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(54) **OPEN-HEEL SHOE SWIM FIN**

(57) Open-heel shoe swim fin comprising a paddle portion (2) and a shoe portion (1), said shoe portion (1) comprising a sole portion (101; 301) made in one piece with said paddle portion (2), first coupling means (211, 221) of the strap (3) being arranged on the sides (201) of said shoe portion (1), the strap being connected to a heel member (4;5), said sole portion (101;301) of said shoe being provided, in proximity of the end opposite the one facing said paddle portion, with second coupling means (111, 121; 311, 321) of the strap (3).

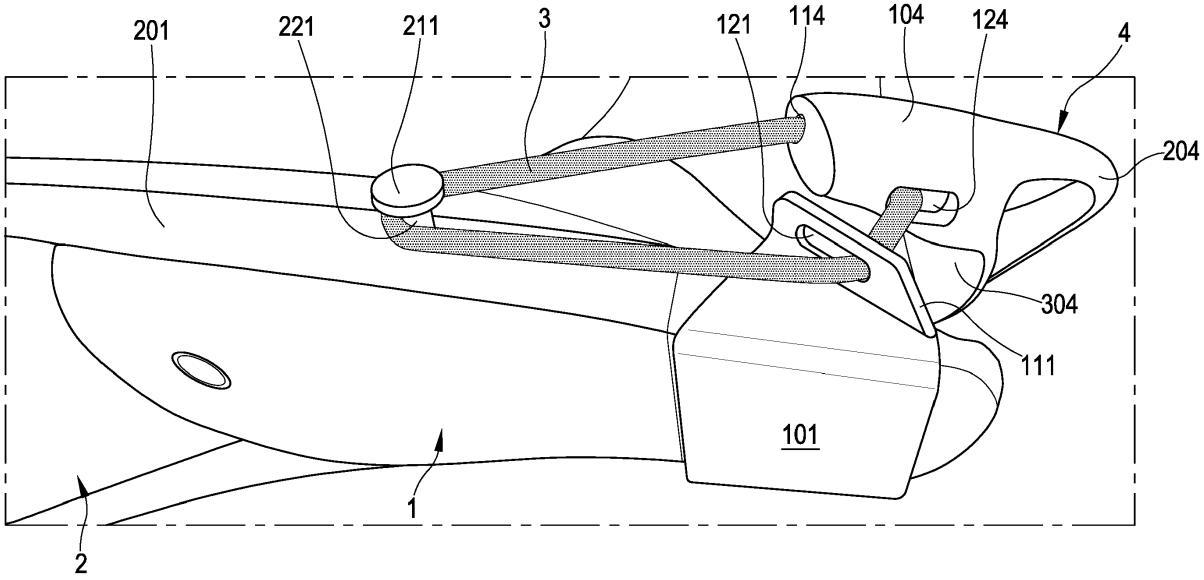

FIG.1

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Description

[0001] The present invention concerns swim fins, and particularly concerns an open-heel shoe swim fin.

[0002] Swim fins, which are made in a very wide variety of shapes and sizes, are divided, among other things, into two main families, that is to say the one of full-foot fins, in which the user's foot is completely inserted up to the heel into a suitable housing, and the one of the open-heel fins, in which only the user's forefoot enters a cavity suitably arranged in the fin, while the heel is surrounded by a strap connected to the foot-pocket sides and provided with a portion or element, named heel element, right suitable to accommodate the user's heel.

[0003] Clearly, the two different types of fins address to very different uses; full-foot fins normally address to the user who practices snorkeling or underwater fishing, where it is important to control the fin movement whereas it is not essential to have the ability to wear dive boots to protect the feet from cold. On the other hand, this last necessity becomes very important when practicing scuba diving to even considerable depths, being therefore advisable to reduce as much as possible the heat loss from the diver's body. However, the use of dive boots actually prevents the adoption of full-foot fins, which are generally designed to best adapt to the shape of the naked foot and would tend to slip away when another interposed material is present.

[0004] A problem with the use of open-heel shoe fins lies in the fact that, in this type of fins, the sole portion of the shoe of the fin is made of a relatively more rigid material and in one piece with the paddle portion of the fin, and this configuration makes it so that the same sole portion moves away from and close to the diver's heel during a finning cycle, thus creating a strong feeling of instability, thus losing the functionality (thrust) and simultaneously increasing the load exerted by the strap, i.e. by the heel element, on the heel of the user.

[0005] The strap that is used to hold the foot in the open-heel shoe is generally made of elastomeric material, and is prone to cause discomfort to the user at the Achilles tendon, due to the very shape of the ankle section. In this regard, the initial attempt was to make straps having an enlarged central portion, so as to spread over a larger area the tensile load exerted by the strap, then a removable heel element has been inserted on the strap made of elastomeric material. This solution is mainly connected to the possibility of choosing a more comfortable material for the heel element, and at the same time of allowing the two parts to be replaced in distinguished ways.

[0006] At the state of the art, solutions such as the one reported in document EP2433680, whose owner is the same applicant, are known. However, the heel element described therein is a body of flexible material that is essentially flat and is adapted to the user's heel by deformation. This solution tends on the one hand to wear out the element itself, which is subjected to a considerable load, and on the other hand clearly limits the comfort of the user, since in use the heel element will tend to naturally slide towards the Achilles tendon and to apply its maximum load right in that region.

[0007] Moreover, open-heel fins are currently used exclusively in combination with dive boots, as the existing straps and heel elements are not suitable to allow a comfortable and continuous use without the buffering and cushioning effect of neoprene. Moreover, the open-heel shoe fins are only developed for being used with dive boots, so the material of the shoe itself is rather rigid (to improve the transmission of the force from foot to fin), but this does not make it very comfortable without dive boots. This way, dive boots or two kinds of different fins must be always available.

[0008] Object of the present invention is thus to provide an open-heel shoe swim fin wherein it is possible to connect the heel element to the shoe of the fin in a more stable way, so that to reduce and control the oscillation of the sole portion with respect to the back portion of the foot of the user, and so that to distribute the load of the connection more efficiently.

[0009] Moreover, a further object of the invention is to provide a heel member that is able to overcome the problems highlighted above and to be coupled with a shoe of a sufficiently soft material for being comfortable, thus ensuring greater fitting comfort to the user and simultaneously greater stability and safety in the coupling with the shoe of the fin by means of the strap and thus allowing a comfortable and continuous use both in combination with dive boots and in the absence of dive boots on the feet of the user.

[0010] Object of the present invention is thus an open-heel shoe swim fin comprising a paddle portion and a shoe portion, said shoe portion comprising a sole portion made in one piece with said paddle portion, first coupling means of the strap being arranged on the sides of said shoe portion, the strap being connected to a heel member, said sole portion of said shoe being provided, in proximity of the end opposite the one facing said paddle portion, with second coupling means of the strap.

[0011] In a first embodiment, said strap is connected at an end of said heel member and returned to the heel member itself by coupling the strap of the shoe of the fin with said first and said second coupling means. In a variant, said strap is connected with said heel member and returned to said heel member by coupling with said first coupling means, and coupled with said second coupling means.

[0012] Said first and said second coupling means can comprise flaps radially projecting from said shoe portion, which are substantially oriented in parallel to the sole plane of the shoe, and provided with at least one through-slot for connecting with the strap. In a preferred embodiment, the walls of the slot have an inclination so that to favor the connection with the strap.

[0013] Moreover, further object of the present invention is a heel member for an open-heel shoe fin, com-

prising a looped-shaped body with a substantially parabolic profile, so that to form a cavity with a substantially parabolic profile inside it, the cavity being adapted for housing the ankle of the user, which is provided in both of its arms with at least one axial duct adapted for housing the strap for the coupling with the shoe of the fin.

[0014] In an embodiment, at least one radial cavity communicating with said axial duct, is provided on each of said arms, said cavity being suitable for the coupling with an element intended to connect with an end of the strap. Advantageously, said arms are each provided with a further axial duct parallel to the first duct, said radial cavities being in communication with one of the two ducts. This way, the strap portion runs along the entire overall length of said heel member from the one that is returned by the coupling means coupling with the sides of the shoe of the fin.

[0015] Advantageously, said heel member is made in one piece of elastically yielding material, and preferably of polymeric foam, and even more preferably closed-cell polymeric foam. Polymeric foams suitable for making the aforesaid heel member comprise polyurethane and polystyrene.

[0016] An embodiment variation provides that the heel element is made of thermoplastic rubber or natural rubber or mixtures thereof.

[0017] In a further embodiment, the body of said member is provided with gripping means on the outer wall of its vertex; these gripping means comprise a through opening made near the vertex of said heel member.

[0018] Further advantages and characteristics of the swim fin according to the present invention will become clearer in the following detailed description of some embodiments thereof, made by way of example and without limitations, with reference to the accompanying tables of drawings, in which:

figure 1 is a bottom perspective view of a first embodiment of the fin according to the present invention;

figure 2 is a bottom perspective view of a second embodiment of the fin according to the present invention;

figure 3 is a plan view of the heel member of figure 2, and

figure 4 is a perspective view of the heel member shown in figure 3.

[0019] A first embodiment of the fin according to the present invention is shown in figure 1; 1 denotes the shoe portion of said fin, which is provided with a paddle portion 2. The flap 211, provided with a slot 221 in which the strap 3 is inserted, the strap being connected to an end of the heel member 4, while the other end crosses the slot 121 of the flap 111 projecting from the sole portion 101, before also connecting with the heel member 4, is outwardly projecting on the side 201 of the shoe. Such heel piece 4 provides two arms 104 wherein an axial duct 114 and a radial opening 124 are formed. The heel piece 4, as will become clearer below, comprises an ogive-shaped cavity 304 adapted for housing the heel of the user, between its two arms 104. At the end facing outwardly, the heel member 4 has the grip 204 for favoring the fin to be fitted.

[0020] A second embodiment of the fin according to the present invention is shown in figure 2; equal numerals correspond to equal parts. In this case, the strap 3 is returned in the slot 221 of the flap 211 projecting backward from the side 201 of the shoe 1 towards the heel member 5, which has two coaxial ducts 115 and 125 on the arm 105, and a radial opening 135 with respect to the same arm, through which the end of the strap 3 is connected to the slot 321 formed in the flap 311 projecting from the sole portion 301. Like in the case previously described, the heel member is provided with the ogive 305 at the intersection of the two arms 105 and of the grip 205.

[0021] A plan view of the heel member of figure 2 is shown in figure 3; equal numerals correspond to equal parts. The positioning of the axial ducts 115 and 125 formed in the two arms 105, which are parallel to one another, is highlighted in the figure. As is clear in figure 4, which shows the same member from the opposite perspective with respect to that of figure 3, the ducts 125 open onto the radial cavities 135 formed on the side walls of each arm 105, while the ducts 115 open onto the wall facing the grip 205.

[0022] The operation of the fin according to the present invention will become clearer below. As mentioned in the preamble, in the open-heel shoe fins known in the state of the art, the strap, provided with a heel piece, is connected to a single point for each side of the shoe. Consequently, this results in the fact that the sole portion near the heel of the diver moves close to and away from the heel itself during the finning cycle, thus making the finning not very comfortable and also less safe. The fin according to the present invention is provided, as proved in both embodiments of figures 1 and 2, with further coupling means for coupling with the strap, which are arranged in proximity of the heel of the user, and thus able to minimize the oscillation described above and then globally improving the fitting of the fin and its use.

[0023] In the embodiment of figure 1, the two ends of the strap are connected to the heel member 4 and returned through the slots of the flaps 211 and 111. The embodiment of figure 2, which is functionally equivalent to that of figure 1, provides the advantage of a more compact arrangement of the strap and thus more effective in preventing possible contacts and tangling of the strap itself. The heel member 5 used in this embodiment has two axial ducts overlapping inside the arm 105, and which allow the forth and back travel of the strap 3 with respect to the slot 221 of the flap 211.

[0024] The flaps 211, 111 and 311 projecting from the shoe portion of the fin according to the invention are preferably made in one piece with said shoe portion of the

fin, usually made of thermoplastic material.

[0025] In order to implement these solutions, a heel member that allows to easily and stably connect the strap to two points for each side of the shoe was advantageously designed. Such member was designed so that to solve the problems encountered in the open-heel shoe fins known in the state of the art.

[0026] The shape of the body of the heel member according to the present invention ensures a housing that better meets the comfort needs of the anatomical part concerned with respect to that which is provided in the state of the art. In fact, as shown in figure 3, the substantially parabolic profile of the cavity comprised between the two arms 105 allows a better distribution of the load exerted by the strap. Then, the fact that the heel member body is made of an elastically yielding material allows the Achilles tendon of the user to rest more "softly" at the vertex of the cavity on one hand and allows the ends of the arms 105 to converge towards the heel of the user on the other, thus enveloping it and thus evenly distributing the load exerted by the strap.

[0027] In particular, the ogive 305 intended to house the heel of the user is adherent to the morphology of the anatomic part in question, and its shape allows the positioning of the Achilles tendon. The geometry is so that, in theory, the tendon itself is unstressed, i.e. the heel piece rests on the sides adjacent to the tendon.

[0028] Once properly connected to the shoe, according to one of the modes described above, the heel member can simply be used by the user who, at the fitting time, will introduce his foot by using the grip provided at the end of the vertex end of the body of the aforesaid member.

[0029] The device according to the present invention thus provides an effective solution to the problems highlighted at the state of the art, thus ensuring a comfortable fit and further contributing to the rationalization and simplification of the connection with the open-heel shoe of the fin.

[0030] The body of the heel member is made of elastically yielding material, and preferably of closed-cell polymeric foam, which better adapts to the conditions of high environmental stress to which the device is subjected; preferable polymeric foams are polyurethane foams and polystyrene foams.

Claims

1. Open-heel shoe swim fin comprising a paddle portion (2) and a shoe portion (1), said shoe portion (1) comprising a sole portion (101; 301) made in one piece with said paddle portion (2), first coupling means (211, 221) of the strap (3) being arranged on the sides (201) of said shoe portion (1), the strap being connected to a heel member (4;5), said sole portion (101;301) of said shoe being provided, in proximity of the end opposite the one facing said paddle portion, with second coupling means (111, 121; 311, 321) of the strap (3).

2. Swim fin according to claim 1, wherein said strap (3) is connected at an end of said heel member (4) and returned to the heel member (4) itself by coupling the strap (3) of the shoe (1) of the swim fin with said first (211, 221) and said second (111, 121) coupling means.

3. Swim fin according to claim 1, wherein said strap (3) is connected with said heel member (5) and returned to said heel member (5) by coupling with said first coupling means (211, 221), and coupled with said second coupling means (311, 321).

4. Swim fin according to any one of preceding claims 1 to 3, wherein said first (211, 221) and said second (111, 121; 311, 321) coupling means comprise flaps radially projecting from said shoe portion (1), which are substantially oriented in parallel to the sole plane (101; 301) of the shoe and provided with at least one through-slot (221, 121; 321) for connecting with the strap.

5. Swim fin according to claim 4, wherein the walls of the slot (221, 121; 321) have an inclination so that to favor the connection with the strap (3).

6. Heel member for an open-heel shoe swim fin, comprising a looped-shaped body (4; 5) with a substantially parabolic profile, so that to form a cavity with a substantially parabolic profile inside it, the cavity being adapted for housing the ankle of the user, which is provided in both of its arms with at least one axial duct (114; 115, 125) adapted for housing the strap (3) for the coupling with the shoe of the swim fin.

7. Heel member according to claim 6, wherein each of said arms (104; 105) is provided with at least one radial cavity (124; 135), communicating with said at least one axial duct (114; 115; 125).

8. Heel member according to claim 7, wherein said arms (105) are each provided with a further axial duct (125) parallel to the first duct (115), said radial cavities (135) being in communication with one of the two ducts.

9. Heel member according to any one of claims 6 to 8, wherein said heel member is made in one piece of an elastically yielding material, and preferably of expanded polymeric material, and even more preferably of expanded closed cell polymeric material.

10. Heel member according to any one of preceding claims 6 to 8, wherein the body of said member is made in one piece of thermoplastic rubber or natural

rubber or mixtures of these rubbers.

11. Heel member according to any one of preceding claims 6 to 10, wherein the body (4; 5) of said member is provided, on the outer wall of its vertex, with gripping means (204; 205).

12. Open-heel shoe swim fin according to any one of preceding claims 1 to 5, wherein said heel member (4; 5) is made according to one or more of preceding claims 6 to 11.

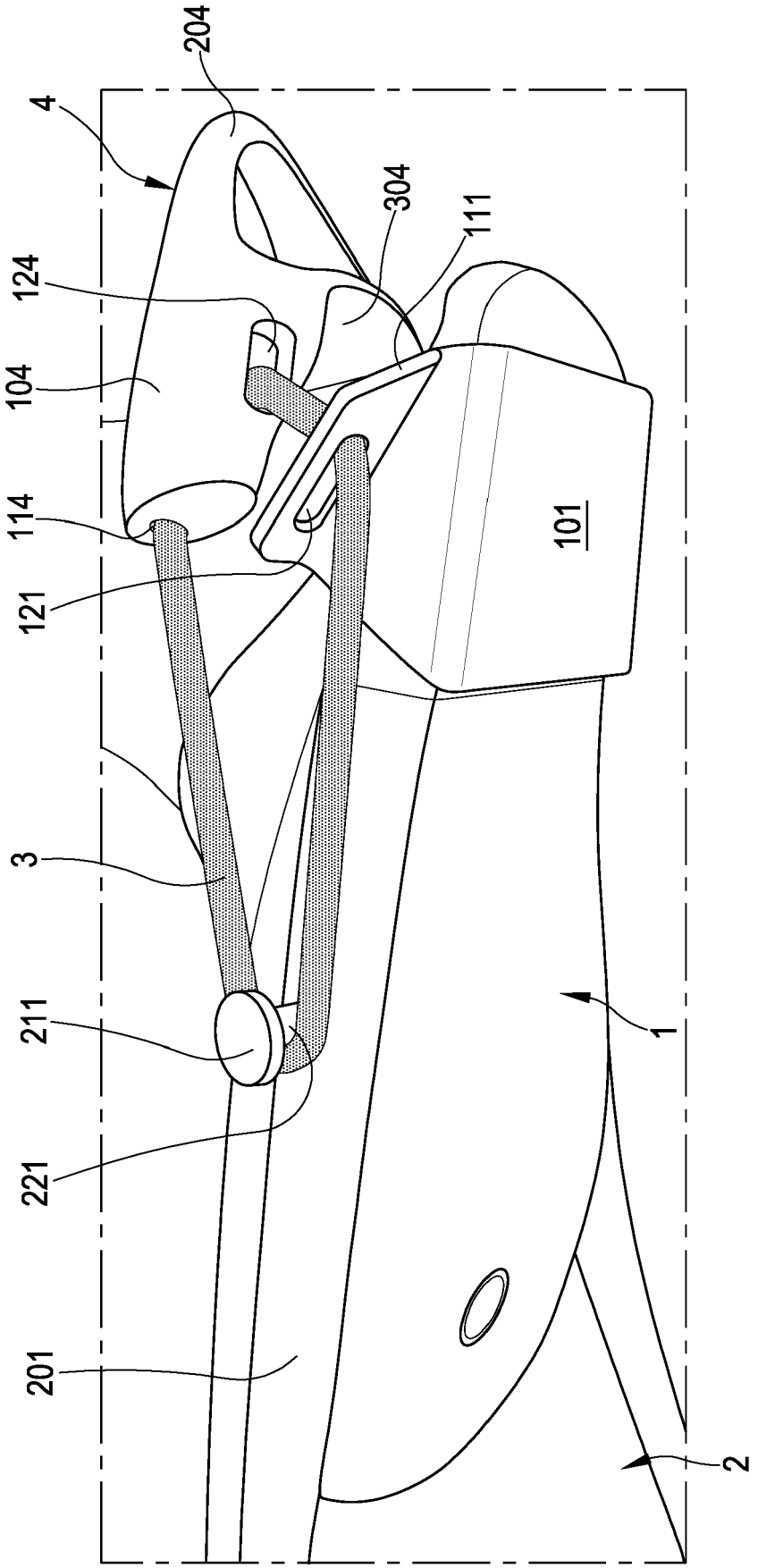

FIG.1

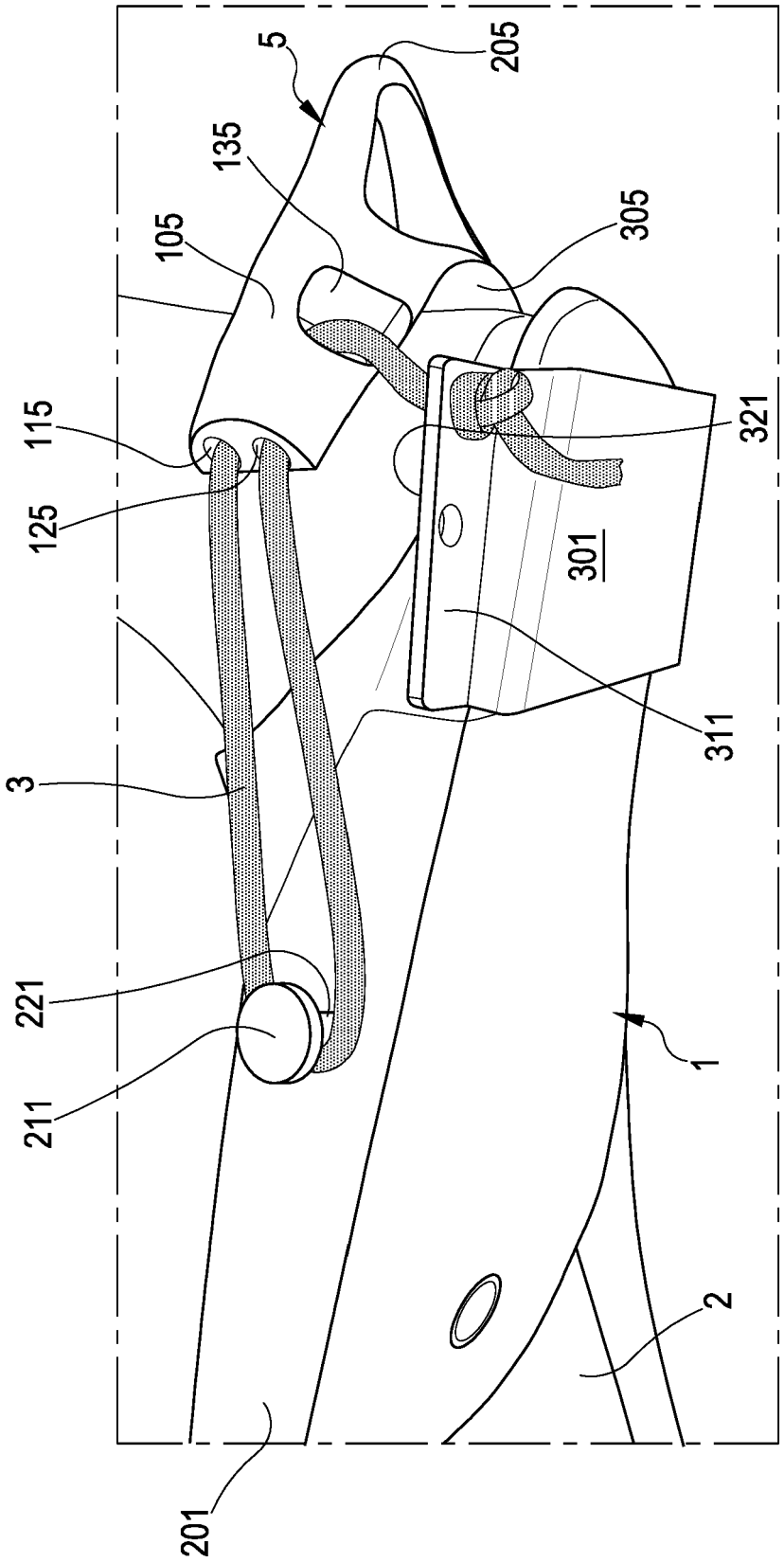

FIG.2

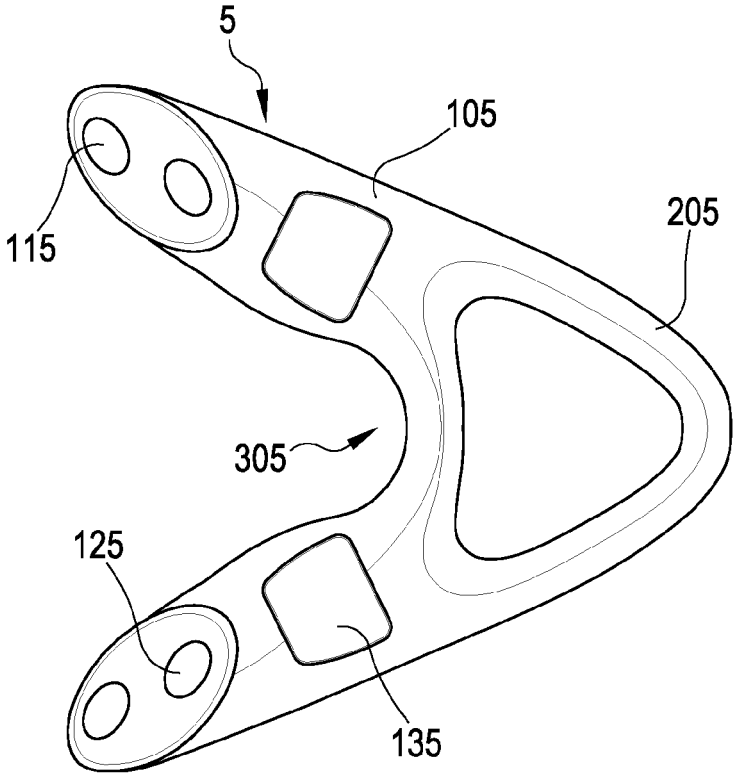

FIG.3

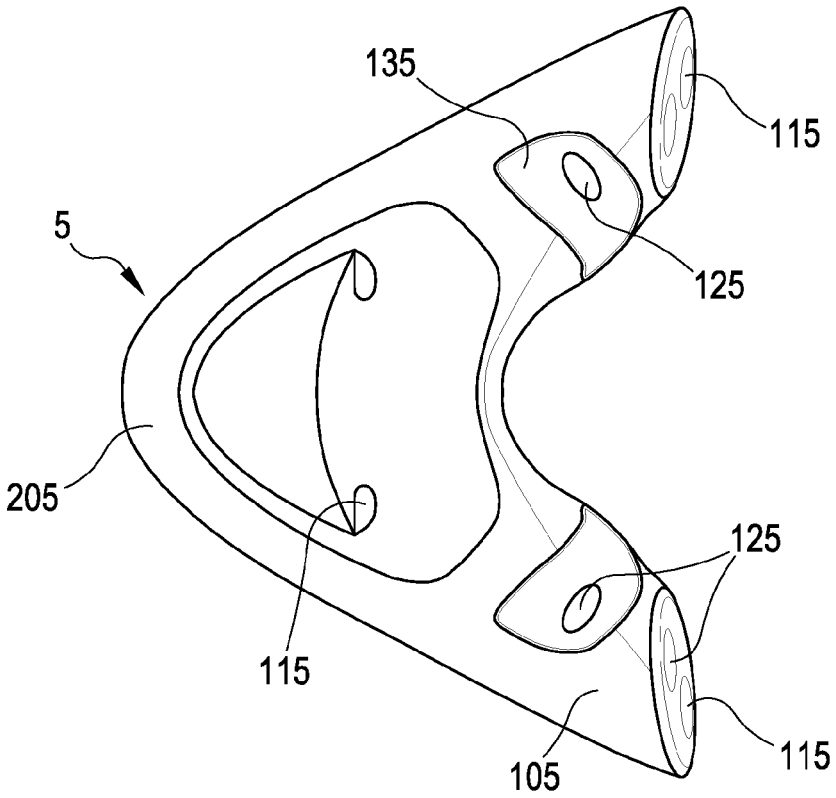

FIG.4

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EUROPEAN SEARCH REPORT

Application Number
EP 20 15 1339

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 2012/102692 A1 (FENG LI-JEN [TW]) 3 May 2012 (2012-05-03)	6,7,9-11	INV. A63B31/11
Y	* paragraphs [0016] - [0023]; figures *	12	
A		1-5,8	

X	US 5 467 508 A (FENG LE-JANG [TW]) 21 November 1995 (1995-11-21)	6,7,9-11	
Y	* column 2, line 56 - column 4, line 30;	12	
A	figures 2A, 4 *	1-5,8	

X,D	EP 2 433 680 A1 (MARES SPA [IT]) 28 March 2012 (2012-03-28)	6,9-11	
Y	* paragraphs [0007] - [0010]; figures *	12	
A		1-5,7,8	

X	TW M 537 920 U (QBAS CO LTD [TW]) 11 March 2017 (2017-03-11)	1-3	
Y	* abstract; figures *	12	
A		4-11	

X	WO 99/12612 A1 (SCOTT EDWARD [GB]) 18 March 1999 (1999-03-18)	1	TECHNICAL FIELDS SEARCHED (IPC)
A	* pages 4-5; figures *	2-12	A63B

A	US 6 123 594 A (MASSE E ROGER [US]) 26 September 2000 (2000-09-26) * figures *	1-12	

X,P	EP 3 578 233 A1 (MARES SPA [IT]) 11 December 2019 (2019-12-11)	6-11	
A,P	* claims; figures *	1-5,12	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	5 June 2020	Herry, Manuel

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

EPO FORM 1503 03.82 (P04C01)

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Application Number
EP 20 15 1339

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☒ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

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LACK OF UNITY OF INVENTION
SHEET B

Application Number
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The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-12

Independent claim 1 and dependent claims 2-5 and 12 relate to an open-heel shoe swim fin.
Independent claim 6 and dependent claims 7-11 relate to a heel member for an open-heel shoe swim fin.

1.1. claims: 1-5, 12

Independent claim 1 relates to an open-heel shoe swim fin comprising a paddle portion and a shoe portion, said shoe portion comprising a sole portion made in one piece with said paddle portion, and also comprising "coupling means of the strap ... connected to a heel member". According to this wording neither the strap nor the heel member belong to the open-heel shoe swim fin. Claim 1 thus covers any coupling means which are suitable for coupling (Examination Guidelines F-IV.4.13.1) with a strap being arranged on the sides of said shoe portion, the strap itself being suitable for being connected to a heel member, said sole portion of said shoe being provided, in proximity of the end opposite the one facing said paddle portion, with second coupling means of a strap.
Claim 1 thus merely relates to an open-heel shoe swim fin comprising a paddle portion and a shoe portion provided with first and second coupling means of a strap.

1.2. claims: 6-11

Independent claim 6 relates to a heel member suitable for being connected to an open-heel shoe swim fin, comprising a looped-shaped body with a substantially parabolic profile, so as to form a cavity with a substantially parabolic profile inside it, the cavity being adapted for housing the ankle of the user, which is provided in both of its arms with at least one axial duct which is adapted for housing the strap for the coupling with the shoe of the swim fin.
Claim 6 thus merely relates to a heel member comprising a looped-shaped body with a substantially parabolic profile, so as to form a cavity with a substantially parabolic profile inside it, the cavity being adapted for housing the ankle of the user, which is provided in both of its arms with at least one axial duct which is adapted for housing a strap for the coupling with a shoe of a swim fin.

Please note that all inventions mentioned under item 1, although not necessarily linked by a common inventive concept, could be searched without effort justifying an additional fee.

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 20 15 1339

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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05-06-2020

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		EP 3578233 A1	11-12-2019
		US 2019366160 A1	05-12-2019

EPO FORM P0459

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

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 2433680 A **[0006]**