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(54) **FIN WITH SECONDARY BLADE SET**

(57) Fins with a secondary blade set including a foot pocket portion, a main blade and a secondary blade set are provided. The foot pocket portion is used to fit a user's foot. The main blade includes a first end and a second end. The first end is fixed to the foot pocket portion and

the second end is extended along the first direction that is away from the foot pocket portion. The secondary blade set includes at least one secondary blade which is disposed on the main blade via a fixing portion.

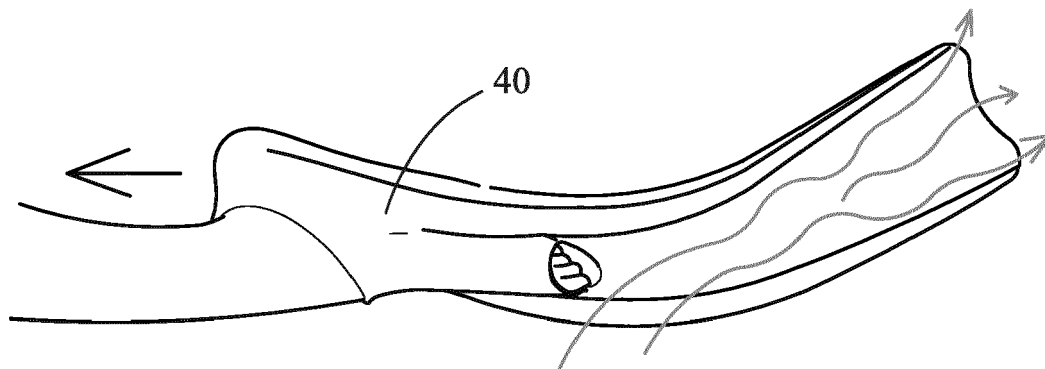


FIG. 1

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Description

[0001] This application claims priority to U.S Provisional Application No. 62/677,684 filed on May 30, 2018 and Taiwan Patent Application No. 108106579 filed on February 26, 2019, which are hereby incorporated by reference in its entirety.

BACKGROUND OF THE INVENTION

Field of the Invention

[0002] The present invention provides fins, and in particular, fins that are used for snorkeling or diving sports with a secondary blade set.

Descriptions of the Related Art

[0003] During water sports such as snorkeling, diving activities or the like, people usually wear fins to increase the water-kicking area to generate a sufficient pushing force. As shown in **FIG. 1**, flat-plate fins **40** (or paddle fins) are commonly used by the user to perform an activity under water. When used, a resistance will be generated by the water on the web portion of the fins so that the web portion is bent when the feet of the user are swinging upwards and downwards to kick the water (in the direction towards the water surface and the bottom of the water when the user faces down). The web portion applies a force to the water by virtue of the elasticity recovery of the material and the structure thereof so that the user can move forward in the water.

[0004] However, regardless of the skills, manners and strength of the legs of the user when kicking the water, or the use of fin forms with different ribs and cavities, the web surface of the web portion will shake, incline, sway or the like during the water-kicking action under the disturbance of water resistance of different strengths and from different directions as long as the fins are flat-plate fins, thereby, influencing the pushing efficiency (as shown in **FIG. 1**). Thus, this results in increased physical exertion and oxygen consumption of the user. Some manufacturers have designed fins with a web portion made of a lighter and softer material or fissure fins (or split fins) to solve the aforesaid drawbacks and thus achieve the effect of reducing the load of the legs and reducing the oxygen consumption of the body during the water-kicking action. However, with certain sea conditions, such fins provide an insufficient pushing force so that the user cannot propel themselves adequately out to safety. Accordingly, it is important in the art to find a web surface that does not shake, incline or sway during usage while maintaining or increasing the pushing force during usage.

SUMMARY OF THE INVENTION

[0005] An objective of the present invention is to pro-

vide fins with a secondary blade set, which can provide a sufficient or even enhanced pushing force while reducing the load on the legs of a user during the water sport.

[0006] To achieve the aforesaid objective, the fins of the present invention comprises a foot pocket portion, a main blade and a secondary blade set. The foot pocket portion is for a user's foot to insert therein. The main blade comprises a first end and a second end. The first end is fixed to the foot pocket portion, while the second end is extended along the first direction that is away from the foot pocket portion. The secondary blade set comprises at least one secondary blade which is disposed on the main blade via a fixing portion.

[0007] To achieve the aforesaid objective, the secondary blade set included in the fins of the present invention is formed integrally with the main blade.

[0008] To achieve the aforesaid objective, an included angle between the at least one secondary blade and the main blade of the fins of the present invention is between 0 degree to 90 degrees.

[0009] To achieve the aforesaid objective, the main blade included in the fins of the present invention comprises an upper surface facing the user and a lower surface opposite to the upper surface. When the at least one secondary blade comprises a plurality of secondary blades, the secondary blades are disposed on the upper surface and the lower surface respectively in a corresponding manner or an alternating manner.

[0010] To achieve the aforesaid objective, the main blade included in the fins of the present invention further comprises at least one fixing hole, through which the fixing portion of the at least one secondary blade is passed, so that the at least one secondary blade is disposed on the main blade.

[0011] To achieve the aforesaid objective, the main blade included in the fins of the present invention comprises an upper surface facing the user and a lower surface opposite the upper surface. The fixing portion is disposed on at least one of the upper surface or the lower surface by locking, snapping-in or bonding.

[0012] To achieve the aforesaid objective, in the fins of the present invention, the first length of the main blade extending along the first direction is unequal to the second length of the at least one secondary blade extending along the first direction.

[0013] To achieve the aforesaid objective, the fixing portion of the secondary blade set included in the fins of the present invention is disposed on the main blade, and located between one-quarter to three-quarters of the first length of the main blade.

[0014] To achieve the aforesaid objective, the secondary blade set included in the fins of the present invention has a height perpendicular to the main blade. The height is at least 40 millimeters.

[0015] To achieve the aforesaid objective, the secondary blade set included in the fins of the present invention has a blade thickness. The blade thickness increases from the end away from the foot pocket portion to the

other end closer to the foot pocket portion.

[0016] To achieve the aforesaid objective, the blade thickness of the secondary blade set included in the fins of the present invention ranges between 3 millimeters to 15 millimeters.

[0017] To achieve the aforesaid objective, the material of the secondary blade set included in the fins of the present invention comprises metal.

[0018] To achieve the aforesaid objective, the secondary blade set included in the fins of the present invention extends along the second direction, and an included angle between the second direction and the first direction is between 0 degree to 45 degrees.

[0019] To achieve the aforesaid objective, the secondary blade set included in the fins of the present invention comprises an external profile or a section shape which is fish fin-like, triangular, trapezoidal, rectangular, L-shaped or S-shaped.

[0020] The detailed technology and preferred embodiments implemented for the subject invention are described in the following paragraphs accompanying the appended drawings for people skilled in this field to well appreciate the features of the claimed invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021]

FIG. 1 is a schematic perspective view illustrating the streamflow status during the use of general flat-plate fins;

FIG. 2 is a schematic perspective view of fins according to the present invention;

FIG. 3A and **FIG. 3B** are schematic perspective views illustrating the type of a foot pocket portion of general flat-plate fins;

FIG. 4 is a schematic perspective view of fins with a plurality of ribs according to the present invention;

FIG. 5A to **FIG. 5G** are schematic perspective views of fins with different configurations of secondary blades according to the present invention;

FIG. 6A and **FIG. 6B** are schematic perspective views of fins with secondary blades of different lengths according to the present invention;

FIG. 7A to **FIG. 7C** are schematic perspective views of fins with secondary blade sets assembled in different manners according to the present invention;

FIG. 8 is a schematic top view of fins according to the present invention;

FIG. 9A to **FIG. 9C** are schematic cross-sectional views taken along line **A-A** of the fins of **FIG. 8**;

FIG. 10A is a schematic top view of secondary blades with different thicknesses of the fins according to the present invention;

FIG. 10B and **FIG. 10C** are schematic cross-sectional views taken along line **B-B** of the secondary blades with different thicknesses of the fins of **FIG. 10A**;

FIG. 11A and **FIG. 11B** are schematic cross-section-

al views taken along line **B-B** of the secondary blades with different angles of inclination of the fins according to the present invention;

FIG. 12A and **FIG. 12B** are schematic top views of secondary blade sets with different extending directions of the fins according to the present invention;

FIG. 13 is a schematic perspective view illustrating the swing of the secondary blade during the use of the fins according to the present invention; and

FIG. 14 is a schematic perspective view illustrating the streamflow status during the use of the fins according to the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0022] **FIG. 2** is a schematic perspective view of fins **10** according to the preferred embodiment of the present invention. The fins **10** have a foot pocket portion **100**, a main blade **200** and a secondary blade set **300**. The technical contents of these elements will be described sequentially as follows.

[0023] The foot pocket portion **100** may be used for a user's foot to insert therein when the user is performing a water sport such as snorkeling or diving. The foot pocket portion **100** may be selected to be a full-foot foot pocket portion (as shown in **FIG. 3A**) or an open-heel foot pocket portion (as shown in **FIG. 3B**) depending on the habits of the user. The main blade **200** comprises a first end **210** and a second end **220**. The first end **210** is fixed to the foot pocket portion **100**, and the second end **220** is extended along the first direction **D1** that is away from the foot pocket portion **100**. The secondary blade set **300** comprises at least one secondary blade **310** which is disposed on the main blade **200** via a fixing portion **312**.

[0024] As shown in **FIG. 4**, the main blade **200** has an upper surface **202** and a lower surface **204** that is opposite to the upper surface **202** (which respectively correspond to the instep of and the sole of the user's foot). The upper surface **202** and the lower surface **204** may have a plurality of ribs and a plurality of grooves to assist in stream guiding. The secondary blade set **300** may be disposed on both the upper surface **202** and the lower surface **204** of the main blade **200**, or disposed on the upper surface **202** or lower surface **204** of the main blade **200**. The secondary blade set **300** may have ribs and grooves (not shown) similar to these of the main blade **200**.

[0025] In detail, the secondary blade set **300** may be disposed in many manners in response to requirements of different water sports performed by the user. As shown in **FIG. 5A** to **FIG. 5G**, the secondary blade set **300** may have the following aspects where the at least one secondary blade **310** may be a single secondary blade **310** or two secondary blades **310** which are all mounted on the upper surface **202** (as shown in **FIG. 5A** and **FIG. 5B**). The at least one secondary blade **310** may also be two or more than two secondary blades **310** which are respectively disposed on the upper surface **202** and the

lower surface **204** corresponding to each other (as shown in **FIGs. 5C to 5E**). The at least one secondary blade **310** may also be more than two secondary blades **310** which are respectively disposed on the upper surface **202** and the lower surface **204** in an alternating manner (as shown in **FIG. 5F**). The number of the at least one secondary blade **310** is more than two, and the at least one secondary blade is presented as secondary blades **310'** with a smaller size and arranged on the upper surface **202** in alignment with each other (e.g., three secondary blades **310'** arranged in alignment with each other as shown in **FIG. 5G**). With the variation of the secondary blades **310** in different amounts and configurations, the fins **10** can provide the stream guiding effect at different degrees to reduce or eliminate the disturbance of the water resistance, thereby, maintaining or improving the pushing efficiency in the water for the user as compared to the prior art.

[0026] Additionally, in the present invention, the first length **L1** of the main blade **200** extending along the first direction **D1** may be unequal to the second length **L2** of each of the secondary blades **310** of the secondary blade set **300** extending along the first direction **D1**. That is, depending on the region where the user intends to perform the water sport or the purpose that the user intends to achieve during the water sport, the second length **L2** of the secondary blade **310** may be generally equal to that of the main blade **200** as shown in **FIG. 2**, or may be larger than that of the main blade **200** as shown in **FIG. 6A** to increase the contact area during the water-kicking action and thus, improve the pushing efficiency. Moreover, as shown in **FIG. 6B**, to enhance the stability of the main blade **200** during the water-kicking action, the second length **L2** of the secondary blade **310** may also be shorter than the first length **L1** of the main blade **200** to prevent the shaking, inclining and swaying of the main blade **200** during usage. As a result, there is less water resistance and fatigue to the legs when kicking.

[0027] The main blade **200** and the secondary blade set **300** may be formed integrally as shown in **FIG. 2** (e.g., formed integrally by a single material or formed integrally by overmolding more than two materials). The main blade **200** and the secondary blade set **300** may also be formed separately and then assembled with each other.

[0028] In the aspect where the main blade **200** and the secondary blade set **300** are assembled with each other, the main blade **200** may further comprise at least one fixing hole **206**. The fixing portion **312** of the at least one secondary blade **310** can pass through the at least one fixing hole **206** so that the at least one secondary blade **310** is disposed on the main blade **200**. Furthermore, as shown in **FIG. 7A**, the secondary blade **310** may be made of a soft material, so the secondary blade **310** may pass through the fixing hole **206** so that the fixing portion **312** is clamped within the fixing hole **206**. As shown in **FIG. 7B**, the fixing portions **312** of the two corresponding secondary blades **310** may be connected and clasped with each other, so the fixing portions may respectively pass

through the fixing hole **206** to be fixed on the main blade **200**. Or as shown in **FIG. 7C**, the main blade **200** may be provided with lockholes, grooves or mortises so that the fixing portion **312** of the at least one secondary blade **310** may be disposed on at least one of the upper surface **202** or the lower surface **204** by locking, snapping-in or bonding. In this way, the user may assemble different secondary blades **310** on the main blade **200** depending on the requirements thereof.

[0029] With reference to **FIG. 8** and in the preferred embodiment, the fixing portion **312** of the secondary blade **310** is disposed between one-quarter to three-quarters of a first length **L1** of the main blade **200** to provide a better water-shearing position.

[0030] Additionally, as shown in **FIG. 9A to FIG. 9C**, the at least one secondary blade **310** has a height **H** perpendicular to the main blade **200** (the height **H** extends upward from the upper surface **202** or extends downward from the lower surface **204**). The height is at least 40 millimeters to provide a sufficient water-shearing effect so that the water can pass through the main blade **200** smoothly to reduce the shaking of the main blade **200** caused by the water resistance when the user is kicking water. Also, as shown in **FIG. 9A to FIG. 9C**, the secondary blade **310** may further comprise an external profile or a section shape which is fish fin-like, triangular, trapezoidal, rectangular, L-shaped or S-shaped, thereby achieving different water-shearing and swaying effects.

[0031] With reference to **FIG. 10A**, the secondary blade set **300** may have a blade thickness ranging from 3 millimeters to 15 millimeters. The blade thickness increases from the end away from the foot pocket portion **100** to another end closer to the foot pocket portion **100** in a horizontal direction. Or as shown in **FIG. 10B**, the blade thickness increases from the end away from the main blade **200** to another end closer to the main blade **200** in a vertical direction. The secondary blade set **300** may also be made of materials with different hardness so that the end away from the foot pocket portion **100** or away from the main blade **200** is softer and swings softly with the water like the fin of a fish. In this way, the water can pass through the main blade **200** more smoothly to reduce the inclining or swaying of the main blade **200** caused by the water resistance during the swing of the main blade **200**. The material of the secondary blade set **300** may further comprise metal. For example, a metal sheet of which the thickness is less than 1 millimeter can also be adopted to achieve this effect (as shown in **FIG. 10C**).

[0032] With reference to **FIG. 11A and FIG. 11B**, as observed from the back view, except for the case where the at least one secondary blade **310** is installed perpendicular to the main blade **200**, an angle **A** may be included between the at least one secondary blade **310** and the main blade **200**. The angle **A** ranges from 0 to 90 degrees.

[0033] On the other hand, as observed from the top view of **FIG. 12A**, the at least one secondary blade **310** may extend along the second direction **D2**. Angle **A2** is

included between the second direction **D2** and the first direction **D1**. Angle **A2** ranges from 0 degree to 45 degrees or forms a bent arc towards the second direction **D2** (as shown in **FIG. 12B**).

[0034] With reference to both **FIGs. 13** and **9A**, only the fixing portion **312** of the at least one secondary blade **310** is connected with the main blade **200**, and other parts of the secondary blade **310** except for the fixing portion **312** may not be limited by the swing direction of the main blade **200** (which usually swings upwards and downwards) and swings casually along the direction of the water flow (usually swinging leftwards and rightwards) at a swing angle that may be greater than 90 degrees.

[0035] In this way, with the arrangement of the secondary blade set **300**, the user can indeed perform water shearing when the user is wearing the fins **10** to perform a water sport so that the water is split by the secondary blade **310** and smoothly passes through the web surface of the main blade **200**. Thus, the water will not press against each other on the web surface to generate a disturbing resistance, thereby, reducing the incline and swaying of the main blade during usage in the prior art, and providing the user with a stable pushing force (as shown in **FIG. 14**). Since the secondary blade set **300** may casually swing and twist along a direction opposite to the direction in which the main blade **200** swings, the area of contact with water is increased and the pushing force is enhanced during the swing movement.

[0036] Additionally, the fins **10** provided with the secondary blade set **300** of the present invention can generate a pushing force even if the fins **10** operate in a non-up-and-down manner (such as in frog-type water-kicking action) so that it is easier for the user to tune the amount of the pushing force and the speed required, thereby, making it more convenient for the user to observe aquatic creatures.

[0037] In other words, the advantage of the fins **10** provided with the secondary blade set **300** of the present invention is that in the case where the soft degree of the main blade **200** is not changed to maintain the original pushing force, the user is allowed to have sufficient water sensation during diving and snorkeling sports and can feel more relaxed and smooth. The difficulty of the operation can be reduced; for example, the user can easily move in the water with a posture of a relatively high degree of difficulty, without being limited by the swimming skill of the user. At the same time, the consumption of the strength and the oxygen consumption of the user are reduced, and thus, the pushing efficiency is improved.

[0038] The above disclosure is related to the detailed technical contents and inventive features thereof. People skilled in this field may proceed with a variety of modifications and replacements based on the disclosures and suggestions of the invention as described without departing from the characteristics thereof. Nevertheless, although such modifications and replacements are not fully disclosed in the above descriptions, they have substantially been covered in the following claims as appended.

Claims

1. A fins with a secondary blade set, comprising;
a foot pocket portion, for a user's foot to insert therein;
a main blade, comprising a first end and a second end, wherein the first end is fixed to the foot pocket portion and the second end is extended along a first direction that is away from the foot pocket portion; and
a secondary blade set, comprising at least one secondary blade which is disposed on the main blade via a fixing portion.
2. The fins according to claim 1, wherein the secondary blade set is formed integrally with the main blade.
3. The fins according to claim 1, wherein an angle included between the at least one secondary blade and the main blade is between 0 degree to 90 degrees.
4. The fins according to claim 1, wherein the main blade comprises an upper surface facing the user and a lower surface opposite to the upper surface, and when the at least one secondary blade comprises a plurality of secondary blades, the secondary blades are disposed on the upper surface and the lower surface respectively in a corresponding manner or an alternating manner.
5. The fins according to claim 1, wherein the main blade further comprises at least one fixing hole, through which the fixing portion of the at least one secondary blade is passed, so that the at least one secondary blade is disposed on the main blade.
6. The fins according to claim 1, wherein the main blade comprises an upper surface facing the user and a lower surface opposite to the upper surface, and the fixing portion of the at least one secondary blade is disposed on at least one of the upper surface or the lower surface by locking, snapping-in or bonding.
7. The fins according to claim 1, wherein a first length of the main blade extending along the first direction is unequal to a second length of the at least one secondary blade extending along the first direction.
8. The fins according to claim 1, wherein the fixing portion of the secondary blade set is disposed on the main blade, and located between one-quarter to three-quarters of a first length of the main blade.
9. The fins according to claim 1, wherein the secondary blade set has a height perpendicular to the main blade, and the height is at least 40 millimeters.

10. The fins according to claim 1, wherein the secondary blade set has a blade thickness, and the blade thickness increases from an end away from the foot pocket portion to another end closer to the foot pocket portion. 5
11. The fins according to claim 10, wherein the blade thickness is between 3 millimeters to 15 millimeters.
12. The fins according to claim 1, wherein a material of the secondary blade set comprises metal. 10
13. The fins according to claim 1, wherein the secondary blade set extends along a second direction, and an included angle between the second direction and the first direction is between 0 degree to 45 degrees. 15
14. The fins according to claim 1, wherein the secondary blade set comprises an external profile or a section shape which is fish fin-like, triangular, trapezoidal, rectangular, L-shaped or S-shaped. 20

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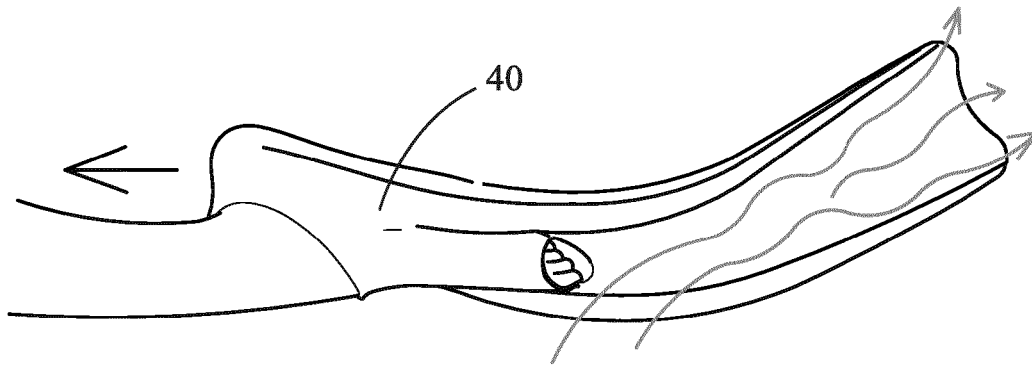


FIG. 1

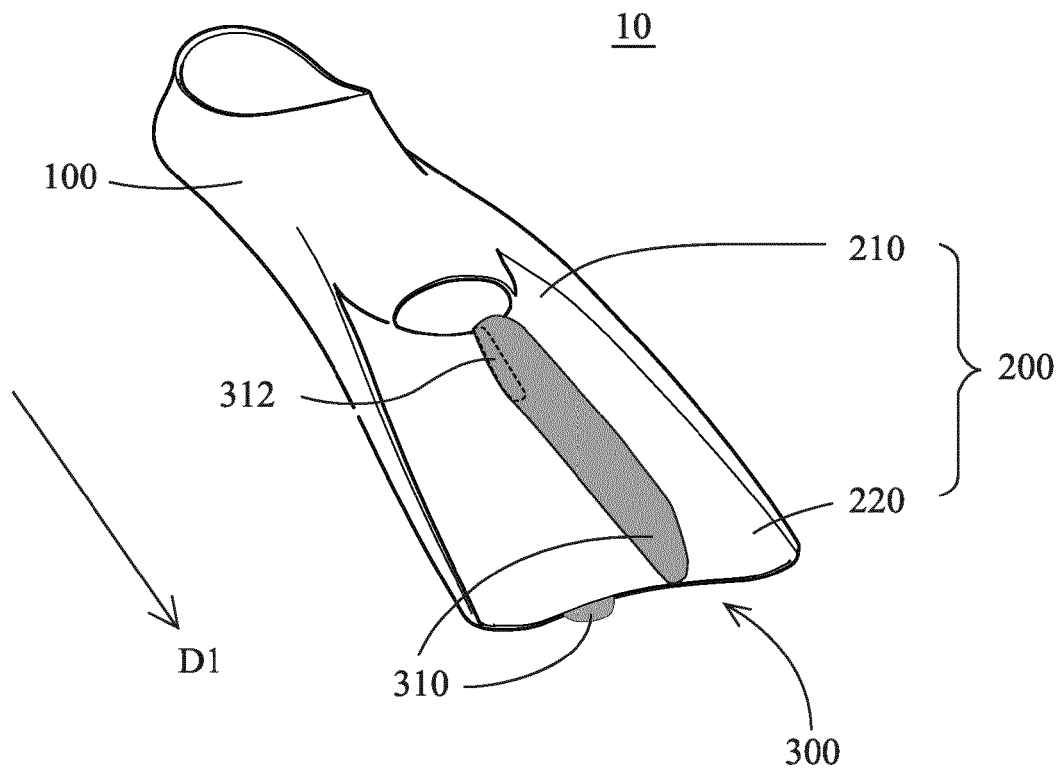


FIG. 2

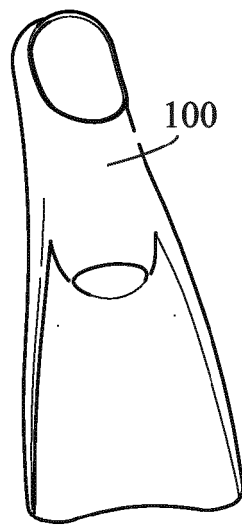


FIG. 3A

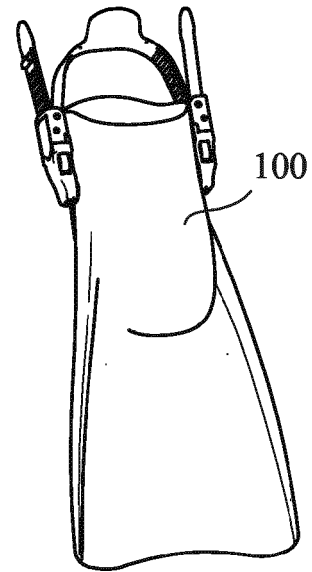


FIG. 3B

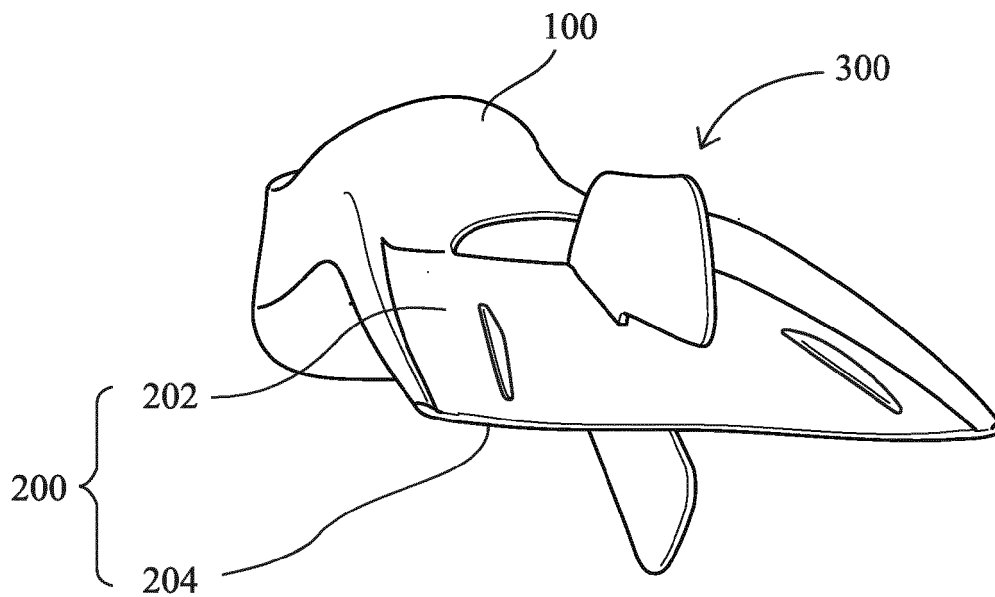


FIG. 4

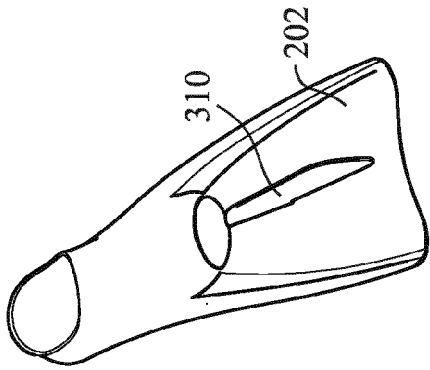


FIG. 5A

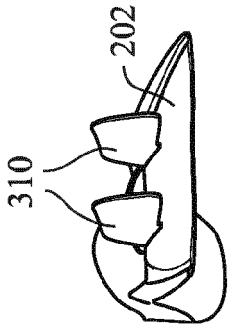


FIG. 5B

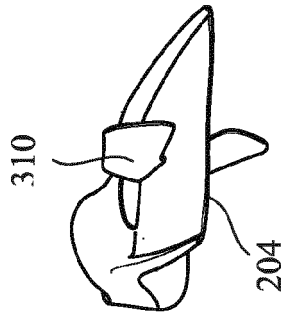


FIG. 5C

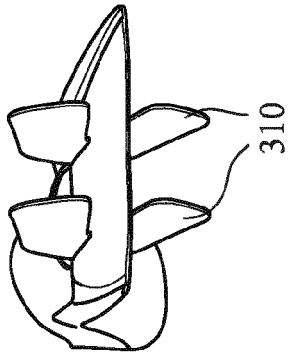


FIG. 5D

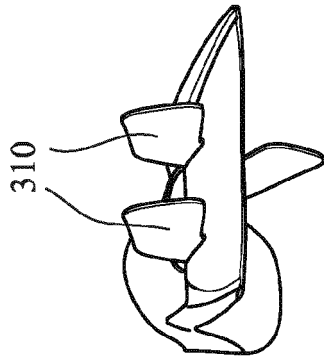


FIG. 5F

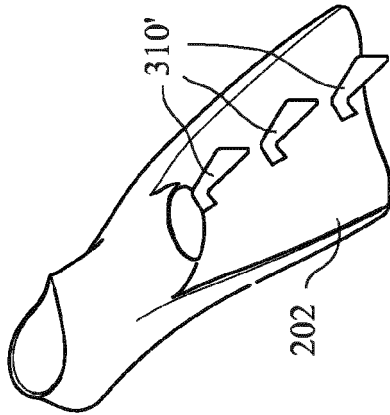


FIG. 5G

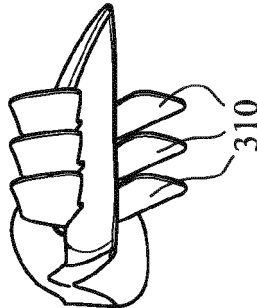


FIG. 5E

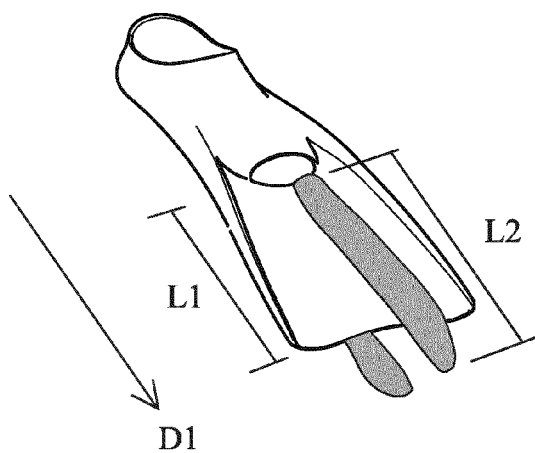


FIG. 6A

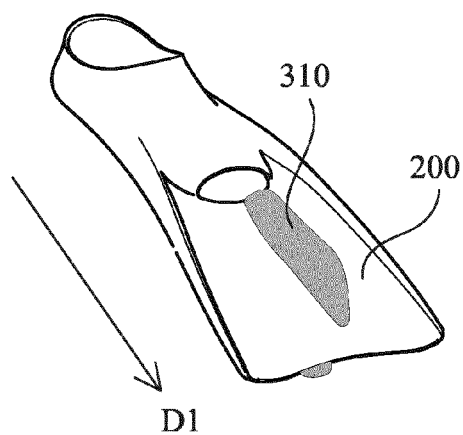


FIG. 6B

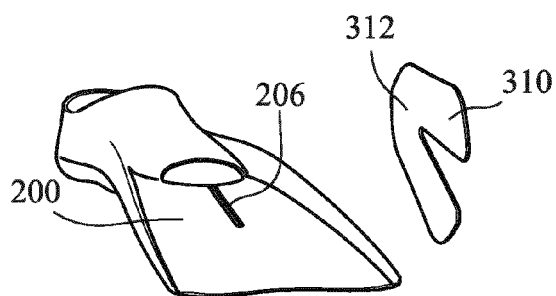


FIG. 7A

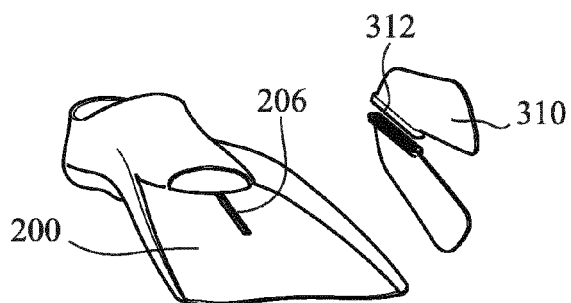


FIG. 7B

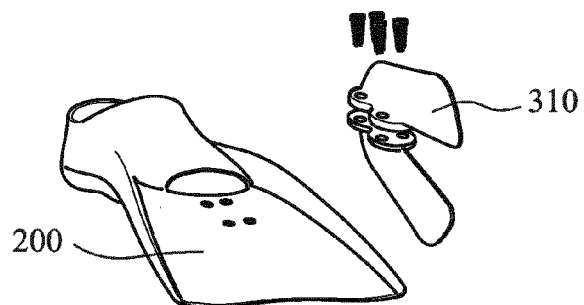


FIG. 7C

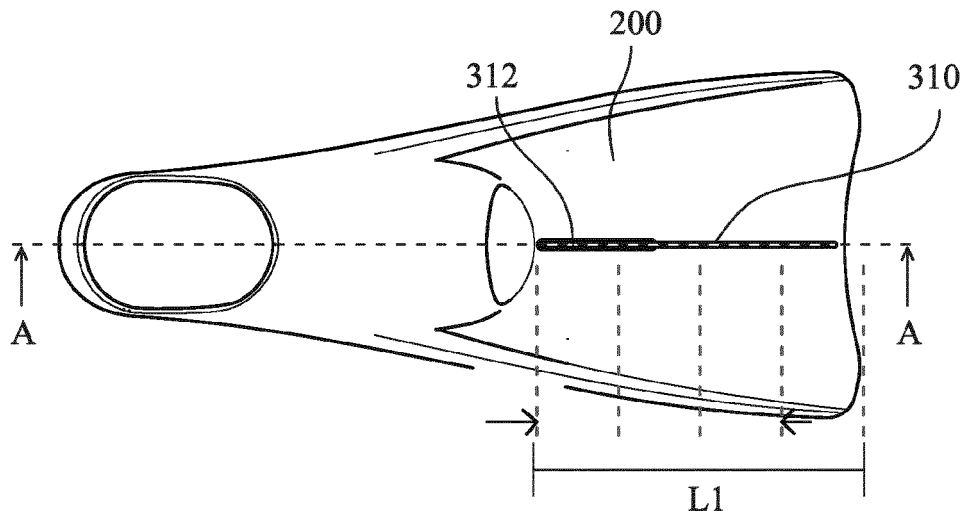


FIG. 8

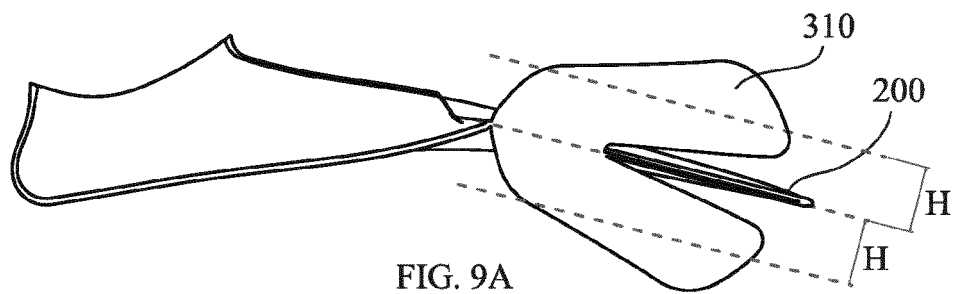


FIG. 9A

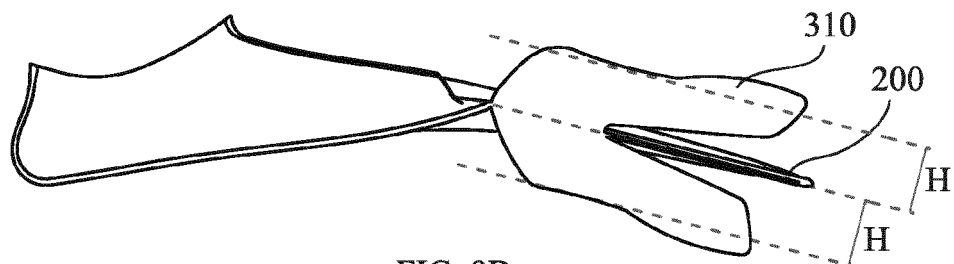


FIG. 9B

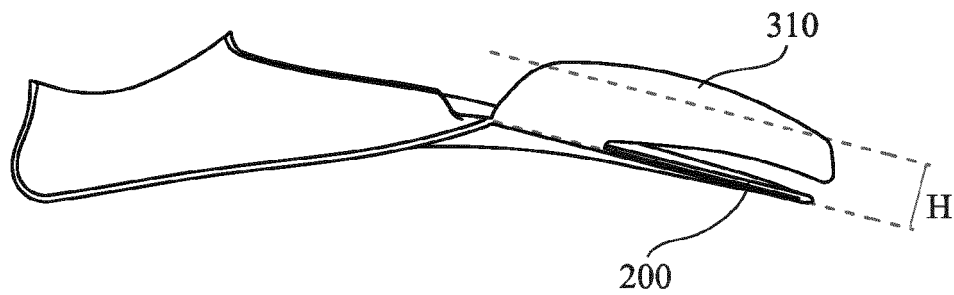


FIG. 9C

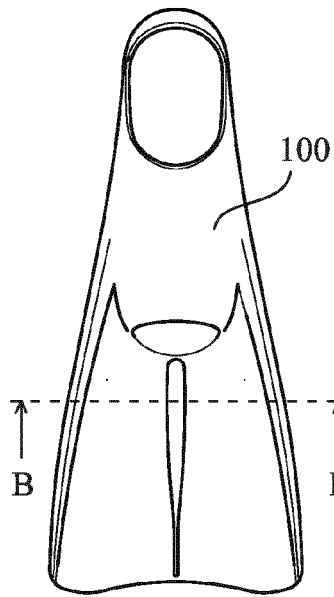


FIG. 10A

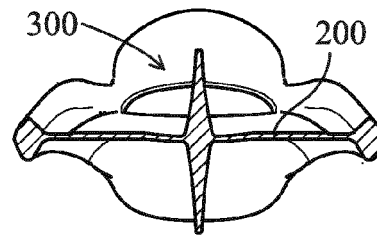


FIG. 10B

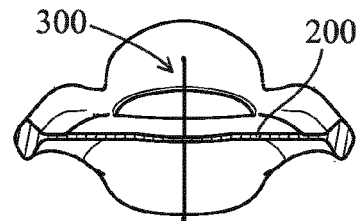


FIG. 10C

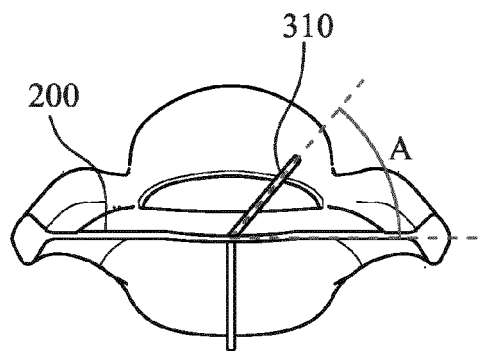


FIG. 11A

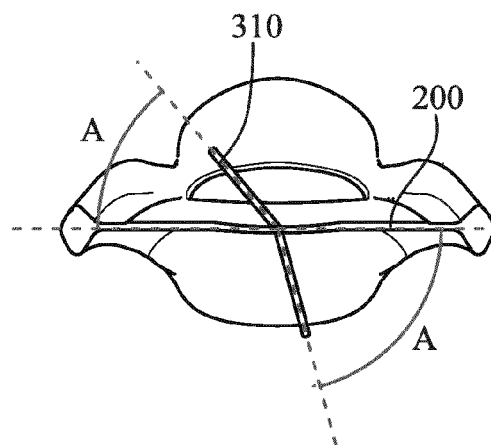


FIG. 11B

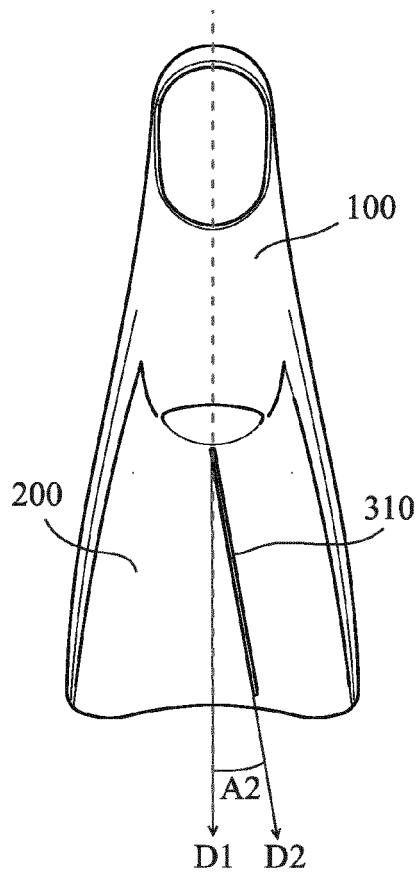


FIG. 12A

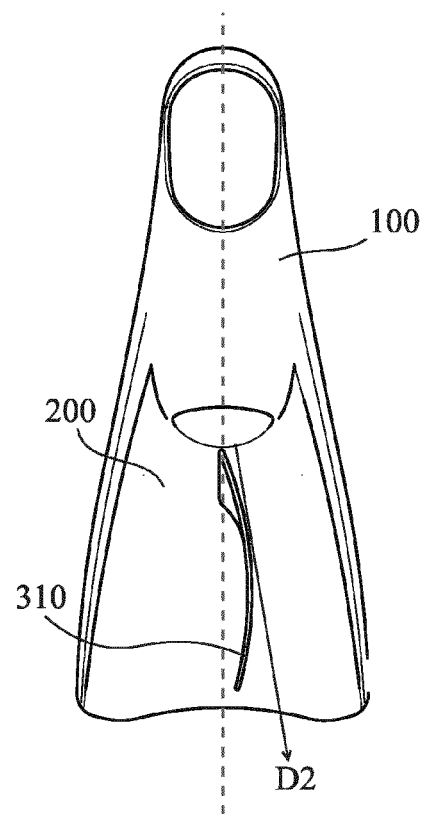


FIG. 12B

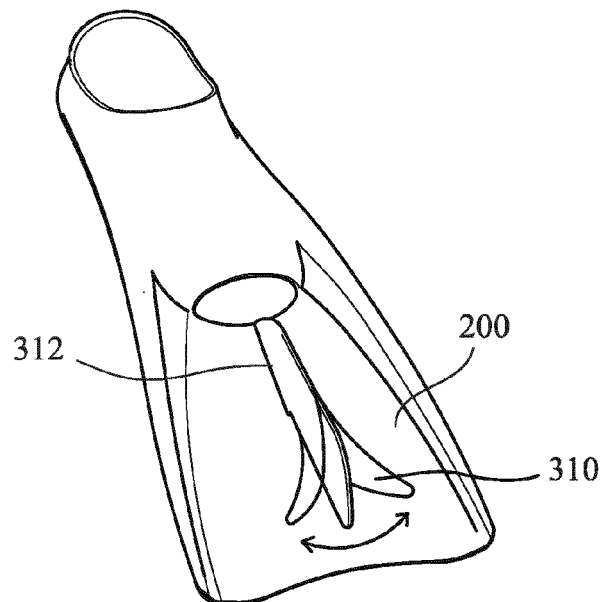


FIG. 13

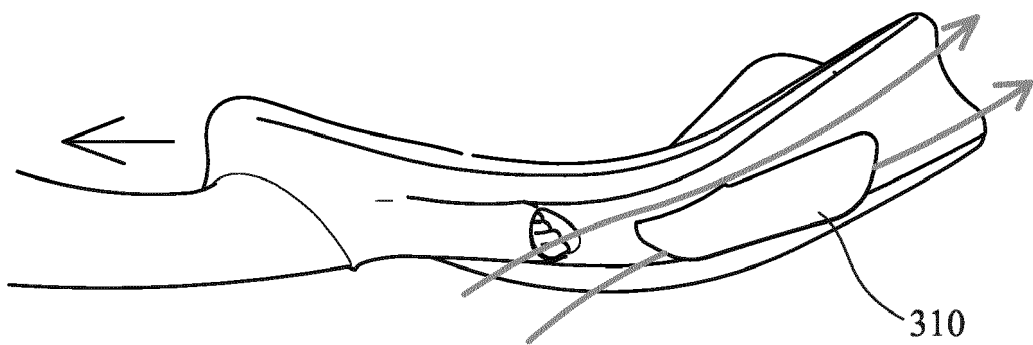


FIG. 14



EUROPEAN SEARCH REPORT

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			A63B
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Place of search Munich		Date of completion of the search 21 October 2019	Examiner Jekabsons, Armands
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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21-10-2019

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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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