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(54) **PADDLE TENNIS RACKET HAVING MULTIPLE CORE MATERIAL LAYERS**

(57) The present invention illustrates a paddle tennis racket (1) having multiple core material layers, which includes a ball hitting portion (10) and a handle portion (20). The ball hitting portion (10) includes a racket frame (13), a first surface layer (14), a second surface layer (16), and an internal structure (15). The racket frame (13) has an inner wall (131), and an accommodating space formed in an encircled manner by the inner wall (131). The internal structure (15) is disposed in the aforementioned accommodating space, and includes an upper core material layer (151), a lower core material layer (153) and at least one middle core material layer (152). The first surface layer (14) and the second surface layer (16) are laid on the top surface of the upper core material layer (151) and the bottom surface of the lower core material layer (153) respectively, and both connected with the racket frame (13). The upper core material layer (151) is larger in rigidity than the lower core material layer (153). The structural configuration of the aforementioned paddle tennis racket (1) makes the forehand surface and the backhand surface of the paddle tennis racket (1) have different rigidity.

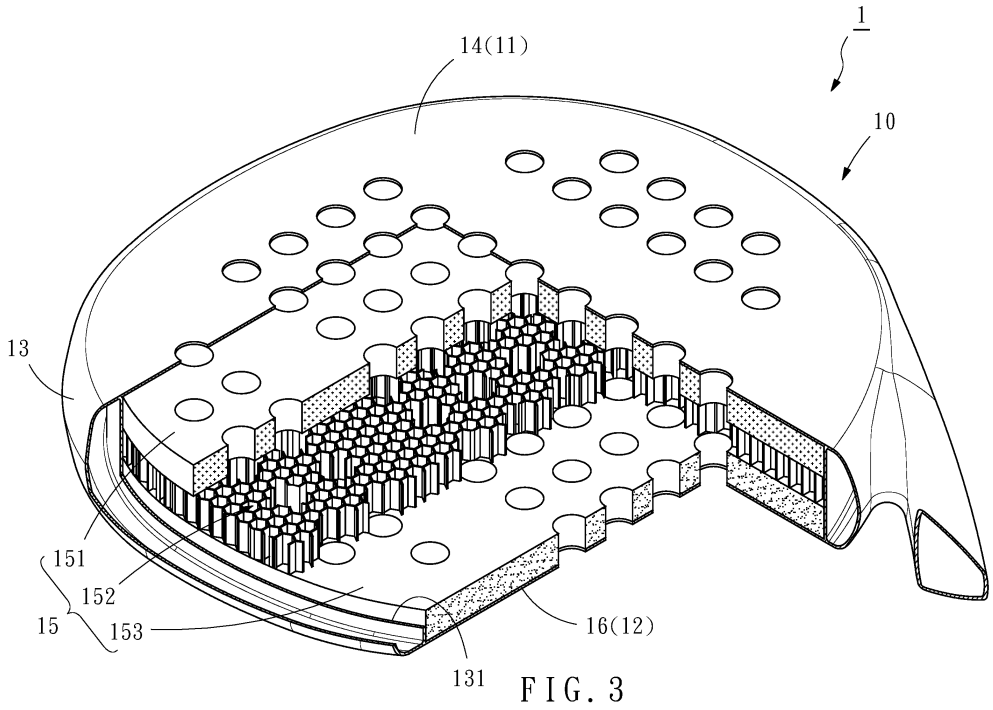

FIG. 3

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a paddle tennis racket and specifically speaking, to a paddle tennis racket having multiple core material layers, which is provided on forehand and backhand surfaces thereof with different rigidities.

2. Description of the Related Art

[0002] Paddle tennis is a sport played with a racket for hitting a ball and similar to tennis. Paddle tennis can be played as singles or doubles, which is smaller in both activity quantity and exercise quantity than tennis and thus suitable for people of all ages, gradually becoming popular and liked by the general masses in recent years.

[0003] The traditional paddle tennis racket is provided therein with a uniform core which is made of a single core material, so the forehand and backhand surfaces of the traditional paddle tennis racket are the same in rigidity. Therefore, under the same hitting force and hitting angle, the power of the ball hit by the forehand surface and the backhand surface will be the same, so players will play in a more limited way during the game, which lowers the splendidness of the game.

SUMMARY OF THE INVENTION

[0004] It is one of the objectives of the present invention to provide a paddle tennis racket with a brand-new structural configuration, the forehand surface and backhand surface of which are different in rigidity.

[0005] Therefore, the present invention provides a paddle tennis racket having multiple core material layers, which includes a ball hitting portion, and a handle portion connected with the ball hitting portion. The aforementioned ball hitting portion includes a racket frame, a first surface layer, a second surface layer, and an internal structure. The aforementioned racket frame has an inner wall, and an accommodating space formed in an encircled manner by the aforementioned inner wall. The internal structure is disposed in the aforementioned accommodating space, and includes an upper core material layer, a lower core material layer, and at least one middle core material layer piled between the upper core material layer and the lower core material layer. The first surface layer is laid on the top surface of the upper core material layer, and connected with the upper rim of the racket frame. The second surface layer is laid on the bottom surface of the lower core material layer, and connected with the lower rim of the racket frame. The upper core material layer is larger in rigidity than the lower core material layer. By the structural configuration of the aforementioned paddle tennis racket, the power of the ball hit by the forehand surface (such as a surface corresponding to the upper core material layer) and the backhand surface (such as a surface corresponding to the lower core material layer) is different, enabling players to use the forehand surface to hit the ball back powerfully or use the backhand surface to perform ball control and lob, so that the players can play the game in a more diverse way, thereby increasing the splendidness of the game.

[0006] In one of the aspects, the upper core material layer may be made of the material different from the material of the lower core material layer. By the difference in material, the upper core material layer and the lower core material layer have different rigidity.

[0007] In another aspect, the upper core material layer may be made of the material the same with the material of the lower core material layer, but the upper core material layer and the lower core material layer are both a foam layer structure, the upper core material layer and the lower core material layer are both made of a same material by foaming, and the porosity of the upper core material layer is smaller than the porosity of the lower core material layer. By different porosities, the rigidities of the upper core material layer and the lower core material layer can be controlled effectively.

[0008] In another aspect, the number of the middle core material layer may be one, and the middle core material layer may be a honeycomb panel.

[0009] In another aspect, the overall density of the upper core material layer is larger than the overall density of the lower core material layer.

[0010] In another aspect, the internal structure may adopt other kinds of structural configurations. Specifically, the upper core material layer may be a honeycomb panel, and the honeycomb panel of the upper core material layer has a plurality of upper hexagon units. The lower core material layer may be also a honeycomb panel, and the honeycomb panel of the lower core material layer has a plurality of lower hexagon units. The material of the upper core material layer is the same with the material of the lower core material layer, and the size of each upper hexagon unit is smaller than the size of each lower hexagon unit. By different sizes of the hexagon units, the rigidities of the upper core material layer and the lower core material layer can be controlled effectively.

[0011] In another aspect, the upper core material layer may be a honeycomb panel, and the honeycomb panel of the upper core material layer has a plurality of upper hexagon units. The lower core material layer may be also a honeycomb panel, and the honeycomb panel of the lower core material layer has a plurality of lower hexagon units. The size of each upper hexagon unit is equal to the size of each lower hexagon unit, but the upper core material layer and the lower core material layer are made of different materials. Only by the difference in material, the upper core material layer and the lower core material layer can still have different rigidities.

[0012] In another aspect, the middle core material layer is glued between the upper core material layer and the

lower core material layer.

[0013] In another aspect, the thickness of the ball hitting portion is ranged from 22 millimeters to 38 millimeters for meeting the standard of the paddle tennis racket.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The detailed structure and features related to the paddle tennis racket illustrated by the following embodiments will be described in the following embodiments. However, it should be understandable that the embodiments and the accompanying drawings to be described herein below are given by way of illustration only, not limitative of the claims of the present invention, and wherein:

FIG. 1 is a perspective view of a paddle tennis racket of a first embodiment;
FIG. 2 is a top view of FIG. 1;
FIG. 3 is a partially cut-off perspective view of FIG. 1;
FIG. 4 is a sectional view taken along the line 4-4 in FIG. 2;
FIG. 5 is a sectional view of a paddle tennis racket of a second embodiment;
FIG. 6 is a partially cut-off perspective view of a paddle tennis racket of a third embodiment; and
FIG. 7 is a partially cut-off perspective view of a paddle tennis racket of a fourth embodiment.

DETAILED DESCRIPTION OF THE INVENTION

[0015] First of all, it is to be mentioned that the technical features provided by the present invention are unlimited to the specific structure, usage and application thereof described in the detailed description of the invention. It should be understood by those skilled in the related art that all the terms used in the content of the specification are for illustrative description. The directional terms mentioned in the content of the specification, such as 'fore', 'upper', 'lower', 'back', 'left', 'right', 'top', 'bottom', 'in', and 'out', are also just for illustrative description on the basis of normal usage direction, not intended to limit the claimed scope.

[0016] For the detailed description of the technical features of the present invention, four embodiments are instanced herein below and described in coordination with the accompanying drawings.

[0017] As shown in FIG. 1 to FIG. 4, a first embodiment provides a paddle tennis racket 1 which includes a ball hitting portion 10, and a handle portion 20 connected with the ball hitting portion 10. The ball hitting portion 10 is the portion of the paddle tennis racket 1 for hitting the ball. Based on the drawing in FIG. 3, the ball hitting portion 10 has a top surface 11 and a bottom surface 12. The top surface 11 and the bottom surface 12 may serve as the forehand surface and the backhand surface respectively. Of course, in some situations, the top surface 11 of the ball hitting portion 10 may serve as the backhand surface, and the bottom surface 12 of the ball hitting portion 10 serves as the forehand surface, so they are unlimited to this embodiment. In usual situations, the thickness of the ball hitting portion 10, i.e. the distance between the top surface 11 and the bottom surface 12, is ranged from 22 to 38 millimeters (mm), so as to meet the standard of the paddle tennis racket. The ball hitting portion 10 structurally includes a racket frame 13, a first surface layer 14, an internal structure 15, and a second surface layer 16. The racket frame 13 is formed in a way that carbon fiber reinforced composite material is softened after being pressurized and heated and then undergoes a crosslinking reaction to solidify. The inside of the racket frame 13 in this embodiment is hollow in shape. The racket frame 13 has an inner wall 131, and an approximately diamond-shaped accommodating space is formed in an encircled manner by the inner wall 131. The internal structure 15 is disposed in the aforementioned accommodating space. The first surface layer 14 and the second surface layer 16 are the parts for directly contacting the ball. The first surface layer 14 and the second surface layer 16 are also made of carbon fiber reinforced composite material. After the first surface layer 14 and the second surface layer 16 are solidified and formed, the first surface layer 14 is integrally connected with the upper rim of the racket frame 13, and the second surface layer 16 is integrally connected with the lower rim of the racket frame 13.

[0018] The internal structure 15 is disposed between the first surface layer 14 and the second surface layer 16. The internal structure 15 includes an upper core material layer 151, a lower core material layer 153, and a middle core material layer 152 piled between the upper core material layer 151 and the lower core material layer 153. The upper core material layer 151 is arranged for bearing the strike of the forehand surface, and the aforementioned first surface layer 14 is laid on the top surface of the upper core material layer 151. The upper core material layer 151 is a foam layer structure, which is made of EVA (ethylene-vinyl acetate) by foaming. The Shore hardness of EVA is Shore A 10-25. The upper core material layer 151 is relatively lower in porosity and relatively higher in overall density, so the upper core material layer 151 has a relatively higher rigidity, thereby having relatively higher ability to resist deformation and thus influential in hitting feeling. The middle core material layer 152 is arranged for providing supporting effect. In this embodiment, the number of the middle core material layer 152 is only one. The number of the middle core material layer 152 can be modified according to the practical demand. The middle core material layer 152 in this embodiment is a honeycomb panel. The honeycomb panel may be made of aluminum plate, cardboard or PP (polypropylene) board. The top surface and bottom surface of the middle core material layer 152 is glued between the upper core material layer 151 and the lower core material layer 153 by adhesive. The lower core material layer 153 is arranged for bearing the strike of the backhand surface,

and the second surface layer 16 is laid on the bottom surface of the lower core material layer 153. The lower core material layer 153 is also a foam layer structure, and made of PU (polyurethane) by foaming. The lower core material layer 153 is relatively higher in porosity (relatively higher in expansion ratio) and relatively lower in overall density, so that the overall lower core material layer 153 has a relatively lower rigidity. Besides, as shown in FIG. 1 and FIG. 4, the ball hitting portion 10 is further provided with a plurality of through holes 17. Each through hole 17 penetrates through the first surface layer 14, the internal structure 15 and the second surface layer 16, enabling air flow to pass through the ball hitting portion 10 smoothly, thereby lowering wind resistance.

[0019] The handle portion 20 is arranged for the user to hold. The handle portion 20 is integrally connected with the racket frame 13. Besides, the handle portion 20 is covered with a grip strap 21 for anti-slip and anti-vibration.

[0020] Because the upper core material layer 151 and the lower core material layer 153 are made of different foam materials, and the porosities and overall densities of the upper core material layer 151 and the lower core material layer 153 are adjusted in a way that the upper core material layer 151 is smaller in porosity (relatively lower in expansion ratio) than the lower core material layer 153 and the upper core material layer 151 is larger in overall density than the lower core material layer 153, the upper core material layer 151 is larger in rigidity than the lower core material layer 153. By such structural configuration, the player uses the forehand surface with the relatively higher rigidity to hit the ball will cause the ball relatively higher power, that is beneficial for the player to hit the ball back powerfully by the forehand surface. On the other hand, the player uses the backhand surface with the relatively lower rigidity to hit the ball will cause the ball relatively lower power, so that the player can use the backhand surface to perform ball control and lob. Therefore, the players can play the game in a more diverse way, thereby increasing the splendidness of the game.

[0021] The present invention further provides a second embodiment, referring to FIG. 5. The paddle tennis racket 1' of the second embodiment is approximately the same in structure with the paddle tennis racket 1 of the first embodiment. One of the differences is that in the second embodiment, the upper core material layer 151 and the lower core material layer 153 are both made of EVA by foaming, but the porosity of the upper core material layer 151 is smaller than the porosity of the lower core material layer 153. The adjustment of different porosities can also make the rigidity of the upper core material layer 151 larger than the rigidity of the lower core material layer 153.

[0022] The present invention further provides a third embodiment, referring to FIG. 6. The paddle tennis racket 1" of the third embodiment is approximately the same in structure with the paddle tennis racket 1 of the first embodiment. The difference therebetween is that in the third embodiment, the upper core material layer 151 is a honeycomb panel, and the honeycomb panel of the upper core material layer 151 has a plurality of upper hexagon units UT. The cross-sectional shape of each upper hexagon unit UT is regular hexagon, and the upper hexagon units UT are connected with each other. The upper core material layer 151 is made of aluminum plate. The number of the middle core material layer 152 is one, and the middle core material layer 152 is made of EVA by foaming. The lower core material layer 153 is also made of aluminum plate. The lower core material layer 153 is also a honeycomb panel, and the honeycomb panel of the lower core material layer 153 has a plurality of lower hexagon units UB. The cross-sectional shape of each lower hexagon unit UB is regular hexagon, and the lower hexagon units UB are connected with each other. Besides, the size of each upper hexagon unit UT is smaller than the size of each lower hexagon unit UB. Despite that the material of the upper core material layer 151 is the same with the material of the lower core material layer 153, the adjustment of the sizes of the upper hexagon units UT and the lower hexagon units UB of the honeycomb panels can also make the rigidity of the upper core material layer 151 larger than the rigidity of the lower core material layer 153.

[0023] The present invention further provides a fourth embodiment, referring to FIG. 7. The paddle tennis racket 1‴ of the fourth embodiment is approximately the same in structure with the paddle tennis racket 1" of the third embodiment. The difference therebetween is that the upper core material layer 151 is a honeycomb panel made of aluminum plate, but the lower core material layer 153 is a honeycomb panel made of PP board. Besides, the size of each upper hexagon unit UT of the honeycomb panel of the upper core material layer 151 is equal to the size of each lower hexagon unit UB of the honeycomb panel of the lower core material layer 153. The difference in material can also make the upper core material layer 151 larger in rigidity than the lower core material layer 153.

[0024] The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention, and all such modifications as would be obvious to one skilled in the art are intended to be included within the scope of the following claims.

Claims

1. A paddle tennis racket (1) having multiple core material layers, the paddle tennis racket (1) comprising a ball hitting portion (10) and a handle portion (20) connected with the ball hitting portion (10), the ball hitting portion (10) comprising a racket frame (13), a first surface layer (14), a second surface layer (16) and an internal structure (15), the racket frame (13)

having an inner wall (131) and an accommodating space formed in an encircled manner by the inner wall (131), the internal structure (15) being disposed in the accommodating space and comprising an upper core material layer (151), a lower core material layer (153) and at least one middle core material layer (152), the at least one middle core material layer (152) being piled between the upper core material layer (151) and the lower core material layer (153), the first surface layer (14) being laid on a top surface of the upper core material layer (151) and connected with an upper rim of the racket frame (13), the second surface layer (16) being laid on a bottom surface of the lower core material layer (153) and connected with a lower rim of the racket frame (13), the upper core material layer (151) being larger in rigidity than the lower core material layer (153).

2. The paddle tennis racket (1) as claimed in claim 1, wherein the upper core material layer (151) and the lower core material layer (153) are made of different materials.

3. The paddle tennis racket (1) as claimed in claim 1, wherein the upper core material layer (151) and the lower core material layer (153) are both a foam layer structure; the upper core material layer (151) and the lower core material layer (153) are both made of a same material by foaming; a porosity of the upper core material layer (151) is smaller than a porosity of the lower core material layer (153).

4. The paddle tennis racket (1) as claimed in claim 2 or 3, wherein a number of the at least one middle core material layer (152) is one, and the at least one middle core material layer (152) is a honeycomb panel.

5. The paddle tennis racket (1) as claimed in anyone of claims 1-3, wherein the upper core material layer (151) is larger in density than the lower core material layer (153).

6. The paddle tennis racket (1) as claimed in claim 1, wherein the upper core material layer (151) is a honeycomb panel, and the honeycomb panel of the upper core material layer (151) has a plurality of upper hexagon units (UT); the lower core material layer (153) is also a honeycomb panel, and the honeycomb panel of the lower core material layer (153) has a plurality of lower hexagon units (UB); the upper core material layer (151) is the same in material with the lower core material layer (153), and each of the upper hexagon units is smaller in size than each of the lower hexagon units.

7. The paddle tennis racket (1) as claimed in claim 2, wherein the upper core material layer (151) is a honeycomb panel, and the honeycomb panel of the upper core material layer (151) has a plurality of upper hexagon units (UT); the lower core material layer (153) is also a honeycomb panel, and the honeycomb panel of the lower core material layer (153) has a plurality of lower hexagon units (UB); each of the upper hexagon units is equal in size to each of the lower hexagon units.

8. The paddle tennis racket (1) as claimed in claim 6 or 7, wherein a number of the at least one middle core material layer (152) is one, and the at least one middle core material layer (152) is a foam layer structure.

9. The paddle tennis racket (1) as claimed in claim 6 or 7, wherein the upper core material layer (151) is larger in density than the lower core material layer (153).

10. The paddle tennis racket (1) as claimed in claim 1, wherein the at least one middle core material layer (152) is glued between the upper core material layer (151) and the lower core material layer (153).

11. The paddle tennis racket (1) as claimed in claim 1, wherein a thickness of the ball hitting portion (10) is ranged from 22 millimeters to 38 millimeters.

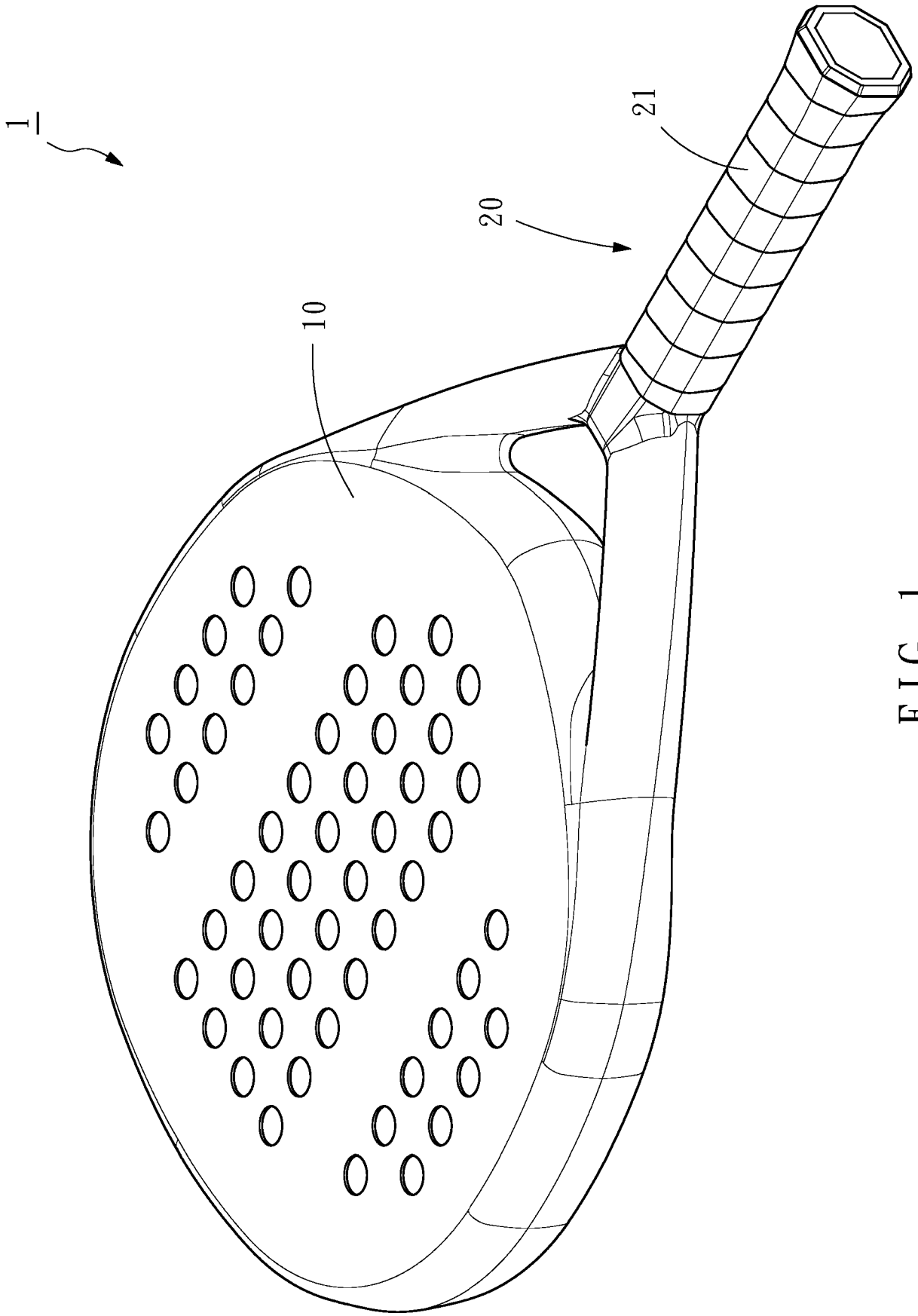

FIG. 1

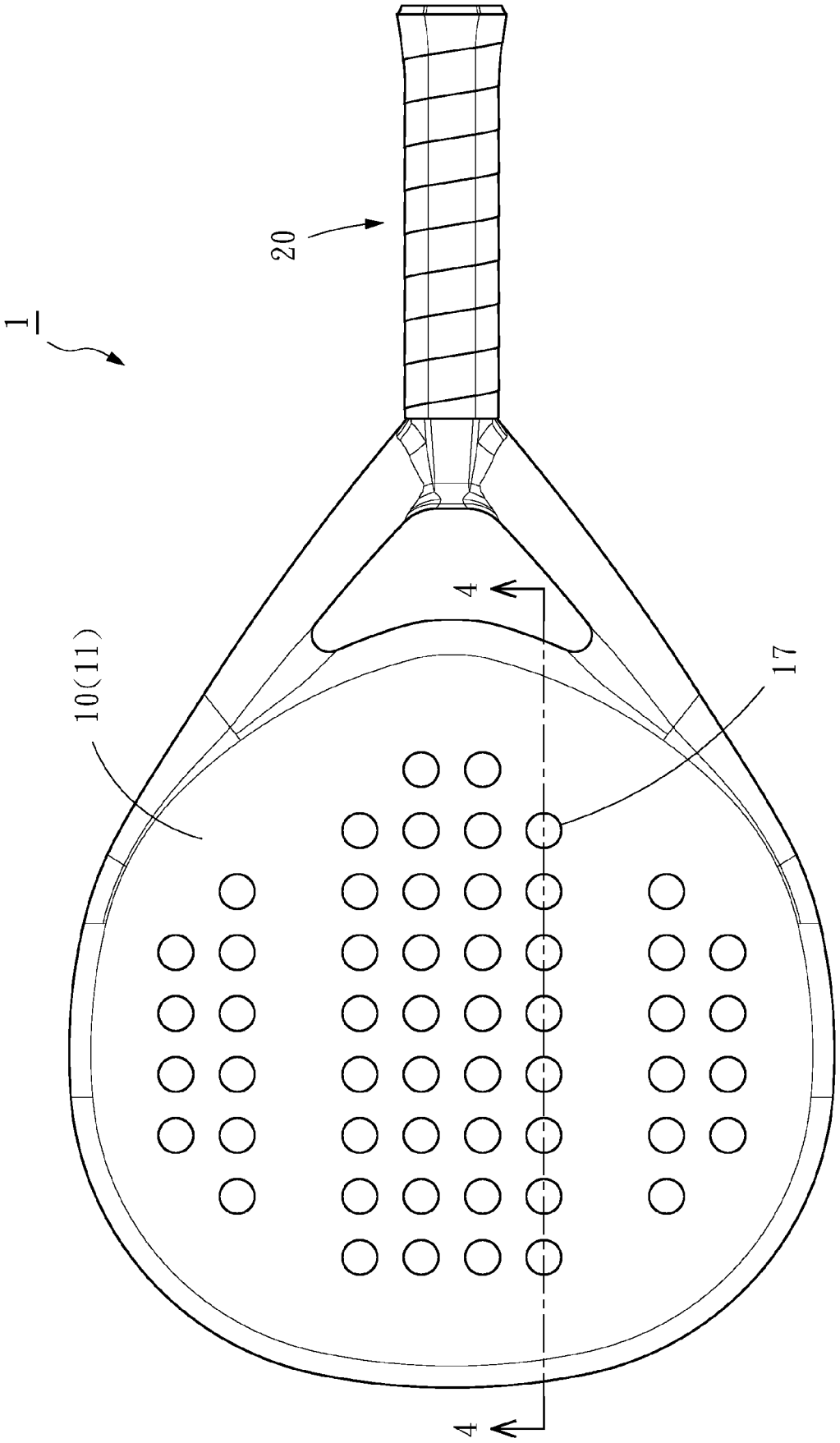

FIG. 2

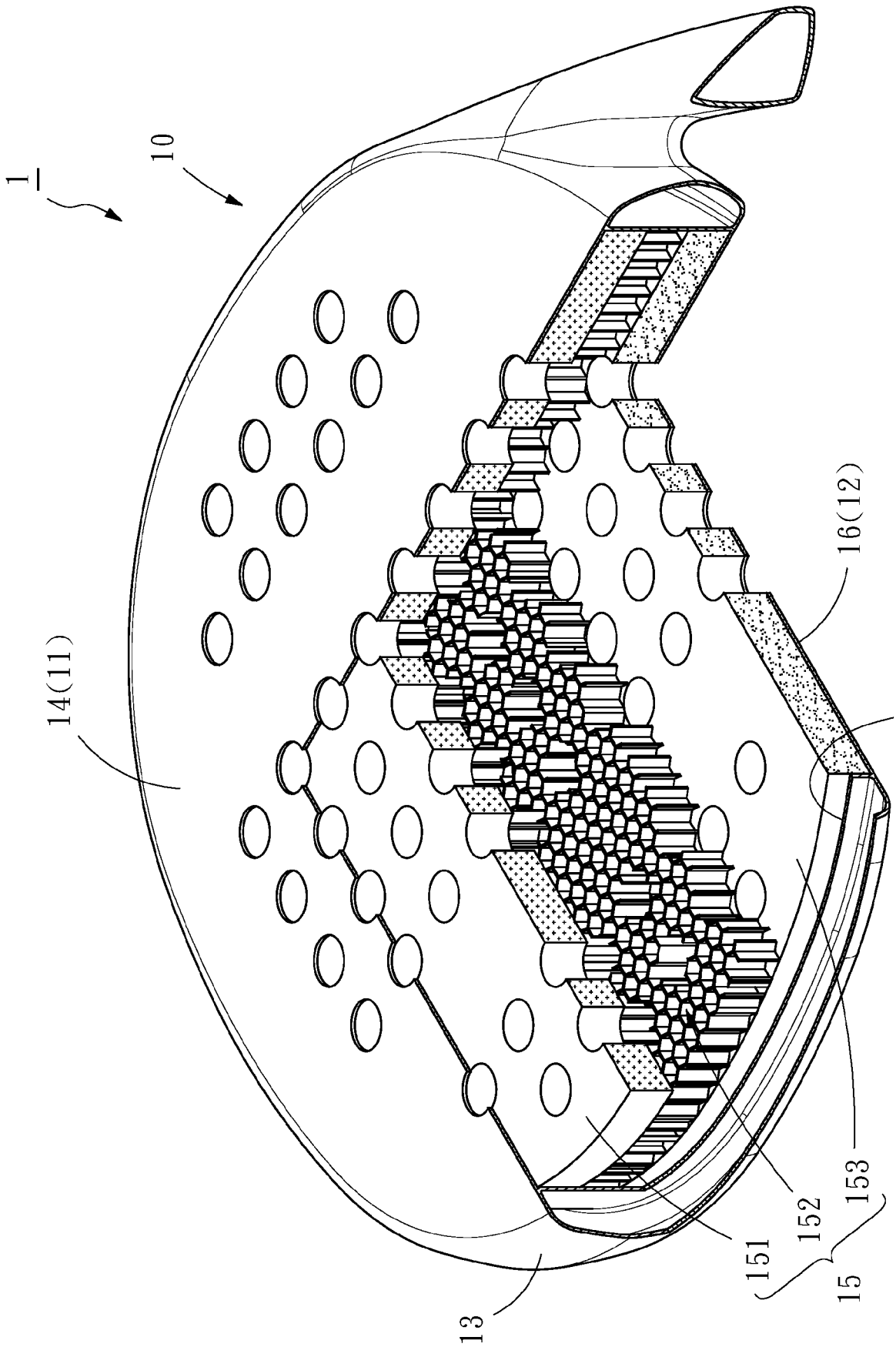

FIG. 3

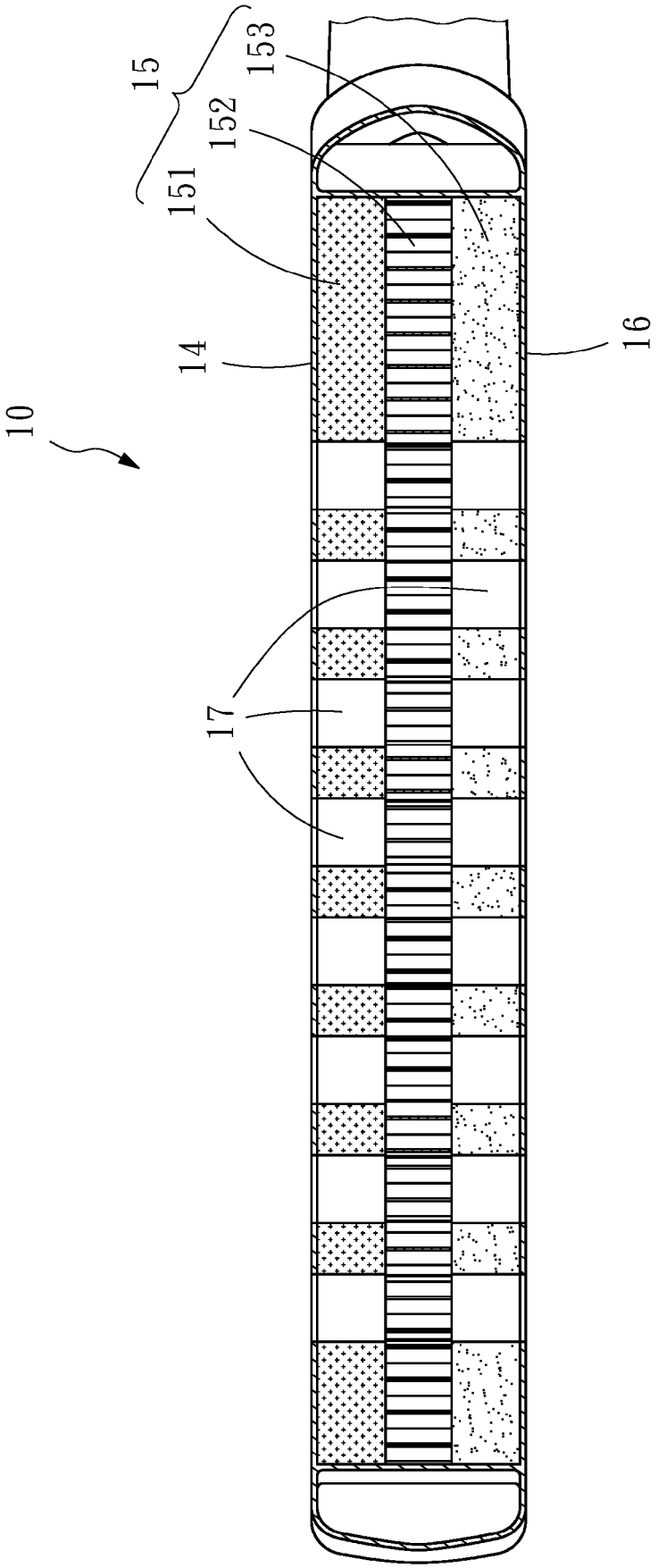

FIG. 4

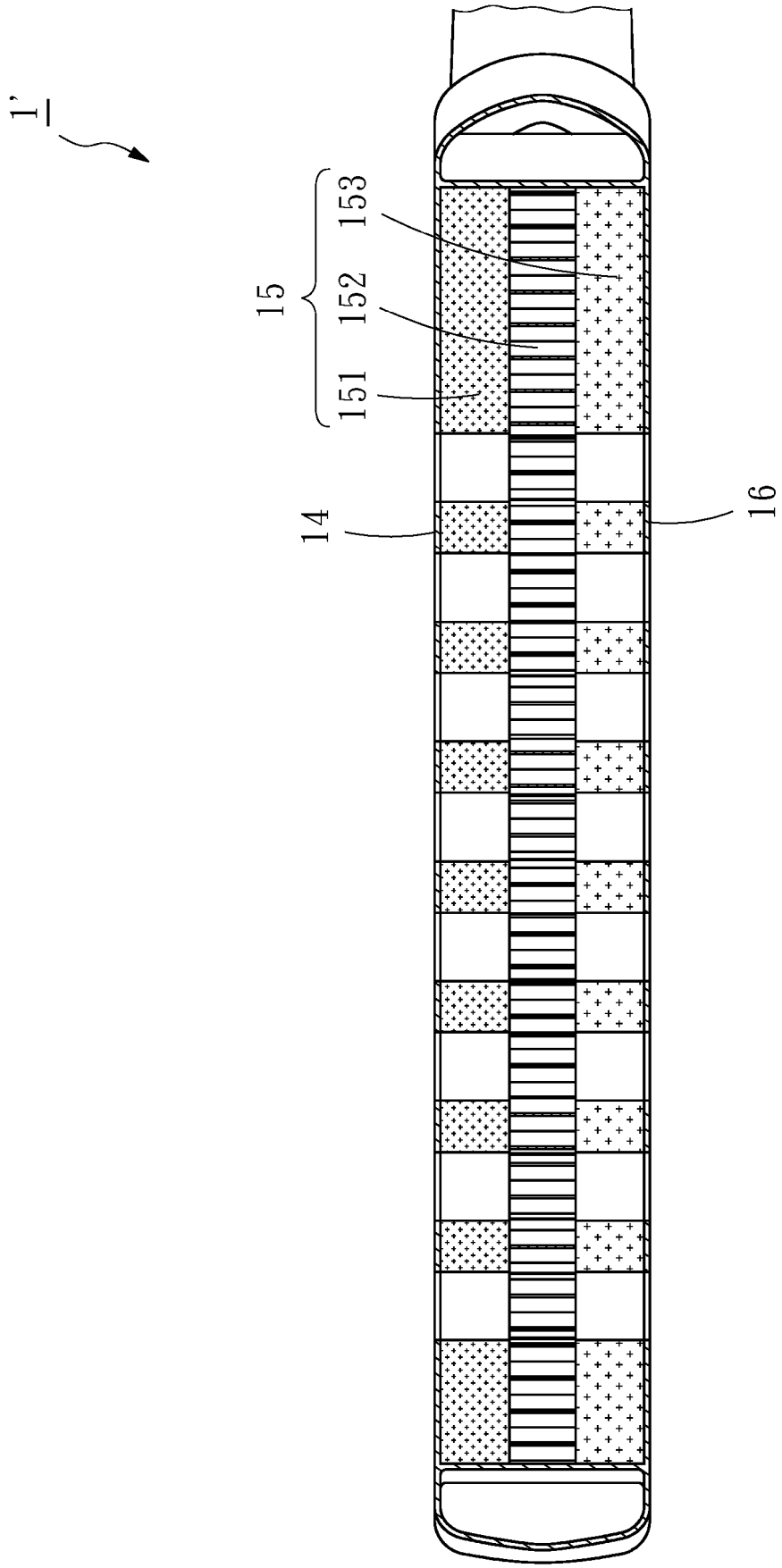

FIG. 5

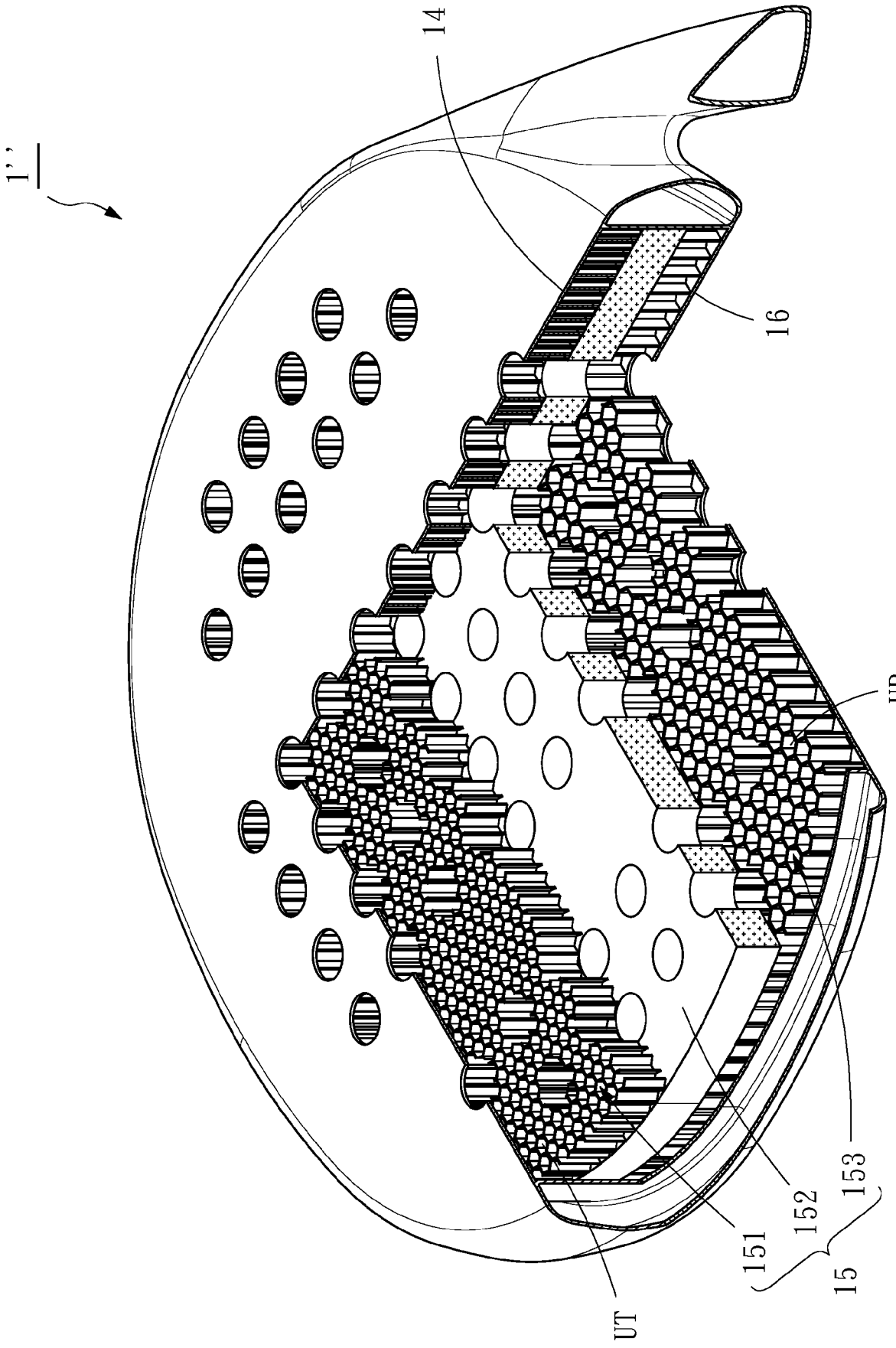

FIG. 6

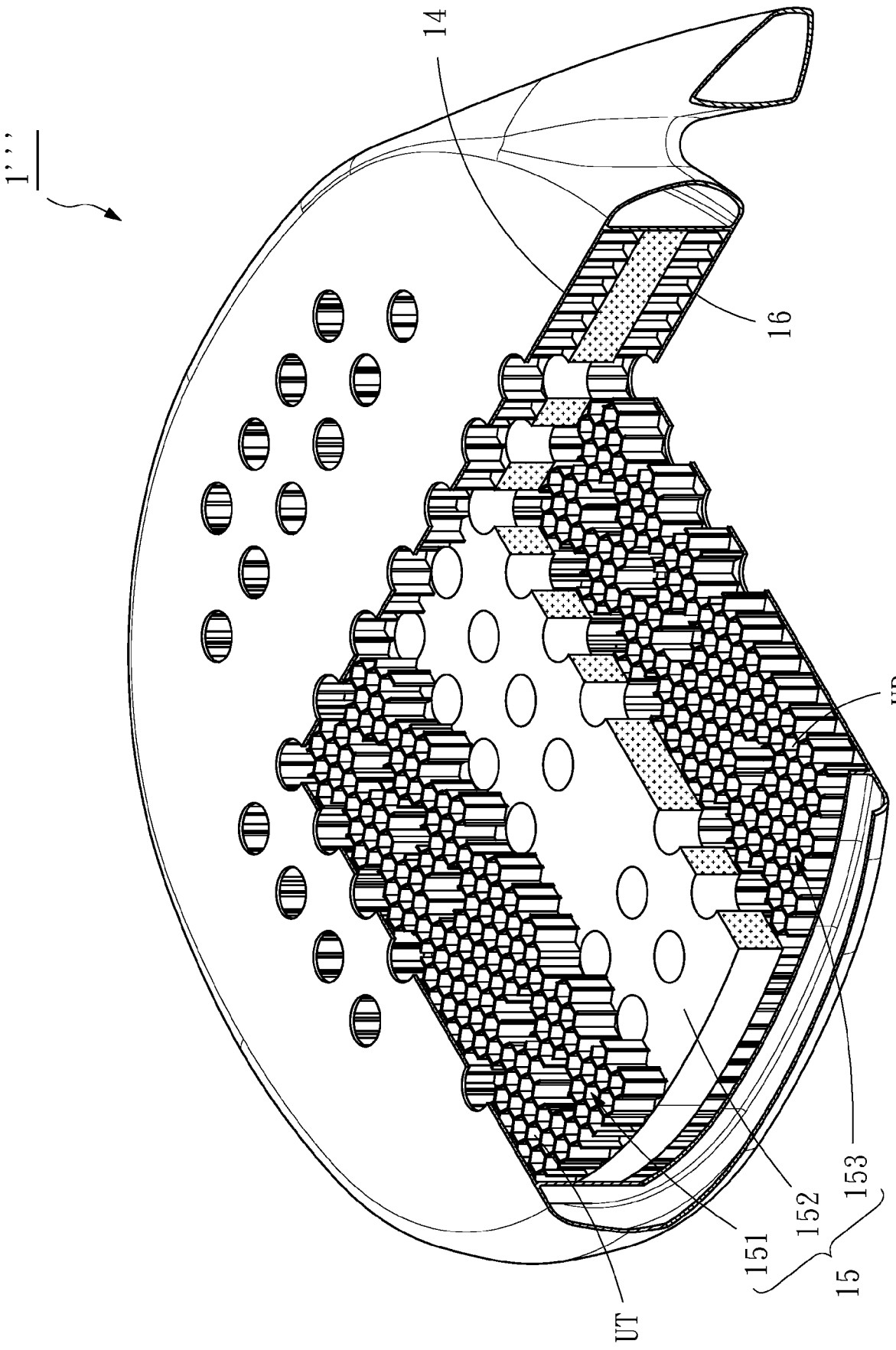

FIG. 7

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EUROPEAN SEARCH REPORT

Application Number
EP 23 19 4245

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 2022/032141 A1 (BRENTS GREGG [US] ET AL) 3 February 2022 (2022-02-03) * paragraph [0056] - paragraph [0107]; figures 1-6e *	1-11	INV. A63B59/48 A63B102/08
A	CN 217 067 583 U (DONGGUAN JINCHENG SPORTS EQUIPMENT CO LTD) 29 July 2022 (2022-07-29) * paragraph [0004] - paragraph [0041]; figures 1-4 *	1-11	
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A	US 2017/136325 A1 (FOX JOHN [US] ET AL) 18 May 2017 (2017-05-18) * paragraph [0027] - paragraph [0045]; figures 1-6 *	1-11	
			TECHNICAL FIELDS SEARCHED (IPC)
			A63B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	21 February 2024	Jekabsons, Armands

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2022032141 A1	03-02-2022	NONE	
CN 217067583 U	29-07-2022	NONE	
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