket, the sweet spot can be suppressed from expanding more than necessary in the longitudinal direction.

=== Regarding Racket 1 ===

[0021] Hereinbelow, a badminton racket as a racket according to this invention is given as an example to explain the Embodiments. Fig. 1 shows a front view and a perspective view of the badminton racket (hereinbelow, racket 1). Note that, the left drawing is the front view and the right drawing is the perspective view. Fig. 2 is a front view of an upper half of a frame 10 of the racket 1. The racket 1 has a shaft 20, the frame 10 joined to the tip end

side in the longitudinal direction of the shaft 20, a handle 30 joined to the rear end side in the longitudinal direction of the shaft 20, strings 40 stretched tightly in the inner side of the frame 10, and grommets 50 through which the strings 40 are passed. In the explanation, a direction orthogonal to the longitudinal direction on a hitting surface of the racket 1 (on a plane along the hitting surface) is called a width direction, and a direction orthogonal to the hitting surface of the racket 1 is called a thickness direction.

[0022] The shape of the frame 10 is a substantially oval shape extending in the longitudinal direction. Further, the frame 10 is provided with a plurality of string holes 11 (corresponds to through holes) with intervals therebetween along a circumferential direction of the frame 10 over almost the entire perimeter of the frame 10, the string holes 11 being for the strings 40 to pass through, and the string holes 11 penetrating from an inner peripheral surface 10a thereof to an outer peripheral surface 10b thereof. As shown in Fig. 2, the grommet 50 has a cylindrical portion 51 and a top portion 52, and the cylindrical portion 51 and the top portion 52 are provided with a hole for the string 40 to pass through. The cylindrical portion 51 of the grommet 50 is passed through the string hole 11, a tip end of the cylindrical portion 51 protrudes from the inner peripheral surface 10a of the frame 10, and the top portion 52 is engaged to the outer peripheral surface 10b of the frame 10.

[0023] Further, at the time the strings 40 are stretched tightly in the frame 10, for example, the string 41 that is passed through the string holes 11 (grommet 50) from an inner side of the frame 10 to the outside of the frame 10 is turned back along the outer peripheral surface 10b of the frame 10, and an action of passing the string through the next string hole 11 (grommet 50) is repeated. As a result, in the inner side of the frame 10, a plurality of "horizontal strings 41" which is a region of the strings 40 along the width direction are strung with intervals therebetween in the longitudinal direction and a plurality of "vertical strings 42" which is a region of the strings 40 along the longitudinal direction intersecting the horizontal strings 41 are strung with intervals therebetween in the width direction. Thus, a net-like hitting surface is formed. Note that, in a region to the tip end side in the longitudinal direction of the frame 10, a recessed portion 12 is provided in the outer peripheral surface 10b, and openings of the string holes 11 are provided in the recessed portion 12, thus the string 40 is turned back in the recessed portion 12.

=== Regarding String Hole 11 ===

[0024] Fig. 3A and Fig. 3B are drawings showing a difference in the movable range of the horizontal string 41 due to a difference in the penetrating direction of the string holes 11. With the racket 1, by making an area of the frame 10 (an area of the frame 10 and a hitting surface) small, air resistance at the time of swinging de-

creases, and high-speed swinging becomes possible, thus the speed of the shuttlecock at the time of smashing can be improved. But, in a case where the area of the frame 10 is made small, the sweet spot also becomes small, and controllability decreases. The sweet spot is a region with good repulsion and little vibration at the time of hitting. With the substantially oval-shaped frame 10, the horizontal string 41 that passes through the sides (the both end portions in the width direction and a central portion in the longitudinal direction) is longer than the horizontal string 41 that passes through the end portions in the longitudinal direction, and the vertical string 42 that passes through the top (a tip end portion in the longitudinal direction and a central portion in the width direction) are longer than the vertical string 42 that passes through the end portions in the width direction, and a deformation amount of the strings 40 at the time of hitting with the central portion within the frame 10 is large, thus the central portion within the frame 10 becomes the sweet spot. On the other hand, it is known that by smashing using the region to the tip end side in the longitudinal direction in the frame 10, the speed of the shuttlecock improves, and in particular an experienced player has a tendency to use the region to the tip end side in the longitudinal direction within the frame 10 at the time of hitting. Thus, the racket 1 in this Embodiment aims to expand the sweet spot to the tip end side in the longitudinal direction within the frame 10.

[0025] Therefore, in this Embodiment, as shown in Fig. 2, an angle $\theta 1$ (hereinbelow, also referred to as a "penetrating angle", and corresponds to a first angle) formed by the width direction and a penetrating direction of the string holes 11 positioned to the tip end side in the longitudinal direction than a center O of the frame 10, of the plurality of the string holes 11 through which the horizontal strings 41 are passed, is made smaller than an angle $\theta 2$ (hereinbelow, also referred to as a "normal angle", corresponds to a second angle) formed by the width direction and a normal direction of the inner peripheral surface 10a of the frame 10 in a position provided with the string hole 11 (a vertical direction in respect to a tangent to the inner peripheral surface 10a).

[0026] Specifically, the penetrating angle $\theta 1$ of the eight string holes 11 in total (hereinbelow also referred to as "horizontal string holes") are made smaller than normal angle $\theta 2$, the eight string holes 11 being 2 string holes 11a(3), 11b(3) for a third horizontal string 41 (3) from the tip end side in the longitudinal direction to pass through, 2 string holes 11a(4), 11b(4) for a fourth horizontal string 41(4) to pass through, 2 string holes 11a(6), 11b(6) for a sixth horizontal string 41(6) to pass through, and 2 string holes 11a(8), 11b(8) for an eighth horizontal string 41(8) to pass through, of the horizontal strings 41 aligned in the longitudinal direction. Note that, a cylindrical portion 51 of the grommet 50 is passed through along the string hole 11, so that the angle $\theta 1$ formed by the axial direction of the grommets 50 that are passed through the eight horizontal string holes 11 and the width

direction are also smaller than the normal angle $\theta 2$.

[0027] Further, with the racket 1 of this Embodiment, the horizontal string holes 11 are penetrated so that the penetrating direction of the horizontal string holes 11 are formed along the width direction as much as possible (a direction in which the horizontal string 41 extends within the frame 10). In other words, the horizontal string holes 11 are penetrated so that the penetrating angle of the horizontal string holes 11 come as close as possible to zero degrees. In Fig. 2, the penetrating angle $\theta 1$ of the horizontal string holes 11a(6), 11b(6), 11a(8), 11b(8) through which the sixth and the eighth horizontal strings 41(6), 41(8) pass is zero degrees. It is not limited to this however, and for example, the penetrating angle $\theta 1$ of the horizontal string holes 11 through which the third and fourth horizontal strings 41(3), 41(4) pass may be made as zero degrees, or on the other hand, the penetrating angle $\theta 1$ of the horizontal string holes 11 for the sixth and eighth horizontal strings 41(6), 41(8) to pass through may be made larger than zero degrees, or the penetrating angle $\theta 1$ of the 2 horizontal string holes 11 for a horizontal string 41 with the same number to pass through may vary. Further, the penetrating angle of the string holes 11 for the first and the second horizontal strings 41(1), 41(2) to pass through may be made smaller than the normal angle.

[0028] Here supposing that, as shown in Fig. 3B, the penetrating direction of the horizontal string holes 11 (the horizontal string holes 11a(4), 11b(4) for the fourth horizontal string 41(4) to pass through in the drawing) is along the normal direction. In this case, the horizontal string 41(4) bends relatively largely in positions p3, p4 where the horizontal string 41(4) passes through the inner peripheral surfaces 10a of the frame 10, so that the movement of the horizontal string 41(4) is fixed in the positions p3, p4. Thus, the movable range in the width direction of the horizontal string 41(4) becomes a length Lb between the inner peripheral surfaces 10a of the frame 10.

[0029] On the contrary, with the racket 1 in this Embodiment, the penetrating angle $\theta 1$ of the horizontal string holes 11 is made smaller than the normal angle $\theta 2$. Therefore, as shown in Fig. 3A, the angle that the horizontal string 41 (4) bends in positions where the horizontal string 41(4) passes through the inner peripheral surfaces 10a of the frame 10 can be made smaller compared to the case in Fig. 3B, and the horizontal string 41(4) can be bent in the positions p1, p2 where the horizontal string 41(4) passes through the outer peripheral surfaces 10b of the frame 10. Thus, the movable range of the horizontal string 41(4) in the width direction can be made as a length La between the outer peripheral surfaces 10b of the frame 10, and the movable range of the horizontal string 41(4) can be made longer than when compared to the case in Fig. 3B. In particular, by making the penetrating angle $\theta 1$ of the horizontal string holes 11 zero degrees, the movable range of the horizontal string 41 (4) can be made long more certainly. As a result, a deformation

amount of the string 40 can be made large at the time of hitting in a region more to the tip end side in the longitudinal direction than the central portion within the frame 10 and repulsion can be improved.

[0030] In other words, with the racket 1 in this Embodiment, the movable range of the horizontal string 41 which passes through the eight horizontal string holes 11 positioned in between the top and the sides of the frame 10 can be made close to the movable range of the horizontal string 41 passing the central portion of the frame 10, thus the sweet spot to the tip end side in the longitudinal direction within the frame 10 can be expanded and controllability can be improved. Therefore, even when the area of the frame 10 is made small to make high-speed swing possible, the sweet spot can be prevented from becoming small. Further, the flight and the hitting feeling of the shuttlecock at the time of smashing using the region to the tip end side in the longitudinal direction in the frame 10 can be improved, and the racket 1 of this Embodiment can be provided as the racket 1 appropriate for a player who uses the region to the tip end side in the longitudinal direction within the frame 10.

[0031] Further, with the racket 1 in this Embodiment, the penetrating direction of the string holes 11 other than the eight horizontal string holes 11 positioned between the top and the sides of the frame 10 is made to be along the normal direction to the inner peripheral surface 10a of the frame 10 in the positions where each of the string holes 11 are provided. Supposing that, the penetrating direction of all the string holes 11 for the horizontal string 41 to pass through is made to be along the width direction and the penetrating direction of all the string holes 11 for the vertical string 42 to pass through is made to be along the longitudinal direction, then the sweet spot expands too much. In that case, it becomes difficult to determine which region within the frame 10 is used for hitting and conversely controllability decreases. Further, the speed of the shuttlecock decreases.

[0032] In particular the experienced player has a tendency to use the tip end side in the longitudinal direction of the frame 10 at the time of hitting, so that there is no need to make the sweet spot in the position to the rear end side in the longitudinal direction than the center of the frame 10 wide. Therefore, as with the racket 1 in this Embodiment, by making the penetrating direction of the string hole 11 provided to the rear end side in the longitudinal direction of the frame 10 to be along the normal direction, only the sweet spot to the tip end side in the longitudinal direction within the frame 10 can be expanded, and it is possible to suppress the sweet spot to the rear end side in the longitudinal direction from expanding more than necessary.

[0033] Further, the longitudinal direction of the racket 1 is longer than the width direction, and the movable range of the vertical string 42 can be made wider than that of the horizontal string 41, thus there is no need to make the movable range of the vertical string 42 wide. Therefore, as with the racket 1 of this Embodiment, by

making the penetrating direction of the string holes 11 for the vertical string 42 to pass through to be along the normal direction, it is possible to suppress the sweet spot from expanding more than necessary in the longitudinal direction.

[0034] Further, by making the penetrating direction of the string hole 11 to be along the normal direction rather than along the width direction or the longitudinal direction, for example the drilling processing with such as a drill becomes easy. Therefore, as with the racket 1 of this Embodiment, by making the penetrating direction of the string holes 11 other than the eight horizontal string holes 11 to be along the normal direction, the drilling processing of the frame 10 can be made easy.

[0035] Further, with the racket 1 of this Embodiment, the penetrating angle $\theta 1$ of the string hole 11 through which the horizontal string 41 is passed and through which the vertical string 42 is not passed, of the string holes 11 positioned to the tip end side in the longitudinal direction than the center O of the frame 10, is made smaller than the normal angle $\theta 2$. In other words, the penetrating direction of the string hole 11 through which the horizontal string 41 and the vertical string 42 are passed is made to be along the normal direction. For example, in Fig. 2, the penetrating direction of the string holes 11a(5), 11b(5), 11a(7), 11b(7) through which the fifth and the seventh horizontal strings 41(5), 41(7) from the tip end side in the longitudinal direction pass is along the normal direction.

[0036] The string hole 11 for two strings 40 to pass through has a larger hole diameter compared to the string hole 11 for only one string 40 to pass through, and the movement of the horizontal string 41 in the inner peripheral surfaces 10a of the frame 10 is less prone to be restricted, and the movable range of the horizontal string 41 is less prone to become short. Therefore, even in the case that the penetrating direction of the string hole 11 for two strings 40 to pass through is made to be along the normal direction, the sweet spot can be prevented from becoming small. In other words, it is not necessary to make the hole diameter of the string hole 11 through which only the horizontal string 41 passes large in order to expand the sweet spot, thus the strength of the frame 10 can be enhanced. Further, by making the penetrating direction of the string hole 11 through which two strings 40 are passed to be along the normal direction, the drilling processing of the frame 10 can be made easy.

[0037] Further, supposing that the penetrating direction of the string hole 11 through which two strings 40 are passed is made to be along the width direction, then as shown in Fig. 3B a bending angle $\theta 3$ of the vertical string 42 becomes a right angle or an angle close to a right angle. In that case, a stress at the time of hitting concentrates in a corner portion where the vertical string 42 bends. Therefore, by making the penetrating direction of the string hole 11 through which two strings 40 pass to be along the normal direction, a bending angle of the vertical string 42 can be made gentle, and the stress con-

centration at the time of hitting can be suppressed, thus decrease in strength of the vertical string 42 and the grommets 50 can be suppressed. It is not limited to this, however, and the penetrating direction of the string holes 11 through which the horizontal string 41 and the vertical string 42 pass and that are positioned to the tip end side in the longitudinal direction than the center O of the frame 10 may be made to be along the width direction.

[0038] Further, with the racket 1 of this Embodiment, as the raw material (for example, resin) of the grommets 50 that are passed through the eight horizontal string holes 11 positioned in between the top and the sides of the frame 10, a harder raw material than a raw material of the grommets 50 that are passed through the other string holes 11 is used. In this way, a frictional drag between the grommets 50 that are passed through the horizontal string holes 11 and the horizontal strings 41 can be made smaller than a frictional drag between the grommets 50 that are passed through other string holes 11 and the horizontal strings 41. Thus, the horizontal string 41 that is passed through the horizontal string hole 11 becomes easier to move, a deformation amount of the string 40 at the time of hitting in a region to the tip end side in the longitudinal direction within the frame 10 can be made larger, and repulsion can be further improved. In other words, the sweet spot to the tip end side in the longitudinal direction within the frame 10 can be expanded more certainly.

[0039] Further, with the racket 1, the region to the tip end side in the longitudinal direction of the frame 10 has a shorter length in the width direction compared to the region to the rear end side in the longitudinal direction. With such a racket 1, the horizontal strings 41 that pass through the region to the tip end side in the longitudinal direction of the frame 10 have a shorter movable range than the horizontal strings 41 that pass through the region to the rear end side in the longitudinal direction, thus the racket 1 in this Embodiment becomes more effective. Further, the racket 1 may have a tapered shape with the top of the frame 10 flattened. With such a racket 1, a normal angle θ_2 of the string holes 11 provided between the top and the sides of the frame 10 becomes relatively large, and the movement of the horizontal string 41 in the inner peripheral surfaces 10a of the frame 10 is prone to being restricted, thus the racket 1 in this Embodiment becomes more effective.

[0040] The above Embodiments are to facilitate understanding of this invention, and do not limit this invention in any way. This invention can be changed or modified without departing from the scope thereof, as defined by the appendent claims.

[0041] For example, in the above Embodiments, as the racket according to this invention, the badminton racket is provided as an example, but it is not limited thereto. For example, this invention may be applied to such as a tennis racket or a squash racket. Further, in the above Embodiments, as the racket according to this invention, the racket 1 with the string 40 stretched tightly within the

frame 10 is provided as an example, but it is not limited to this, and the racket does not have to have the string 40 stretched tightly therein.

Claims

1. A racket (1) comprising:

a shaft (20) having a tip end and a rear end spaced from the tip end in a longitudinal direction of the racket;

a handle (30) joined to said rear end of the shaft (20);

a frame (10) having a tip end and a rear end spaced from the tip end in said longitudinal direction of the racket, the frame being joined at its rear end to the tip end of the shaft and having left and right sides spaced from one another in a width direction of the racket, the width direction being orthogonal to the longitudinal direction, the frame (10) having a center (O) which is spaced from said left and right sides in the width direction and from the tip and rear ends of the frame (10) in the longitudinal direction, an upper half disposed between the center (O) and the tip end of the frame (10), and a lower half disposed between the center (O) and the rear end of the frame (10), the upper half and the lower half each including a plurality of horizontal strings (41) extending in the width direction and a plurality of vertical strings (42) extending in the longitudinal direction, the horizontal strings (41) and the vertical strings (42) together forming a net-like hitting surface, the frame (10) having a first plurality of pairs of opposed string holes (11) disposed at intervals along a circumferential direction of the frame in both the upper half and the lower half, each string hole (10) penetrating the frame (10) from an inner peripheral surface (10a) of the frame to an outer peripheral surface (10b) of the frame along a penetrating direction to allow a respective one of said strings (41, 42) to pass through the respective string hole (11), wherein said penetrating direction of each string hole (11) allowing a respective one of the horizontal strings (41) to pass through it and said width direction define a first angle (θ_1) there between, which first angle (θ_1) is smaller than a second angle (θ_2) formed between said width direction and a normal direction which is normal to a tangent to said inner peripheral surface (10a) of the frame (10) at a position provided with a respective one of said string holes (11) allowing the horizontal strings (41) to pass through them, **characterized in that**, in the upper half of the frame (10), the first angle (θ_1) at each string hole (11) of one or more pairs of

- opposed string holes (11) allowing the horizontal strings (41) extending in the upper half of the frame to pass through them is smaller than the second angle (θ_2), and in the lower half of the frame (10), the penetrating direction of each string hole (11) of all pairs of opposed string holes (41) allowing the horizontal strings (41) extending in the lower half of the frame (10) to pass through them coincides with the normal direction.
2. A racket according to claim 1, **characterized in that** the frame (10) includes a second plurality of pairs of opposed string holes (11) disposed at intervals along the circumferential direction of the frame (10), each string hole of the second plurality of pairs of opposed string holes (11) penetrating the frame from the inner peripheral surface (10a) to the outer peripheral surface (10b) along a penetrating direction which coincides with a normal direction which is normal to a tangent to the inner peripheral surface (10a) at a position provided with the respective string hole of the second plurality of pairs of opposed string holes (11), each string hole of the second plurality of opposed string holes (11) allowing both a horizontal string (41) and a vertical string (42) to pass jointly through the respective string hole (11).
3. A racket according to claim 1 or 2, **characterized in that** the first angle (θ_1) is zero degrees.
4. A racket according to any one of claims 1 to 3, **characterized in that** the penetrating direction of each string hole of the first plurality of pairs of opposed string holes (11) allowing a respective one of the vertical strings (42) to pass through them coincides with a normal direction which is normal to a tangent to the inner peripheral surface (10a) of the frame (10) at a position provided with the respective string hole of the first plurality of opposed string holes (11).

Patentansprüche

1. Schläger (1), umfassend:
- einen Schaft (20) mit einem Spitzenende und einem Rückende, das vom Spitzenende in einer Längsrichtung des Schlägers beabstandet ist; einen Griff (30), der mit dem Rückende des Schafts (20) verbunden ist; einen Rahmen (10) mit einem Spitzenende und einem Rückende, das vom Spitzenende in der Längsrichtung des Schlägers beabstandet ist, wobei der Rahmen an seinem Rückende mit dem Spitzenende des Schafts verbunden ist und eine linke und eine rechte Seite hat, die in einer Breitenrichtung des Schlägers voneinander

der beabstandet sind, wobei die Breitenrichtung orthogonal zur Längsrichtung ist, wobei der Rahmen (10) einen Mittelpunkt (0) hat, der von der linken und der rechten Seite in der Breitenrichtung und vom Spitzen- und Rückende des Rahmens (10) in der Längsrichtung beabstandet ist, wobei eine obere Hälfte zwischen dem Mittelpunkt (0) und dem Spitzenende des Rahmens (10) ausgebildet ist und eine untere Hälfte zwischen dem Mittelpunkt (0) und dem Rückende des Rahmens (10) ausgebildet ist, wobei die obere Hälfte und die untere Hälfte jeweils eine Mehrzahl von horizontalen Saiten (41), die sich in der Breitenrichtung erstrecken, und eine Mehrzahl von vertikalen Saiten (42), die sich in der Längsrichtung erstrecken, aufweisen, wobei die horizontalen Saiten (41) und die vertikalen Saiten (42) gemeinsam eine netzartige Schlagfläche bilden, wobei der Rahmen (10) eine erste Mehrzahl von Paaren gegenüberliegender Saitenlöcher (11) hat, die in Intervallen entlang einer Umfangsrichtung des Rahmens in der oberen Hälfte und der unteren Hälfte ausgebildet sind, wobei jedes Saitenloch (10) den Rahmen (10) von einer inneren Peripheriefläche (10a) des Rahmens zu einer äußeren Peripheriefläche (10b) des Rahmens entlang einer Durchdringungsrichtung durchdringt, um es einer jeweiligen der Saiten (41, 42) zu ermöglichen, das jeweilige Saitenloch (11) zu durchlaufen, wobei die Durchdringungsrichtung jedes Saitenlochs (11), das einer jeweiligen der horizontalen Saiten (41) das Durchlaufen ermöglicht, und die Breitenrichtung einen ersten Winkel (θ_1) dazwischen definieren, wobei der erste Winkel (θ_1) kleiner als ein zweiter Winkel (θ_2) ist, der zwischen der Breitenrichtung und einer Normalrichtung gebildet ist, die zu einer Tangente zur inneren Peripheriefläche (10a) des Rahmens (10) an einer Position normal ist, die mit einem jeweiligen der Saitenlöcher (11) versehen ist, die den horizontalen Saiten (41) das Durchlaufen ermöglichen, **dadurch gekennzeichnet, dass** in der oberen Hälfte des Rahmens (10) der erste Winkel (θ_1) an jedem Saitenloch (11) von einem oder mehreren Paaren gegenüberliegender Saitenlöcher (11), die den sich in der oberen Hälfte des Rahmens erstreckenden horizontalen Saiten (41) das Durchlaufen ermöglichen, kleiner als der zweite Winkel (θ_2) ist, und in der unteren Hälfte des Rahmens (10) die Durchdringungsrichtung jedes Saitenlochs (11) aller Paare gegenüberliegender Saitenlöcher (41), die den sich in der unteren Hälfte des Rahmens (10) erstreckenden horizontalen Saiten (41) das Durchlaufen ermöglichen, mit der Normalrichtung zusammenfällt.

2. Schläger nach Anspruch 1, **dadurch gekennzeichnet, dass** der Rahmen (10) eine zweite Mehrzahl von Paaren gegenüberliegender Saitenlöcher (11) umfasst, die in Intervallen entlang der Umfangsrichtung des Rahmens (10) ausgebildet sind, wobei jedes Saitenloch der zweiten Mehrzahl von Paaren gegenüberliegender Saitenlöcher (11) den Rahmen von der inneren Peripheriefläche (10a) zur äußeren Peripheriefläche (10b) entlang einer Durchdringungsrichtung durchdringt, die mit einer Normalrichtung zusammenfällt, die zu einer Tangente zur inneren Peripheriefläche (10a) an einer Position normal ist, die mit dem jeweiligen Saitenloch der zweiten Mehrzahl von Paaren gegenüberliegender Saitenlöcher (11) versehen ist, wobei jedes Saitenloch der zweiten Mehrzahl gegenüberliegender Saitenlöcher (11) einer horizontalen Saite (41) und einer vertikalen Saite (42) das gemeinsame Durchlaufen durch das jeweilige Saitenloch (11) ermöglicht.
3. Schläger nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** der erste Winkel (θ_1) null Grad beträgt.
4. Schläger nach einem der Ansprüche 1 bis 3, **dadurch gekennzeichnet, dass** die Durchdringungsrichtung jedes Saitenlochs der ersten Mehrzahl von Paaren gegenüberliegender Saitenlöcher (11), die einer jeweiligen der vertikalen Saiten (42) das Durchlaufen hindurch ermöglichen, mit einer Normalrichtung zusammenfällt, die zu einer Tangente zur inneren Peripheriefläche (10a) des Rahmens (10) an einer Position normal ist, die mit dem jeweiligen Saitenloch der ersten Mehrzahl gegenüberliegender Saitenlöcher (11) versehen ist.

Revendications

1. Raquette (1), comprenant :
- une tige (20) comportant une extrémité d'embout et une extrémité arrière espacée de l'extrémité d'embout dans une direction longitudinale de la raquette ;
 - une poignée (30) reliée à ladite extrémité arrière de la tige (20) ;
 - un cadre (10) comportant une extrémité d'embout et une extrémité arrière espacée de l'extrémité d'embout dans ladite direction longitudinale de la raquette, le cadre étant rejoint, au niveau de son extrémité arrière jusqu'à l'extrémité d'embout de la tige et présentant des côtés gauche et droit espacés l'un de l'autre dans une direction de largeur de la raquette, la direction de largeur étant orthogonale à la direction longitudinale, le cadre (10) présentant un centre (0) qui est espacé desdits côtés gauche et droit

dans la direction de la largeur et des extrémités d'embout et arrière du cadre (10) dans la direction longitudinale, une moitié supérieure disposée entre le centre (0) et l'extrémité arrière du cadre (10), la moitié supérieure et la moitié inférieure comprenant chacune une pluralité de chaînes horizontales (41) s'étendant dans la direction de la largeur et une pluralité de chaînes verticales (42) s'étendant dans la direction longitudinale, les chaînes horizontales (41) et les chaînes verticales (42) formant ensemble une surface de frappe en forme de filet, le cadre (10) comportant une première pluralité de paires de trous de chaîne opposés (11) disposés à des intervalles le long d'une direction circonferentielle du cadre dans la moitié supérieure et la moitié inférieure, chaque trou de chaîne (10) pénétrant dans le cadre (10) à partir d'une surface périphérique intérieure (10a) du cadre jusqu'à une surface périphérique extérieure (10b) du cadre le long d'une direction de pénétration pour permettre à une chaîne correspondante desdites chaînes (41, 42) de traverser le trou de chaîne correspondant (11), dans laquelle ladite direction de pénétration de chaque trou de chaîne (11) permettant à l'une des chaînes horizontales (41) de le traverser et ladite direction de largeur définissent un premier angle (θ_1) entre elles, lequel premier angle (θ_1) est inférieure à un deuxième angle (θ_2) formé entre ladite direction de largeur et une direction normale qui est normale à une tangente à ladite surface périphérique (10a) du cadre (10) en une position dotée d'un trou correspondant desdits trous de chaîne (11) permettant aux chaînes horizontales (41) de les traverser, **caractérisée en ce que** dans la moitié supérieure du cadre (10), le premier angle (θ_1) au niveau de chaque trou de chaîne (11) d'au moins une paire de trous de chaîne opposés (11) permettant aux chaînes horizontales (41) s'étendant dans la moitié supérieure du cadre de les traverser est inférieur au deuxième angle (θ_2), et dans la moitié inférieure du cadre (10), la direction de pénétration de chaque trou de chaîne (11) de toutes les paires de trous opposés de chaîne (41) permettant aux chaînes horizontales (41) s'étendant dans la moitié inférieure du cadre (10) pour les traverser coïncide avec la direction normale.

2. Raquette selon la revendication 1, **caractérisée en ce que** le cadre (10) contient une deuxième pluralité de paires de trous de chaîne opposés (11) disposés à des intervalles le long de la direction circonferentielle du cadre (10), chaque trou de chaîne de la deuxième pluralité de paires de trous de chaîne opposés (11) pénétrant le cadre de la surface périphérique interne (10a) à la surface périphérique externe

(10b) le long d'une direction de pénétration qui coïncide avec une direction normale qui est normale à une tangente à la surface périphérique interne (10a) en une position prévue avec le trou de chaîne correspondant de la deuxième pluralité de paires de trous de chaîne opposés (11), chaque trou de chaîne de la deuxième pluralité des trous de chaîne opposés (11) permettant à la fois à une chaîne horizontale (41) et à une chaîne verticale (42) de traverser conjointement le trou de chaîne correspondant (11). 5 10

3. Raquette selon la revendication 1 ou 2, **caractérisée en ce que** le premier angle (θ_1) est nul.

4. Raquette selon l'une quelconque des revendications 1 à 3, **caractérisée en ce que** la direction de pénétration de chaque trou de chaîne de la première pluralité de paires de trous de chaîne opposés (11) permettant à une chaîne correspondante des chaînes verticales (42) de les traverser coïncide avec une direction normale qui est normale à une tangente à la surface périphérique (10a) du cadre (10) en une position procurée par le trou de chaîne correspondant de la première pluralité de trous de chaîne opposés (11). 15 20 25

30

35

40

45

50

55

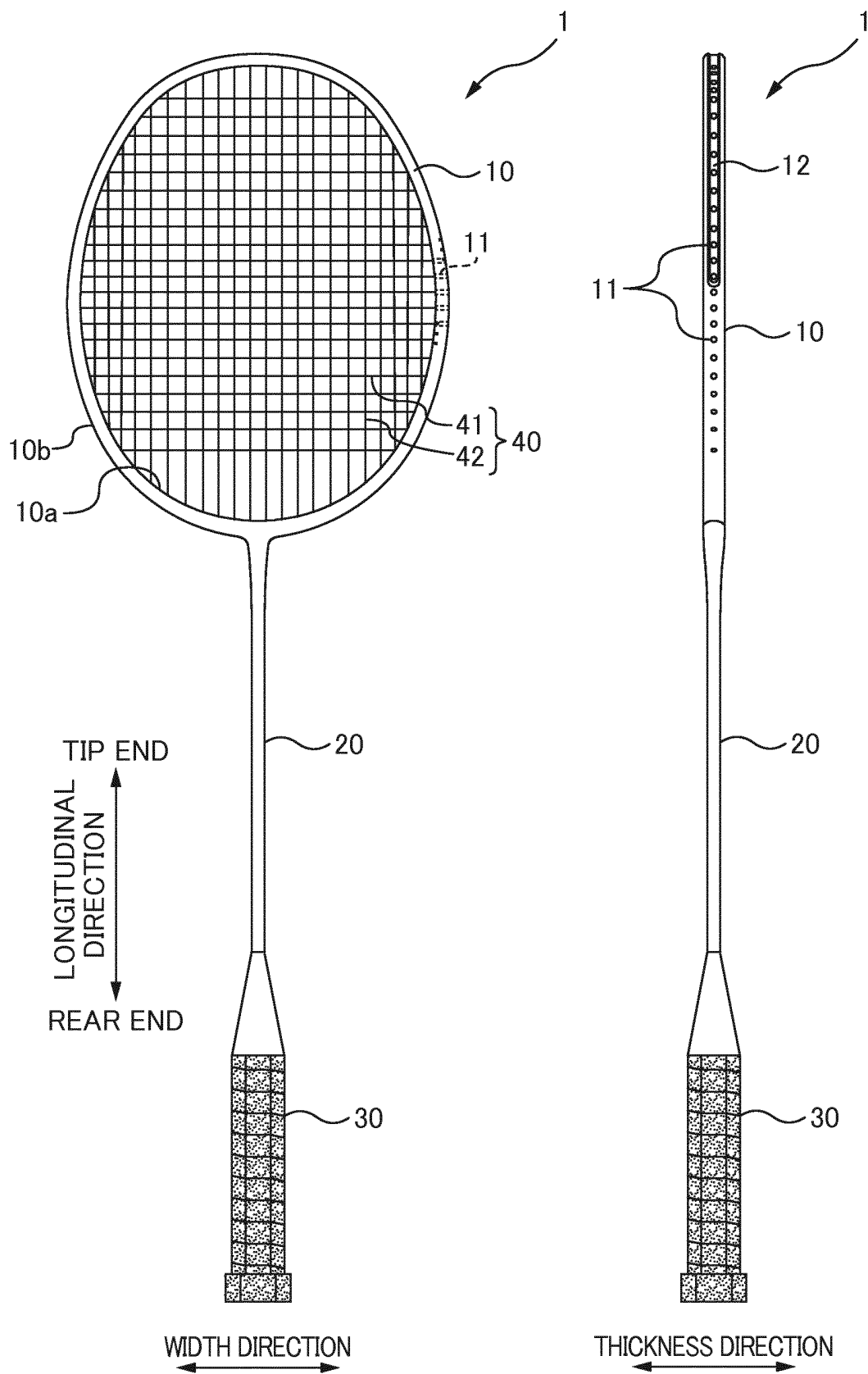
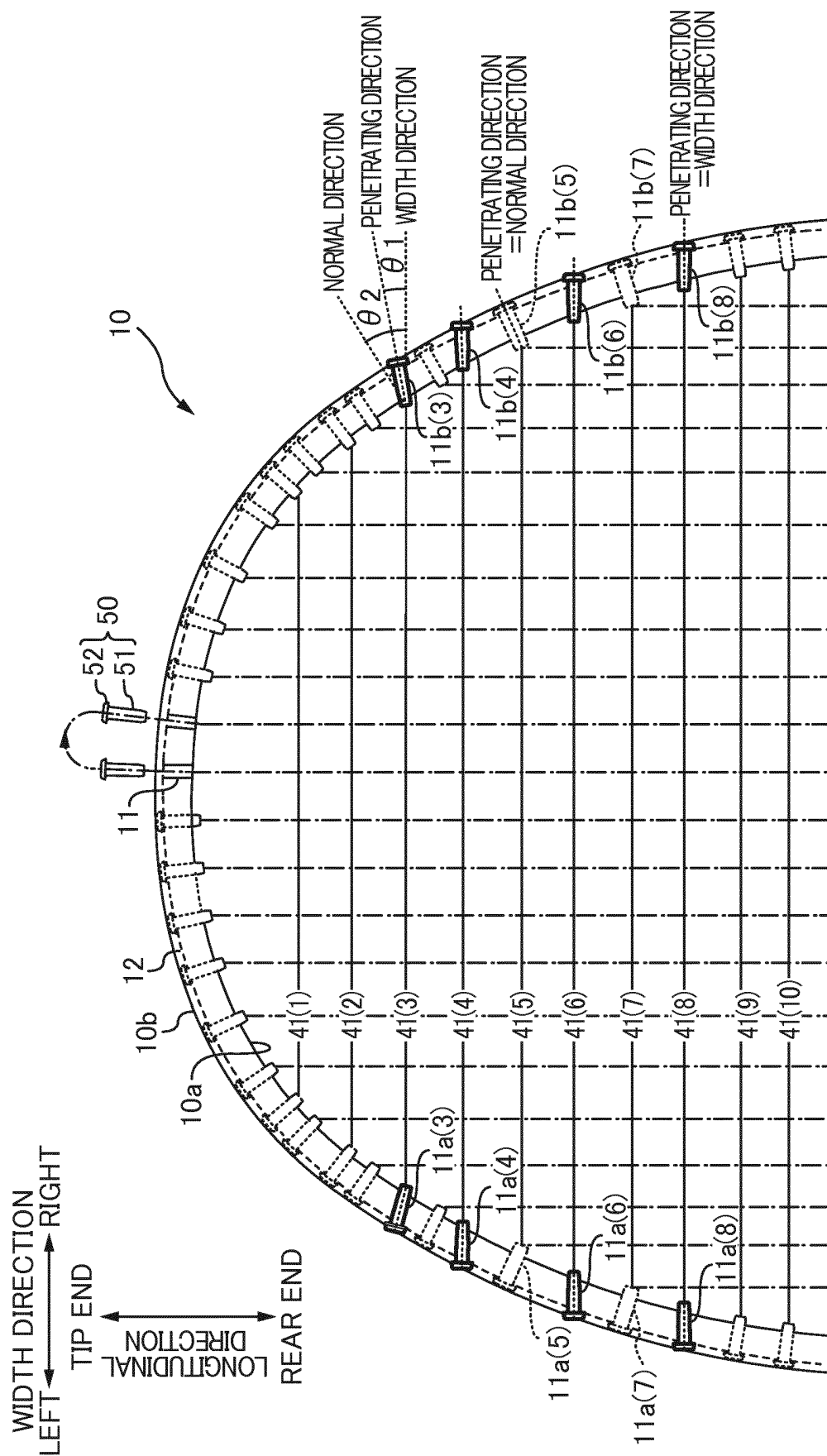


FIG. 1



X CENTER O
FIG. 2

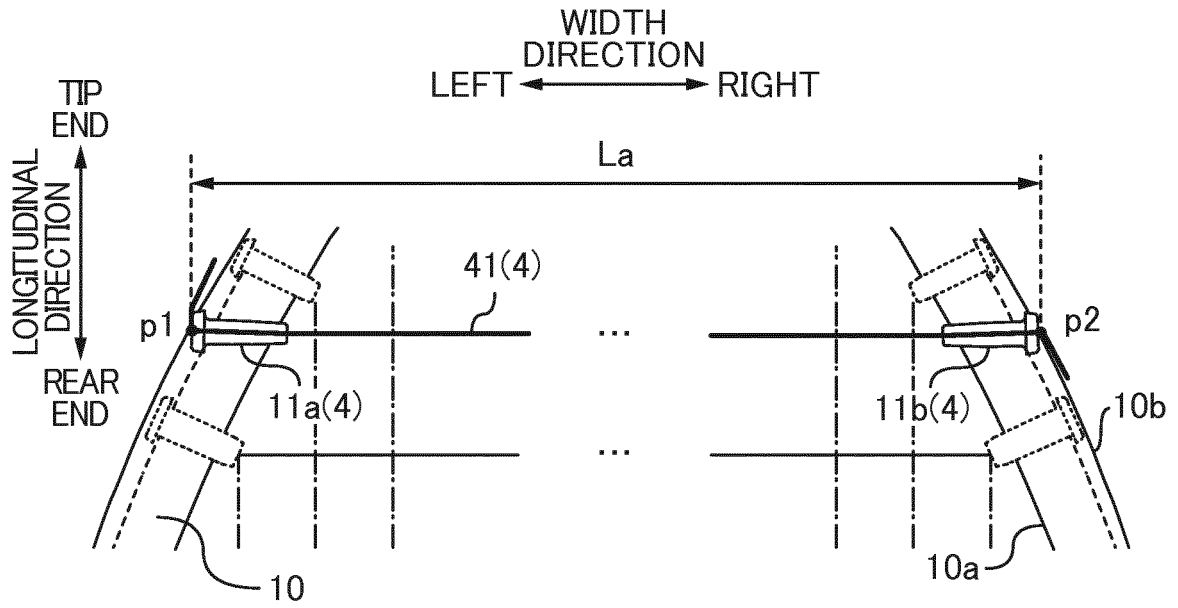


FIG. 3A

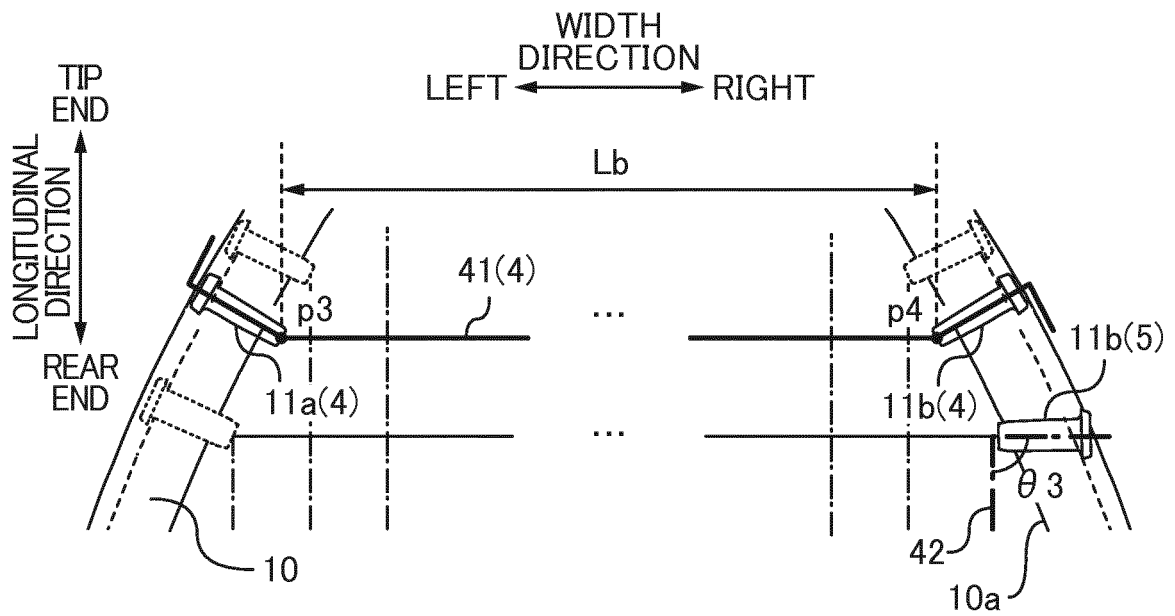


FIG. 3B

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 2000042145 A [0003]
- DE 9308902 U [0003]