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(54) PADEL BAT

(57) Provided is a padel bat 2 having excellent durability and stiffness.

A padel bat 2 has a handle 4 and a head 6. The head 6 has a face fabric 18. The face fabric 18 has a first fiber inclined in a first direction relative to the axial direction of the head 6, and a second fiber inclined in a second direction relative to the axial direction. The head 6 further has a plurality of holes 20. A first array inclined in the first direction relative to the axial direction and a second array inclined in the second direction relative to the axial direction are each formed of the holes 20. A direction of the first fiber and a direction of the first array coincide with each other. A direction of the second fiber and a direction of the second array coincide with each other.

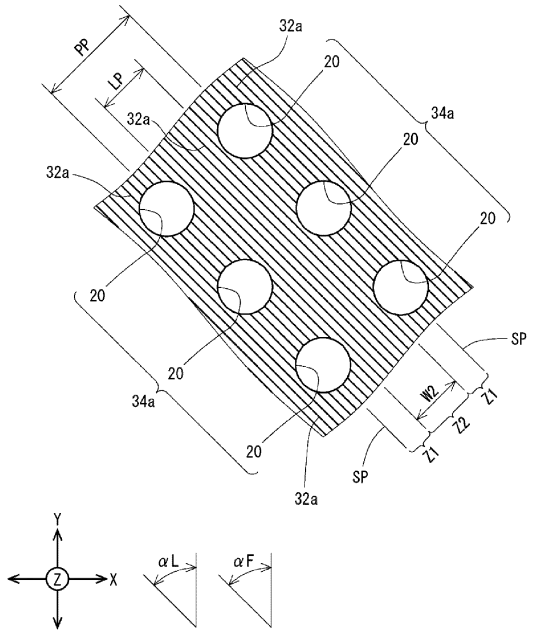

FIG. 11

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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present specification discloses a bat used for padel.

Background Art

[0002] A player hits a ball with a bat in padel. The bat has a head and a handle. The head has a core that is a foamed body, and face fabric adhered to the core. Furthermore, the head has a plurality of holes. Each hole is formed so as to penetrate through the core and the face fabric. The holes can contribute to reduction of air resistance when the bat is swung. US Patent Application Publication No. 2015/0024879 discloses an example of a padel bat.

[0003] The face fabric includes warp fibers and weft fibers. The head is not round. Therefore, in a padel bat in which the warp fiber direction coincides with the axis of the head, the average length of the warp fibers and the average length of the weft fibers are different from each other. When a ball is hit by the padel bat, deformation of the warp fibers and deformation of the weft fibers are not uniform with each other. The face fabric is easily broken.

[0004] As described above, the holes penetrate through the head. The fibers are divided by the holes. Therefore, the holes reduce stiffness of the head.

[0005] The inventors of the present invention intend to provide a padel bat having excellent durability and stiffness.

SUMMARY OF THE INVENTION

[0006] A preferable padel bat has a head and a handle. The head has a frame, a core plate disposed inside the frame, a front face fabric joined to a surface, on a front side, of the core plate, and a rear face fabric joined to a surface, on a rear side, of the core plate. Each face fabric has a first fiber inclined in a first direction relative to an axial direction of the head, and a second fiber inclined in a second direction relative to the axial direction. The head includes a plurality of holes each extending through the front face fabric and reaching the rear face fabric. The head includes a first array that is formed of the holes and inclined in the first direction relative to the axial direction, and a second array that is formed of the holes and inclined in the second direction relative to the axial direction. A direction of the first fiber and a direction of the first array substantially coincide with each other. A direction of the second fiber and a direction of the second array substantially coincide with each other.

[0007] The padel bat is not easily broken due to hitting of a ball. Furthermore, the padel bat allows a player to stably swing the bat.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

FIG. 1 is a front view of a padel bat according to one embodiment;
FIG. 2 is a side view of the padel bat shown in FIG. 1;
FIG. 3 is a cross-sectional view taken along a line III-III in FIG. 1;
FIG. 4 is a cross-sectional view taken along a line IV-IV in FIG. 1;
FIG. 5 is an enlarged perspective view of a part of a ribbon used for face fabric of the padel bat shown in FIG. 4;
FIG. 6 is an enlarged view of a part of the face fabric of the padel bat shown in FIG. 4;
FIG. 7 is an enlarged view along a line VII-VII in FIG. 6;
FIG. 8 is an enlarged view along a line VIII-VIII in FIG. 6;
FIG. 9 is a pattern diagram illustrating holes of the padel bat shown in FIG. 1;
FIG. 10 is a pattern diagram illustrating the holes of the padel bat shown in FIG. 1;
FIG. 11 is an enlarged view of a part of a head of the padel bat shown in FIG. 1;
FIG. 12 is an enlarged view of a part of the head of the padel bat shown in FIG. 1;
FIG. 13 is a pattern diagram illustrating holes of a padel bat of a comparative example;
FIG. 14 is an enlarged view of a part of a head of the padel bat shown in FIG. 13; and
FIG. 15 is an enlarged view of a part of the head of the padel bat shown in FIG. 13.

DETAILED DESCRIPTION

[0009] A preferred embodiment will be described below in detail with appropriate reference to the drawings.

[0010] FIGS. 1 and 2 show a padel bat 2. The bat 2 has a handle 4 and a head 6. In FIG. 1, an alternate long and short dash line indicated by reference character AX represents the axis of the bat 2. In FIGS. 1 and 2, an arrow X represents the width direction of the bat 2, an arrow Y represents the axial direction of the bat 2, and the Z direction represents the thickness direction of the bat 2.

[0011] The handle 4 has a pair of arms 8, a shank 10, and a grip 12. Each arm 8 is disposed between the head 6 and the shank 10. The arm 8 is hollow. A material of the arm 8 is typically fiber-reinforced resin. In the present embodiment, the material of the arm 8 is the same as a material of a frame described below. The arm 8 may have a solid structure.

[0012] The shank 10 extends from the arms 8. The shank 10 is hollow. A material of the shank 10 is typically

fiber-reinforced resin. In the present embodiment, the material of the shank 10 is the same as the material of the frame described below. The shank 10 may have a solid structure.

[0013] The grip 12 is formed by winding a tape around the shank 10. The grip 12 inhibits slippage between a hand of a player and the bat 2 when the padel bat 2 is swung.

[0014] FIG. 3 is a cross-sectional view taken along a line III-III in FIG. 1. FIG. 4 is a cross-sectional view taken along a line IV-IV in FIG. 1. As shown in FIGS. 1, 3, and 4, the head 6 has a frame 14, a core plate 16, a front face fabric 18a, and a rear face fabric 18b. The head 6 further includes a plurality of holes 20. The head 6 has a shape symmetric about the axis AX.

[0015] The frame 14 extends from the arms 8. The frame 14 and the pair of the arms 8 form a loop. The frame 14 is hollow. A material of the frame 14 is fiber-reinforced resin. The fiber-reinforced resin has a resin matrix and multiple reinforcing fibers. The frame 14 includes a plurality of fiber-reinforced layers.

[0016] Examples of base resin of the frame 14 include: thermosetting resins such as epoxy resin, bismaleimide resin, polyimide, and phenol resin; and thermoplastic resins such as polyether ether ketone, polyether sulfone, polyetherimide, polyphenylene sulfide, polyamide, and polypropylene. Resin that is particularly suitable for the frame 14 is epoxy resin.

[0017] Examples of the reinforcing fiber of the frame 14 include carbon fiber, metal fiber, glass fiber, and aramid fiber. Fiber that is particularly suitable for the frame 14 is carbon long fiber. A plurality of kinds of fibers may be used in combination.

[0018] The core plate 16 is disposed inside the frame 14. The core plate 16 is partially surrounded by the frame 14. The core plate 16 is a polymer molded product. In the present embodiment, the core plate 16 includes multiple pieces of foam. In other words, the core plate 16 is a foamed body. The core plate 16 preferably includes multiple independent pieces of foam. A base polymer of the core plate 16 is preferably ethylene-vinyl acetate copolymer (EVA).

[0019] The front face fabric 18a is mainly disposed on the front side (upper side in FIG. 4) of the core plate 16. A portion near the edge of the front face fabric 18a reaches the outer peripheral surface of the frame 14. In the present embodiment, the front face fabric 18a is joined to a surface 22, on the front side, of the core plate 16.

[0020] The rear face fabric 18b is mainly disposed on the rear side (lower side in FIG. 4) of the core plate 16. A portion near the edge of the rear face fabric 18b reaches the outer peripheral surface of the frame 14. In the present embodiment, the rear face fabric 18b is joined to a surface 24, on the rear side, of the core plate 16.

[0021] In the padel bat 2 of the present embodiment, the rear side may not be distinguished from the front side. Therefore, the specifications of the rear face fabric 18b and the specifications of the front face fabric 18a are equivalent to each other. The rear face fabric 18b may have specifications different from the specifications of the front face fabric 18a.

[0022] A material of each face fabric 18 is fiber-reinforced resin. In the present embodiment, a ribbon is used for the face fabric 18. FIG. 5 is an enlarged perspective view of a part of a ribbon 26. The ribbon 26 has a resin matrix 28, and a plurality of reinforcing fibers 30 aligned with each other. Positive fiber or second fiber described below is obtained from the reinforcing fiber 30.

[0023] Examples of base resin of the ribbon 26 include: thermosetting resins such as epoxy resin, bismaleimide resin, polyimide, and phenol resin; and thermoplastic resins such as polyether ether ketone, polyether sulfone, polyetherimide, polyphenylene sulfide, polyamide, and polypropylene. Resin that is particularly suitable for the ribbon 26 is epoxy resin.

[0024] Examples of the reinforcing fiber 30 of the ribbon 26 include carbon fiber, metal fiber, glass fiber, and aramid fiber. Fiber that is particularly suitable for the ribbon 26 is carbon long fiber. A plurality of kinds of fibers may be used in combination.

[0025] FIG. 6 is an enlarged schematic diagram illustrating a part of the face fabric 18. FIG. 7 is an enlarged view along a line VII-VII in FIG. 6. FIG. 8 is an enlarged view along a line VIII-VIII in FIG. 6. FIG. 6 illustrates the face fabric 18 on the assumption that the holes 20 (see FIG. 1) are absent. In FIG. 6, the counterclockwise direction represents a first direction, and the clockwise direction represents a second direction.

[0026] The face fabric 18 has a plurality of first ribbons 26a and a plurality of second ribbons 26b. The first ribbons 26a are inclined in the first direction relative to the axial direction. The second ribbons 26b are inclined in the second direction relative to the axial direction. The first ribbons 26a and the second ribbons 26b are woven. Therefore, as shown in FIG. 7, one first ribbon 26a intersects a plurality of the second ribbons 26b in a zigzag manner. As shown in FIG. 8, one second ribbon 26b intersects a plurality of the first ribbons 26a in a zigzag manner. In FIG. 6, reference character αR represents an angle of the first ribbon 26a relative to the axial direction, and reference character βR represents an angle of the second ribbon 26b relative to the axial direction. In the present embodiment, the angle βR and the angle αR are equal to each other. In the present embodiment, the angle αR is 45° and the angle βR is 45°.

[0027] The first ribbon 26a includes a plurality of first fibers 32a aligned with each other. In FIG. 6, the first fibers 32a are schematically indicated by line segments. The first fibers 32a are embedded in the resin matrix 28. Therefore, the first fiber 32a is not visually recognized as an edge in an actual padel bat 2. The direction in which the first fibers 32a extend coincides with the direction in which the first ribbon 26a extends. Therefore, the first fibers 32a are inclined in the first direction relative to the axial direction. In FIGS. 6 and 8, the first fibers 32a are thinned out and the number of the first fibers 32a drawn

in one first ribbon 26a is nine. In an actual first ribbon 26a, the number of the first fibers 32a is greater than nine.

[0028] The second ribbon 26b includes a plurality of second fibers 32b aligned with each other. In FIG. 6, the second fibers 32b are schematically indicated by line segments. The second fibers 32b are embedded in the resin matrix 28. Therefore, the second fiber 32b is not visually recognized as an edge in an actual padel bat 2. The direction in which the second fibers 32b extend coincides with the direction in which the second ribbon 26b extends. Therefore, the second fibers 32b are inclined in the second direction relative to the axial direction. In FIGS. 6 and 7, the second fibers 32b are thinned out and the number of the second fibers 32b drawn in one second ribbon 26b is nine. In an actual second ribbon 26b, the number of the second fibers 32b is greater than nine.

[0029] As is apparent from FIG. 4, each hole 20 extends through the front face fabric 18a and reaches the rear face fabric 18b. In other words, the hole 20 penetrates through the core plate 16 and the pair of the face fabrics 18. The holes 20 can contribute to reduction of the weight of the head 6. The holes 20 can also contribute to reduction of air resistance of the head 6. The number of the holes 20 is preferably not less than 25 and not greater than 100. The shape of each hole 20 as viewed from the front side is a round shape. The diameter of the round shape is preferably not less than 5 mm and not greater than 20 mm. The head 6 may include a plurality of kinds of the holes 20 having different sizes. The head 6 may include the holes 20 having shapes other than the round shape.

[0030] FIG. 9 is a pattern diagram illustrating the holes 20 of the padel bat 2 in FIG. 1. In FIG. 9, reference character 34a represents a first array. FIG. 9 shows nine first arrays 34a. A plurality of the holes 20 belong to each of the first arrays 34a. In other words, the first array 34a is formed of a plurality of the holes 20. One hole 20 and another hole 20 adjacent to the one hole 20 in the first direction are sequentially grouped, to form the first array 34a. The first array 34a is an imaginary array. Therefore, in the actual padel bat 2, the first array 34a is not recognized as an edge. The extending direction of the first array 34a coincides with the extending direction of a line segment connecting one hole 20 and another hole 20 adjacent to the one hole 20 in the first direction to each other. The first array 34a is inclined in the first direction relative to the axial direction. In FIG. 9, reference character αL represents an angle of the first array 34a relative to the axial direction. In the present embodiment, the angle αL is 45°.

[0031] As is apparent from FIG. 9, each hole 20 belongs to any of the first arrays 34a. The hole 20 which does not belong to any of the first arrays 34a does not exist. The padel bat 2 may include the holes 20 each belonging to any of the first arrays 34a and the holes 20 each belonging to none of the first arrays 34a. A ratio of the number of the holes 20 each belonging to any of the first arrays 34a to the total number of the holes 20 is preferably not less than 60%, more preferably not less than 80%, and particularly preferably not less than 90%. In the embodiment shown in FIG. 9, the ratio is 100%.

[0032] FIG. 10 also illustrates a pattern of the holes 20. The pattern shown in FIG. 10 is the same as the pattern shown in FIG. 9. In FIG. 10, reference character 34b represents a second array. FIG. 10 shows nine second arrays 34b. A plurality of the holes 20 belong to each of the second arrays 34b. In other words, the second array 34b is formed of a plurality of the holes 20. One hole 20 and another hole 20 adjacent to the one hole 20 in the second direction are sequentially grouped, to form the second array 34b. The second array 34b is an imaginary array. Therefore, in the actual padel bat 2, the second array 34b is not recognized as an edge. The extending direction of the second array 34b coincides with the extending direction of a line segment connecting one hole 20 and another hole 20 adjacent to the one hole 20 in the second direction to each other. The second array 34b is inclined in the second direction relative to the axial direction. In FIG. 10, reference character βL represents an angle of the second array 34b relative to the axial direction. In the present embodiment, the angle βL is equal to the angle αL. In the present embodiment, the angle βL is 45°.

[0033] As is apparent from FIG. 10, each hole 20 belongs to any of the second arrays 34b. The hole 20 which does not belong to any of the second arrays 34b does not exist. The padel bat 2 may include the holes 20 each belonging to any of the second arrays 34b and the holes 20 each belonging to none of the second arrays 34b. A ratio of the number of the holes 20 each belonging to any of the second arrays 34b to the total number of the holes 20 is preferably not less than 60%, more preferably not less than 80%, and particularly preferably not less than 90%. In the embodiment shown in FIG. 10, the ratio is 100%.

[0034] As is apparent from the comparison between FIGS. 9 and 10, each of the holes 20 belongs to any of the first arrays 34a and belongs to any of the second arrays 34b. The padel bat 2 may include the hole 20 which belongs to any of the first arrays 34a and does not belong to any of the second arrays 34b. The padel bat 2 may include the hole 20 which does not belong to any of the first arrays 34a and belongs to any of the second arrays 34b. A ratio of the number of the holes 20 each belonging to any of the first arrays 34a and belonging to any of the second arrays 34b to the total number of the holes 20 is preferably not less than 50%, more preferably not less than 70%, and particularly preferably not less than 80%. In the embodiment shown in FIGS. 9 and 10, the ratio is 100%.

[0035] FIG. 11 is an enlarged view of a part of the head 6 of the padel bat 2 shown in FIG. 1. FIG. 11 shows the holes 20 and the first fibers 32a. For convenience of description, in FIG. 11, the second fiber 32b is not shown. Furthermore, in FIG. 11, the first fibers 32a are thinned out.

[0036] As described above, the first fibers 32a are inclined in the first direction relative to the axial direction. In FIG. 11, reference character αF represents an angle of the first fiber 32a relative to the axial direction. In the present embodiment, the angle αF is 45°. As described above, the first array 34a is inclined in the first direction relative to the axial direction. The direction of the first fiber 32a and the direction of the first array 34a coincide with each other.

[0037] In FIG. 11, reference character SP represents a line segment connecting the centers of the holes 20 belonging to the first array 34a to each other. Reference character PP represents a pitch between the first arrays 34a. Reference character LP represents a distance between one first array 34a and another first array 34a adjacent to the one first array 34a. Reference character Z1 represents an intersecting zone and reference character Z2 represents a non-intersecting zone. The direction in which the intersecting zone Z1 extends coincides with the direction in which the first fibers 32a extend. The first fibers 32a disposed in the intersecting zone Z1 intersect the holes 20, and are divided by the holes 20. The direction in which the non-intersecting zone Z2 extends coincides with the direction in which the first fibers 32a extend. The first fibers 32a disposed in the non-intersecting zone Z2 do not intersect the holes 20, and are not divided by the holes 20. In other words, the first fibers 32a disposed in the non-intersecting zone Z2 are extended over the frame 14. In the present embodiment, a width W2 of the non-intersecting zone Z2 is equal to the distance LP.

[0038] FIG. 12 is an enlarged view of a part of the head 6 of the padel bat 2 shown in FIG. 1. FIG. 12 shows the holes 20 and the second fibers 32b. For convenience of description, in FIG. 12, the first fiber 32a is not shown. Furthermore, in FIG. 12, the second fibers 32b are thinned out.

[0039] As described above, the second fibers 32b are inclined in the second direction relative to the axial direction. In FIG. 12, reference character βF represents an angle of the second fiber 32b relative to the axial direction. In the present embodiment, the angle βF is 45°. As described above, the second array 34b is inclined in the second direction relative to the axial direction. The direction of the second fiber 32b and the direction of the second array 34b coincide with each other.

[0040] In FIG. 12, reference character SN represents a line segment connecting the centers of the holes 20 belonging to the second array 34b to each other. Reference character PN represents a pitch between the second arrays 34b. Reference character LN represents a distance between one second array 34b and another second array 34b adjacent to the one second array 34b. Reference character Z3 represents an intersecting zone and reference character Z4 represents a non-intersecting zone. The direction in which the intersecting zone Z3 extends coincides with the direction in which the second fibers 32b extend. The second fibers 32b disposed in the intersecting zone Z3 intersect the holes 20, and are divided by the holes 20. The direction in which the non-intersecting zone Z4 extends coincides with the direction in which the second fibers 32b extend. The second fibers 32b disposed in the non-intersecting zone Z4 do not intersect the holes 20, and are not divided by the holes 20. In other words, the second fibers 32b disposed in the non-intersecting zone Z4 are extended over the frame 14. In the present embodiment, a width W4 of the non-intersecting zone Z4 is equal to the distance LN.

[0041] As is apparent from the comparison between FIGS. 11 and 12, the direction in which the first fibers 32a extend and the direction in which the second fibers 32b extend are symmetric about the axial direction. In the padel bat 2, the average length of the first fibers 32a and the average length of the second fibers 32b are substantially equal to each other. In the padel bat 2, when a ball is hit, deformation of the first fibers 32a and deformation of the second fibers 32b are uniform with each other. The face fabric 18 inhibits breakage of the padel bat 2 even when a ball is repeatedly hit.

[0042] The angle αF of the first fiber 32a and the angle βF of the second fiber 32b may be slightly different from each other. In the description herein, in a case where the absolute value of a difference (αF-βF) is not greater than 10°, it may be considered that "the angle αF and the angle βF are substantially equal to each other". The absolute value of the difference (αF-βF) is more preferably not greater than 7° and particularly preferably not greater than 5°. The angle αF is preferably not less than 30°, more preferably not less than 35°, and particularly preferably not less than 40°. The angle αF is preferably not greater than 60°, more preferably not greater than 55°, and particularly preferably not greater than 50°. Ideally, the angle αF is 45°. The angle βF is preferably not less than 30°, more preferably not less than 35°, and particularly preferably not less than 40°. The angle βF is preferably not greater than 60°, more preferably not greater than 55°, and particularly preferably not greater than 50°. Ideally, the angle βF is 45°.

[0043] Since the direction of the first fiber 32a and the direction of the first array 34a coincide with each other, the width W2 (see FIG. 11) of the non-intersecting zone Z2 is sufficiently great. In other words, in the padel bat 2, the number of the first fibers 32a which are not divided by the holes 20 is great. Since the direction of the second fiber 32b and the direction of the second array 34b coincide with each other, the width W4 (see FIG. 12) of the non-intersecting zone Z4 is sufficiently great. In other words, in the padel bat 2, the number of the second fibers 32b which are not divided by the holes 20 is great. The fibers 32 which are not divided contribute to stiffness of the head 6.

[0044] From the viewpoint of stiffness, a ratio (W2/PP) of the width W2 to the pitch PP is preferably not less than 30%, more preferably not less than 40%, and particularly preferably not less than 45%. From the viewpoint of stiffness, a ratio (W4/PN) of the width W4 to the pitch PN is preferably not less than 30%, more preferably not less

than 40%, and particularly preferably not less than 45%.

[0045] The angle αL of the first array 34a and the angle αF of the first fiber 32a may be slightly different from each other. In the description herein, in a case where the absolute value of a difference (aL-aF) is not greater than 10°, it may be considered that "the direction of the first fiber 32a and the direction of the first array 34a substantially coincide with each other." The absolute value of the difference (aL-aF) is more preferably not greater than 7° and particularly preferably not greater than 5°.

[0046] The angle βL of the second array 34b and the angle βF of the second fiber 32b may be slightly different from each other. In the description herein, in a case where the absolute value of a difference (βL-βF) is not greater than 10°, it may be considered that "the direction of the second fiber 32b and the direction of the second array 34b substantially coincide with each other." The absolute value of the difference (βL-βF) is more preferably not greater than 7° and particularly preferably not greater than 5°.

[0047] As described above, the number of the first arrays 34a is nine (see FIG. 9). The number is preferably not less than five, more preferably not less than seven, and particularly preferably not less than eight. The number is preferably not greater than 15, more preferably not greater than 12, and particularly preferably not greater than 10.

[0048] As described above, the number of the second arrays 34b is nine (see FIG. 10). The number is preferably not less than five, more preferably not less than seven, and particularly preferably not less than eight. The number is preferably not greater than 15, more preferably not greater than 12, and particularly preferably not greater than 10.

Examples

[0049] Hereinafter, the effect of the bat will become apparent according to examples. However, the scope disclosed in the description here should not be restrictively construed based on the description of the examples.

[Example]

[0050] A padel bat shown in FIGS. 1 to 12 was produced. In the padel bat, the ratio (W2/PP) was 50%, and the ratio (W4/PN) was 50%.

[Comparative example]

[0051] A padel bat of a comparative example was obtained in the same manner as in the example except that the pattern of the holes was as shown in FIGS. 13 to 15. In the padel bat, the ratio (W2/PP) was 29%, and the ratio (W4/PN) was 29%.

[Feel at impact]

[0052] Four players were each caused to hit a ball with the padel bats, and feel at impact was inquired from each player. All the players answered that "stiffness feeling provided by the bat of the example was better and more preferable as compared with the bat of the comparative example". The evaluation result indicates that the bat of the example is clearly superior.

[Disclosure items]

[0053] Each of the following items discloses a preferred embodiment.

[0054] It should further be noted that the first direction may extend in the opposite direction to the second direction, preferably in the directly opposite direction.

[0055] It should also be noted that the term substantially herein means that the respective deviation may be up to 10% of the specified parameter or definition.

[Item 1]

[0056] A padel bat including: a head; and a handle, in which

the head has a frame, a core plate disposed inside the frame, a front face fabric joined to a surface, on a front side, of the core plate, and a rear face fabric joined to a surface, on a rear side, of the core plate,
each face fabric has a first fiber inclined in a first direction relative to an axial direction of the head, and a second fiber inclined in a second direction relative to the axial direction,
the head includes a plurality of holes each extending through the front face fabric and reaching the rear face fabric,
the head includes a first array that is formed of the holes and inclined in the first direction relative to the axial direction, and a second array that is formed of the holes and inclined in the second direction relative to the axial direction,
a direction of the first fiber and a direction of the first array substantially coincide with each other, and
a direction of the second fiber and a direction of the second array substantially coincide with each other.

[Item 2]

[0057] The padel bat according to Item 1 in which

an absolute value of a difference (aL-aF) between an angle αL of the first array relative to the axial direction and an angle αF of the first fiber relative to the axial direction is not greater than 10°, and
an absolute value of a difference (βL-βF) between an angle βL of the second array relative to the axial direction and an angle βF of the second fiber relative

to the axial direction is not greater than 10°.

[Item 3]

[0058] The padel bat according to Item 2, in which the angle αF and the angle βF are substantially equal to each other.

[Item 4]

[0059] The padel bat according to Item 3, in which an absolute value of a difference (αF-βF) between the angle αF and the angle βF is not greater than 10°.

[Item 5]

[0060] The padel bat according to any one of Items 2 to 4, in which the angle αF is substantially 45° and the angle βF is substantially 45°.

[0061] The above-described bat is suitable for padel game and practice.

Claims

1. A padel bat (2) comprising:

a head (6); and
a handle (4), wherein
the head (6) has a frame (14), a core plate (16) disposed inside the frame (14), a front face fabric (18a) joined to a surface (22), on a front side, of the core plate (16), and a rear face fabric (18b) joined to a surface (24), on a rear side, of the core plate (16),
each face fabric (18a, 18b) has a first fiber (32a) inclined in a first direction relative to an axial direction of the head (6), and a second fiber (32b) inclined in a second direction relative to the axial direction,
the head (6) includes a plurality of holes (20) each extending through the front face fabric (18a) and reaching the rear face fabric (18b),
the head (6) includes a first array (34a) that is formed of the holes (20) and inclined in the first direction relative to the axial direction, and a second array (34b) that is formed of the holes (20) and inclined in the second direction relative to the axial direction,
a direction of the first fiber (32a) and a direction of the first array (34a) at least substantially or coincide with each other, and
a direction of the second fiber (32b) and a direction of the second array (34b) at least substantially or coincide with each other.

2. The padel bat (2) according to claim 1, wherein
an absolute value of a difference (aL-aF) between an angle αL of the first array (34a) relative to the axial direction and an angle αF of the first fiber (32a) relative to the axial direction is not greater than 10°, and
an absolute value of a difference (βL-βF) between an angle βL of the second array (34b) relative to the axial direction and an angle βF of the second fiber (32b) relative to the axial direction is not greater than 10°.

3. The padel bat (2) according to claim 2, wherein the angle αF and the angle βF are at least substantially equal or equal to each other.

4. The padel bat (2) according to claim 3, wherein an absolute value of a difference (αF-βF) between the angle αF and the angle βF is not greater than 10°.

5. The padel bat (2) according to any one of claims 2 to 4, wherein the angle αF is substantially 45° and the angle βF is at least substantially 45° or is 45°.

6. The padel bat (2) according to any one of claims 1 to 5, wherein the core plate (16) comprises a foamed body, and preferably includes multiple independent pieces of foam.

7. The padel bat (2) according to any one of claims 1 to 6, wherein the face fabric (18) has a plurality of first ribbons (26a) and a plurality of second ribbons (26b), wherein the first ribbons (26a) are inclined in the first direction relative to the axial direction and/or wherein the second ribbons (26b) are inclined in the second direction relative to the axial direction, optionally wherein the first ribbons (26a) and the second ribbons (26b) are woven.

8. The padel bat (2) according to claim 7, wherein the first ribbon (26a) includes a plurality of first fibers (32a) aligned with each other, optionally wherein the first fibers 32a are embedded in a resin matrix (28); and/or
wherein the second ribbon (26b) includes a plurality of second fibers (32b) aligned with each other, optionally wherein the second fibers (32b) are embedded in a resin matrix (28).

9. The padel bat (2) according to any one of claims 1 to 8, wherein each hole (20) penetrates through the core plate 16 and the pair of the face fabrics 18, wherein the number of the holes (20) is preferably not less than 25 and not greater than 100.

10. The padel bat (2) according to any one of claims 1 to 9, wherein a ratio of the number of the holes (20) each belonging to any of the second arrays (34b) to the total number of the holes (20) is preferably not

less than 60%, more preferably not less than 80%, and particularly preferably not less than 90%.

11. The padel bat (2) according to any one of claims 1 to 10, wherein a ratio of the number of the holes (20) each belonging to any of the first arrays (34a) and belonging to any of the second arrays (34b) to the total number of the holes (20) is preferably not less than 50%, more preferably not less than 70%, and particularly preferably not less than 80%.

12. The padel bat (2) according to any one of claims 1 to 11, wherein the angle (αF) of the first fiber (32a) is not less than 30°, more preferably not less than 35°, and particularly preferably not less than 40°; and/or wherein the angle (αF) is preferably not greater than 60°, more preferably not greater than 55°, and particularly preferably not greater than 50°; and/or
wherein the angle (βF) of the second fiber (32b) is preferably not less than 30°, more preferably not less than 35°, and particularly preferably not less than 40°; and/or wherein the angle (βF) is preferably not greater than 60°, more preferably not greater than 55°, and particularly preferably not greater than 50°.

13. The padel bat (2) according to any one of claims 1 to 12, wherein a ratio (W2/PP) of a width (W2) of a non-intersecting zone of fibers to a pitch (PP) between the first arrays (34a) is preferably not less than 30%, more preferably not less than 40%, and particularly preferably not less than 45%; and/or wherein a ratio (W4/PN) of a width (W4) of a further non-intersecting zone to a pitch (PN) between the second arrays 34b is preferably not less than 30%, more preferably not less than 40%, and particularly preferably not less than 45%.

14. The padel bat (2) according to any one of claims 1 to 13, wherein an absolute value of the difference (aL-aF) between the angle (αL) of the first array (34a) and the angle (αF) of the first fiber (32a) is not not greater than 10°, preferably not greater than 7° and particularly preferably not greater than 5°.

15. The padel bat (2) according to any one of claims 1 to 14, wherein an absolute value of the difference (βL-βF) between the angle (βL) of the second array (34b) and the angle (βF) of the second fiber (32b) is not greater than 10°, is more preferably not greater than 7° and particularly preferably not greater than 5°.

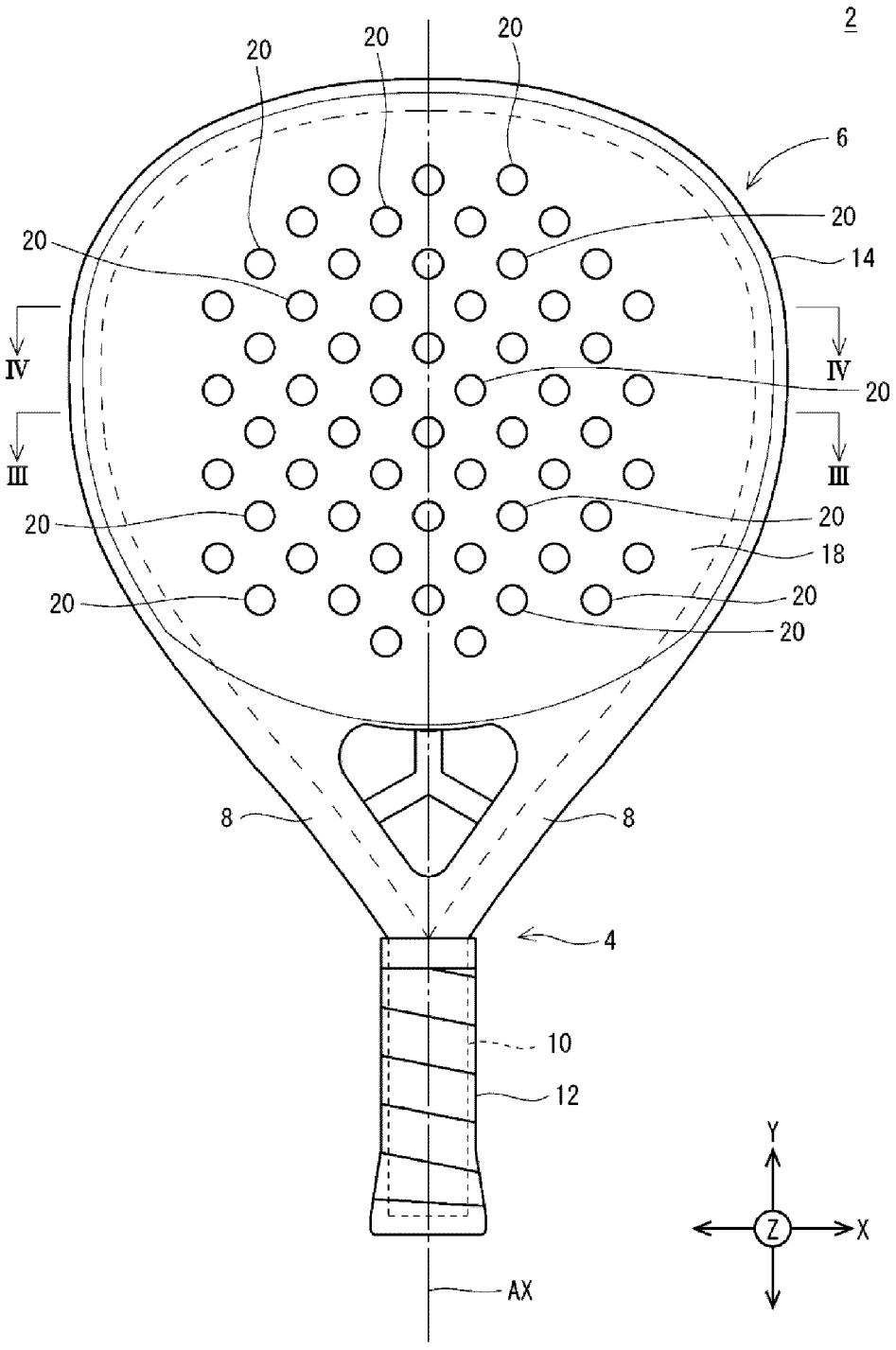
2
20
20
20
6
20
20
14
IV
IV
20
III
III
20
20
18
20
20
20
8
8
4
10
12
Y
Z
X
AX

FIG. 1

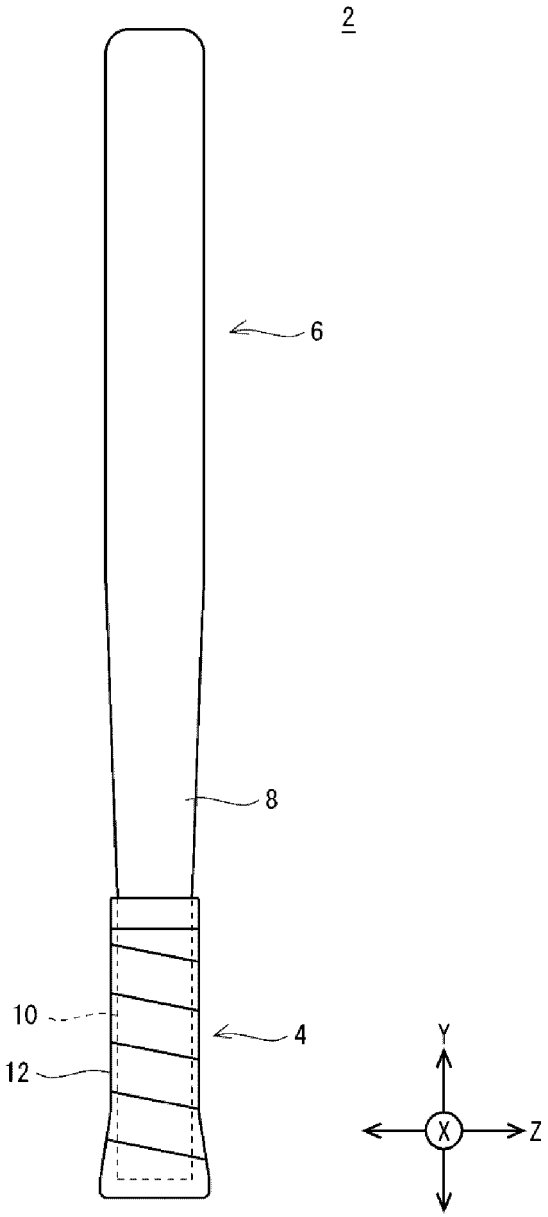

FIG. 2

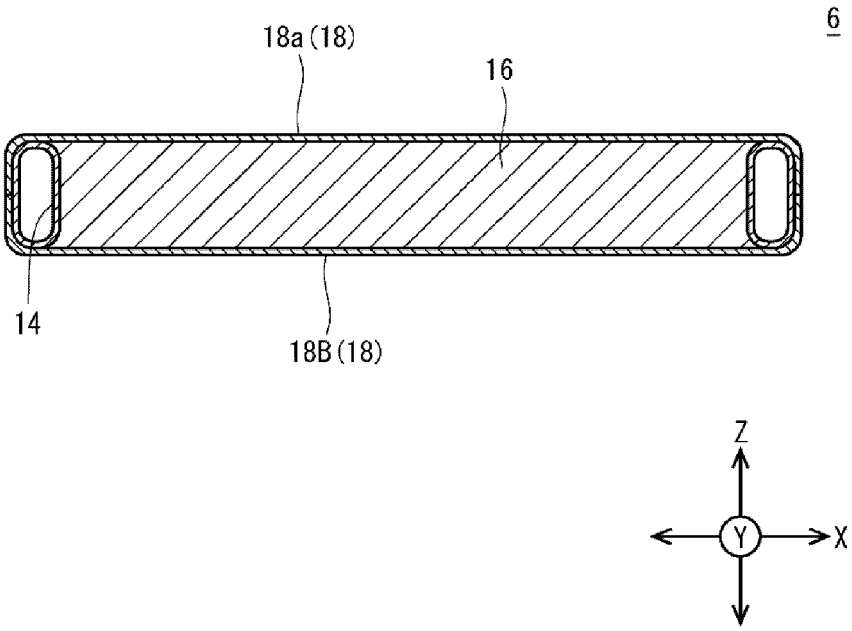

FIG. 3

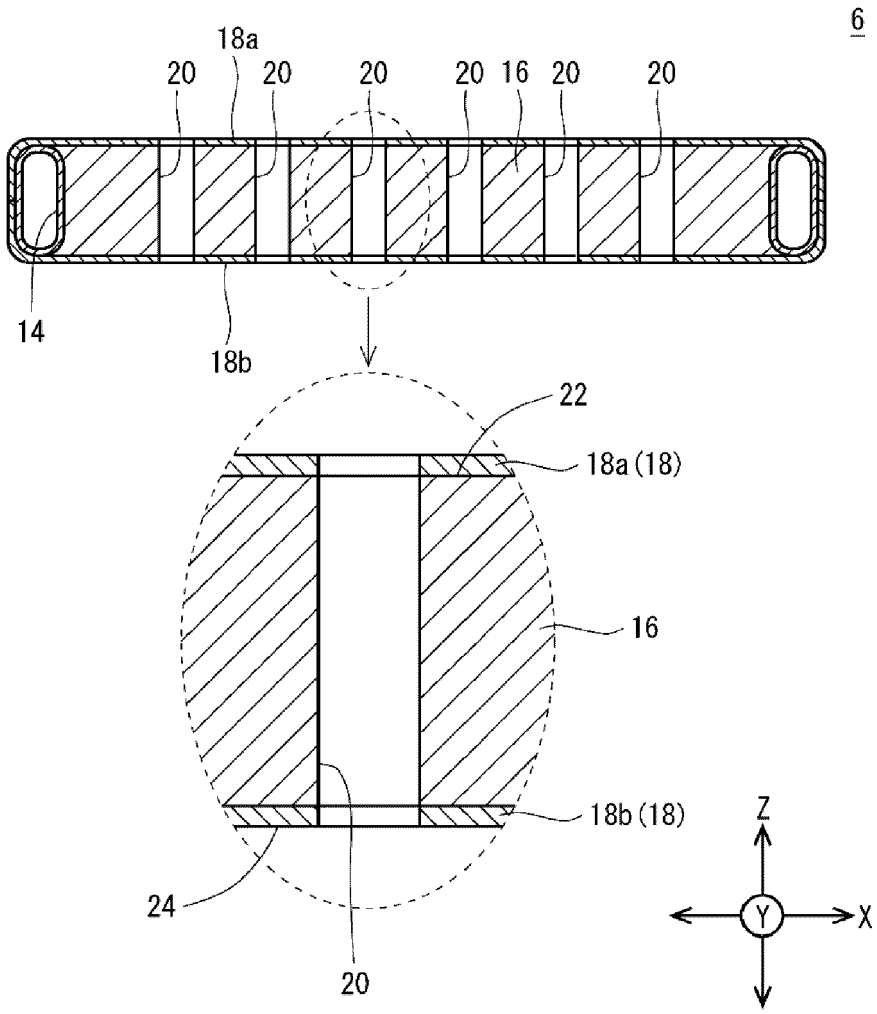

FIG. 4

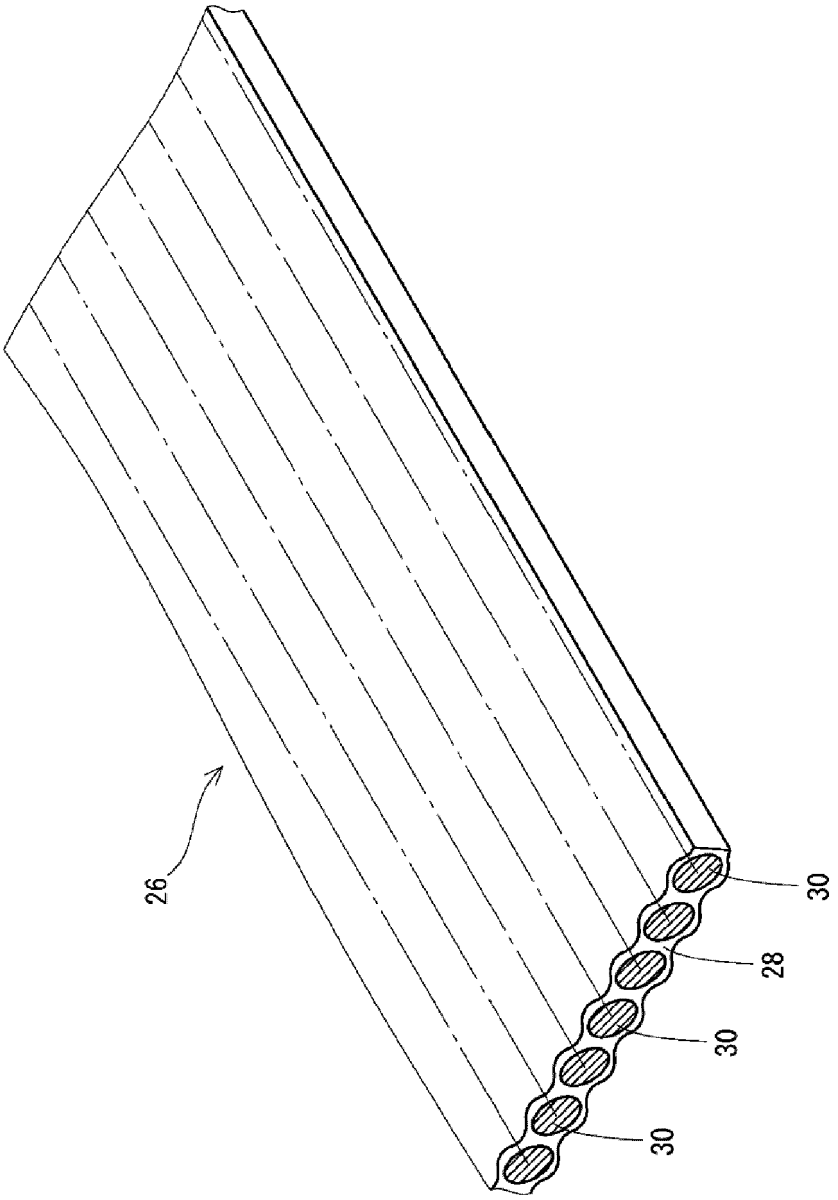

FIG. 5

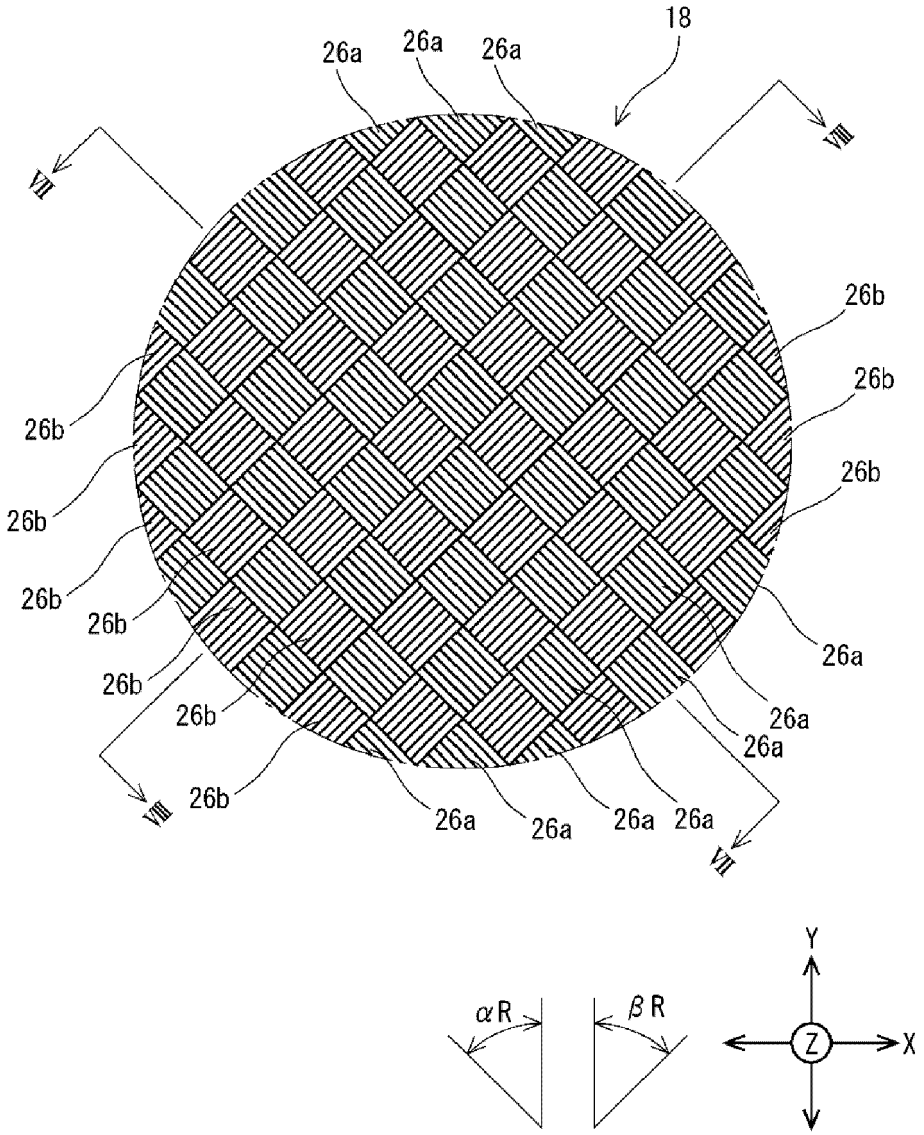
18
26a
26a
26a
VIII
VIII
26b
26b
26b
26b
26b
26b
26b
26b
26a
26a
26a
26a
26a
26a
26a
VIII
VIII
αR
βR
Y
Z
X

FIG. 6

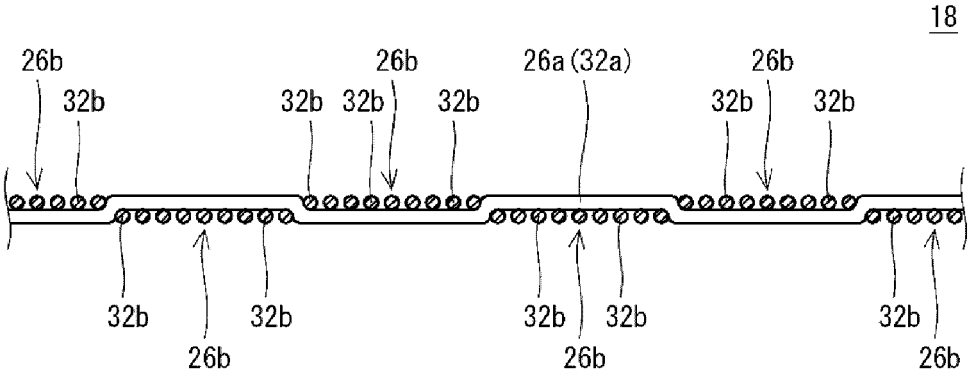
18
26b
32b
32b
32b
26b
32b
26a (32a)
26b
32b
32b
32b
26b
32b
32b
26b
32b
32b
26b
32b
26b

FIG. 7

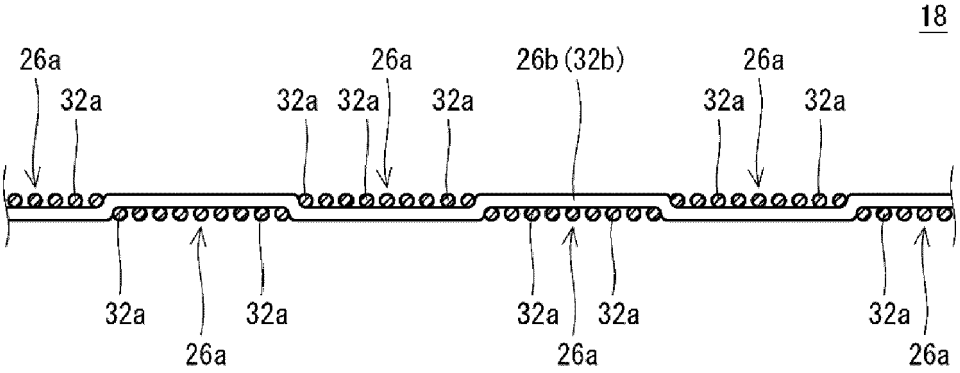
18
26a
32a
26a
32a
32a
32a
26b (32b)
26a
32a
32a
32a
26a
32a
32a
26a
32a
32a
26a
32a
26a

FIG. 8

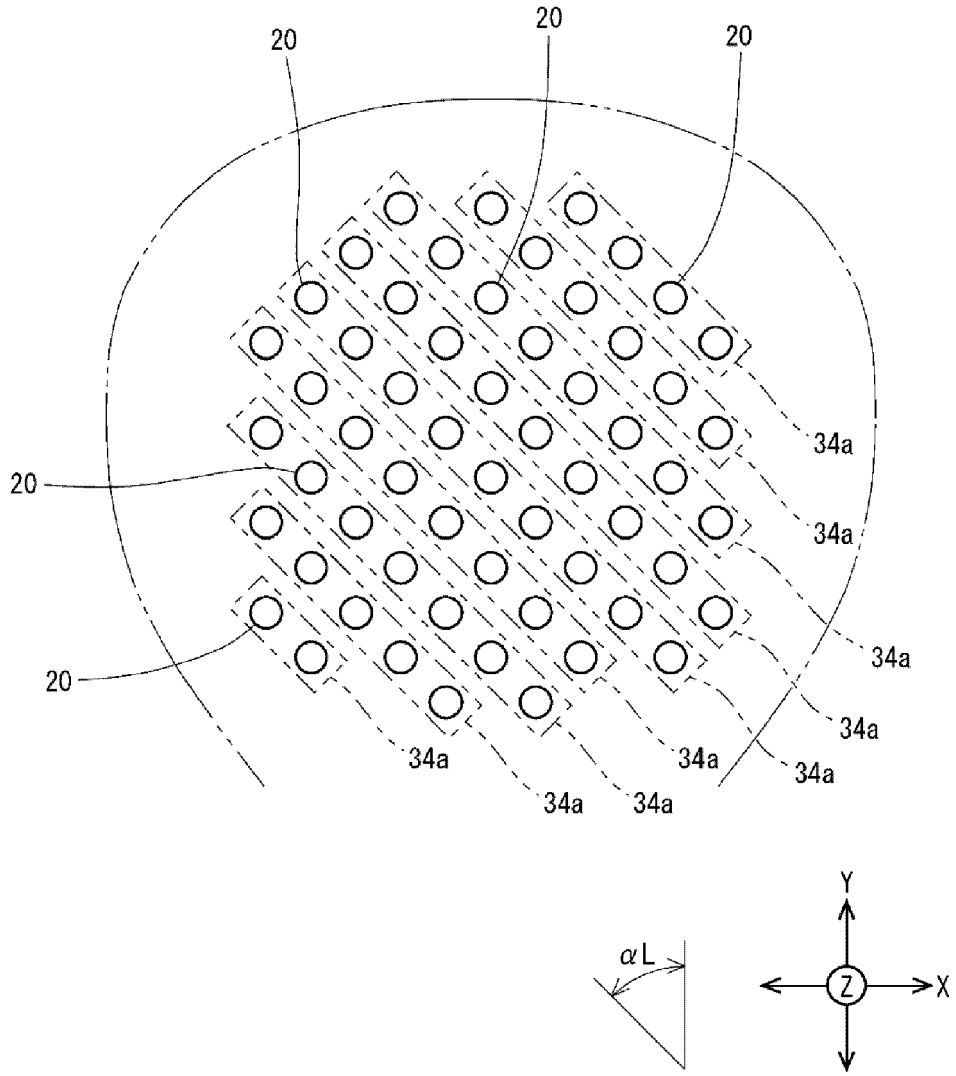

FIG. 9

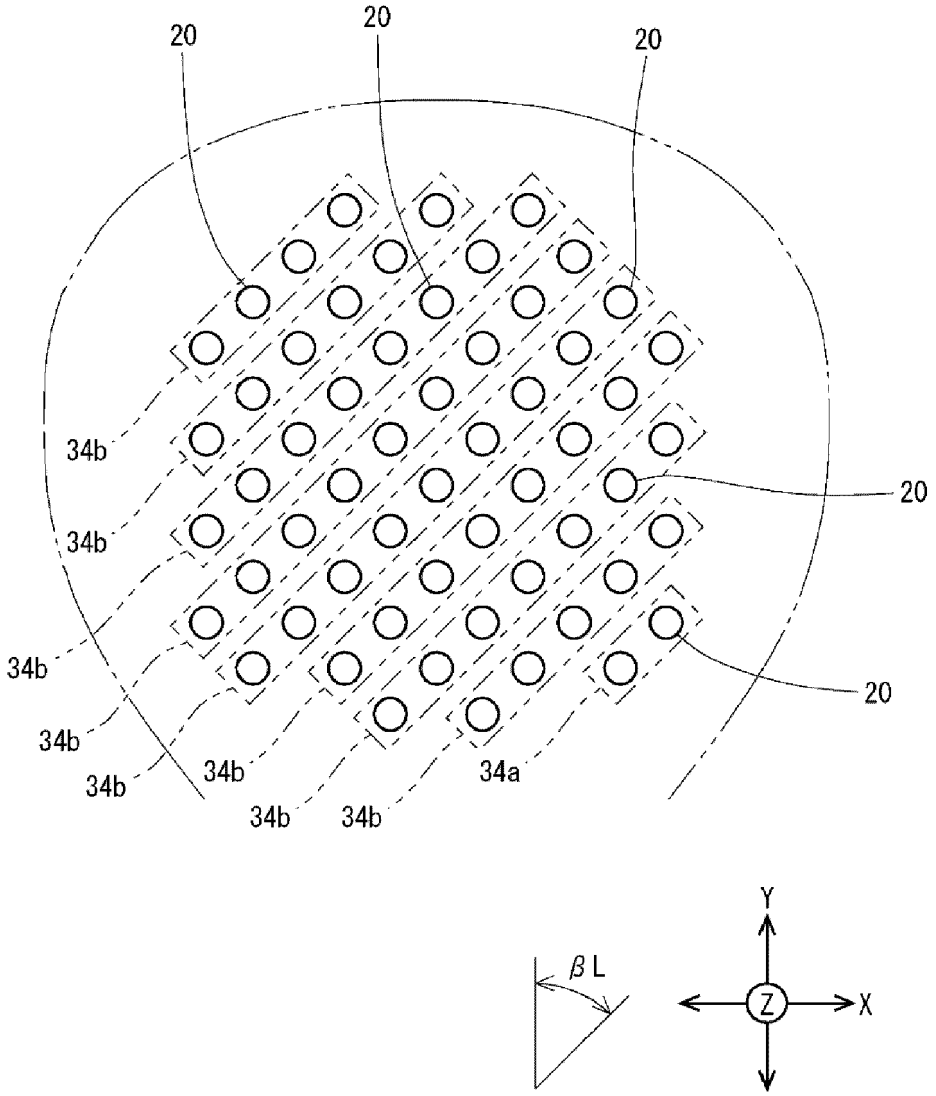

FIG. 10

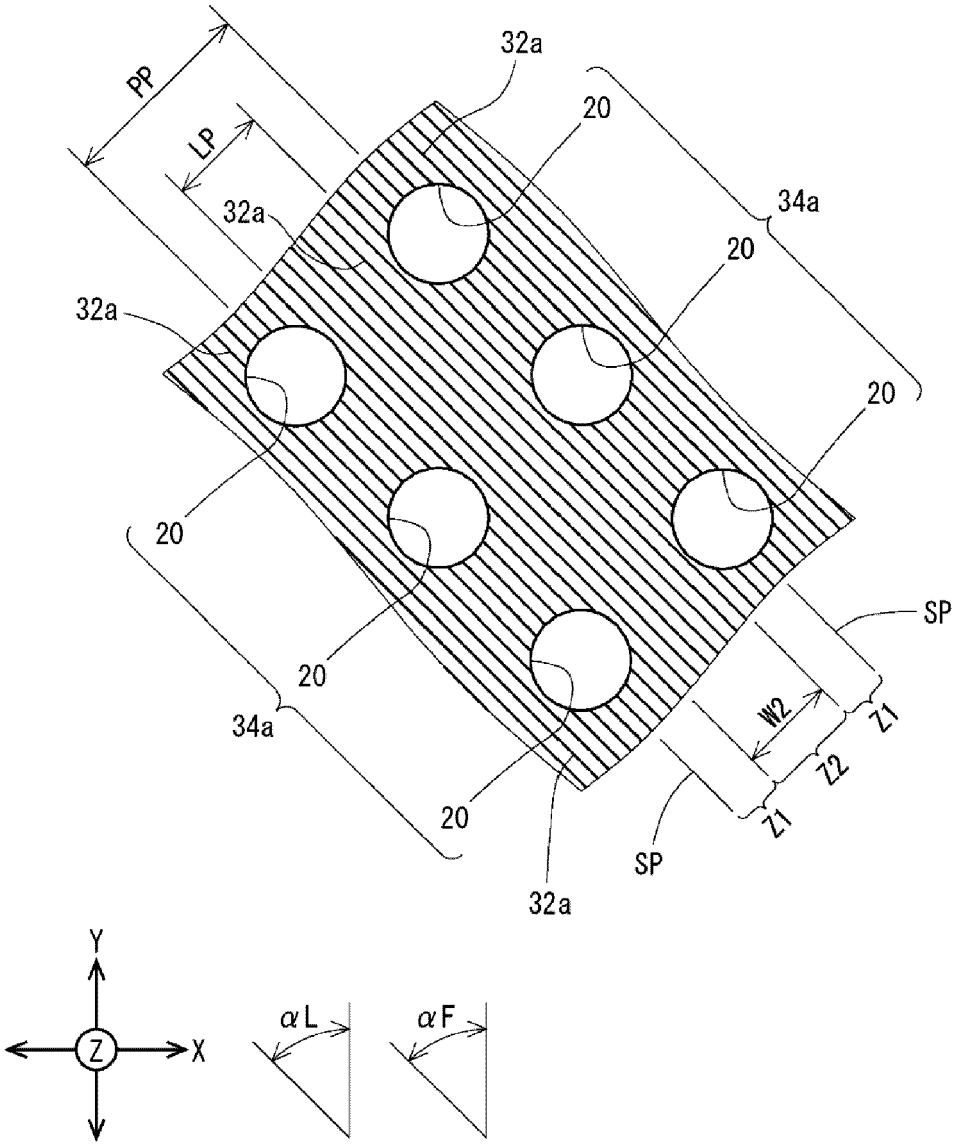

FIG. 11

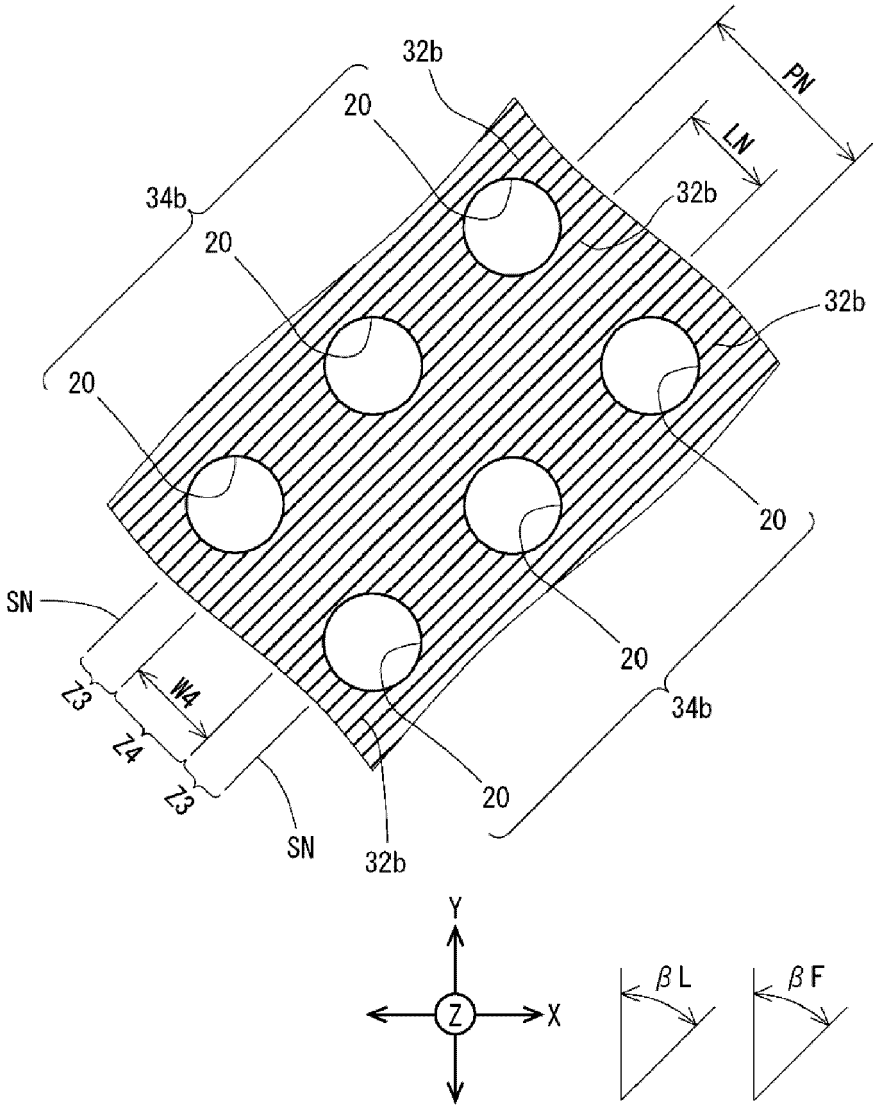
32b
20
PN
LN
34b
32b
20
32b
20
20
SN
W4
Z3
Z4
Z3
20
34b
20
SN
32b
Y
Z
X
βL
βF

FIG. 12

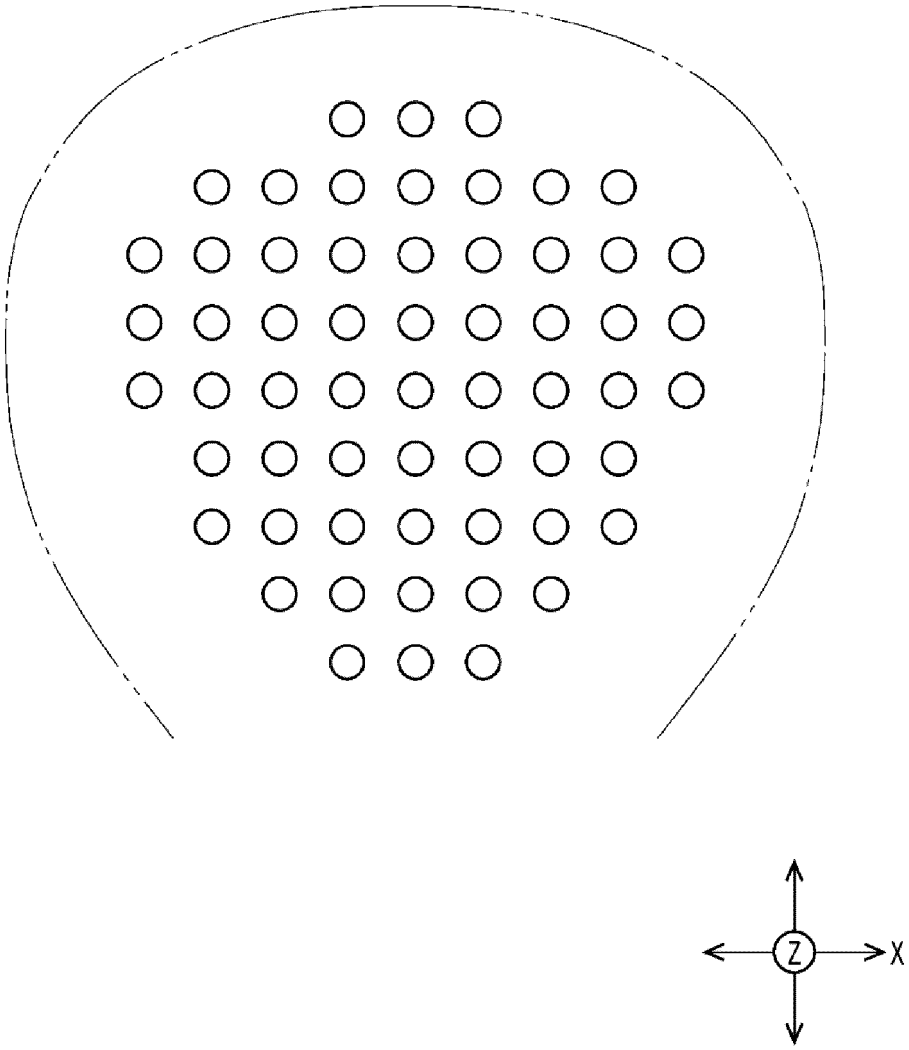

FIG. 13

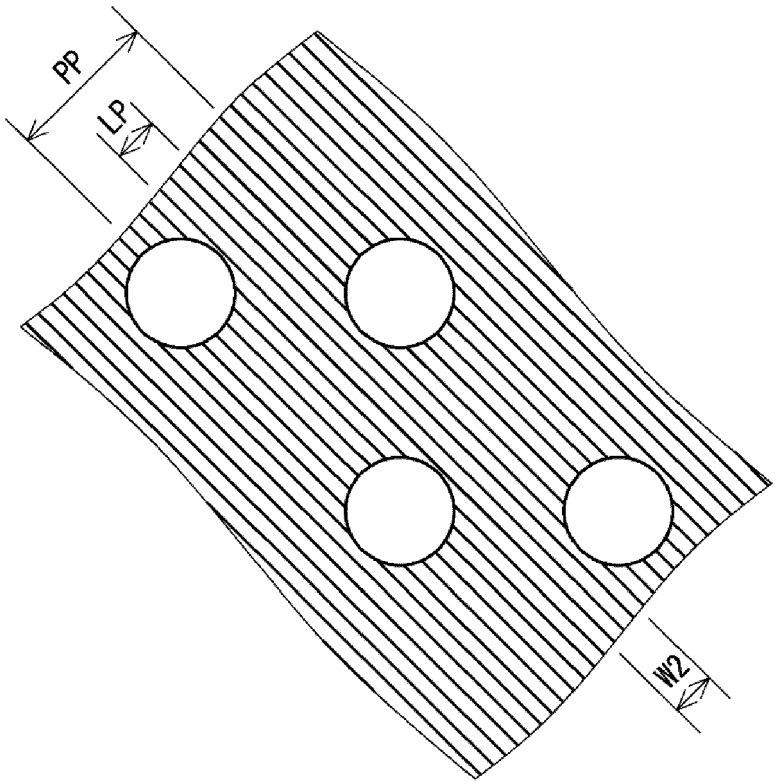

FIG. 14

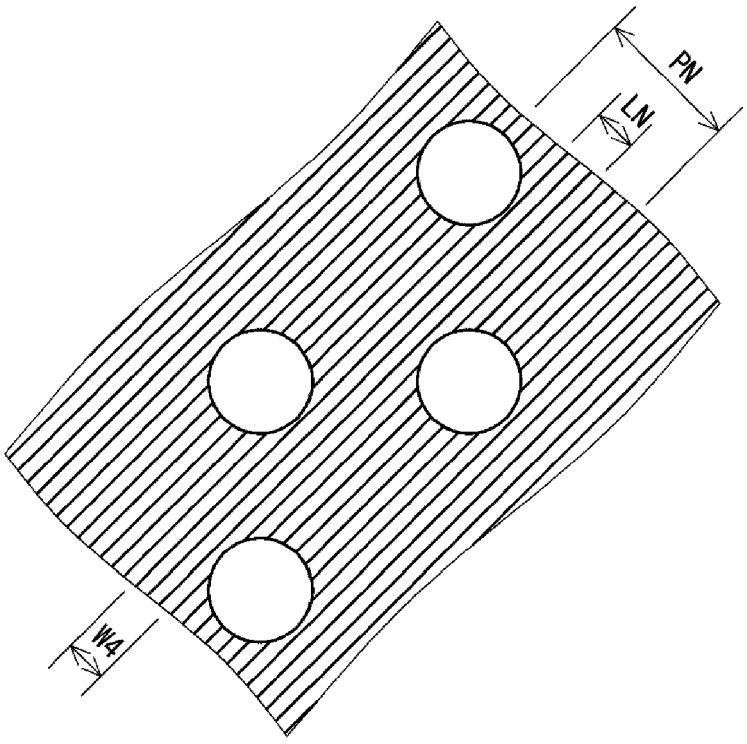

FIG. 15

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EUROPEAN SEARCH REPORT

Application Number
EP 22 20 4170

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 10 864 418 B2 (WILSON SPORTING GOODS [US]) 15 December 2020 (2020-12-15) * the whole document *	1-15	INV. A63B59/48 A63B59/50 A63B102/08
A	CA 3 056 674 A1 (TOVI LLC [US]) 27 March 2020 (2020-03-27) * paragraphs [0001], [0002] * * paragraphs [0050] - [0052]; figures 4,5 * * paragraphs [0060], [0061] * * paragraphs [0066], [0067]; figures 21-23, 11 * * paragraph [0070] *	1-5,7-15	A63B60/50 B29C70/12
A	US 5 407 195 A (TIITOLA ANTTI-JUSSI [FI] ET AL) 18 April 1995 (1995-04-18) * column 10, line 19 - column 12, line 59 *	6	
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A,P	WO 2022/217045 A1 (REVOLIN SPORTS LLC [US]) 13 October 2022 (2022-10-13) * the whole document *	1	

TECHNICAL FIELDS SEARCHED (IPC)
A63B
B29C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	2 March 2023	Tejada Biarge, Diego

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02-03-2023

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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