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(54) **Device and method for strengthening the muscles and stretching the rachis and the lower limbs while swimming.**

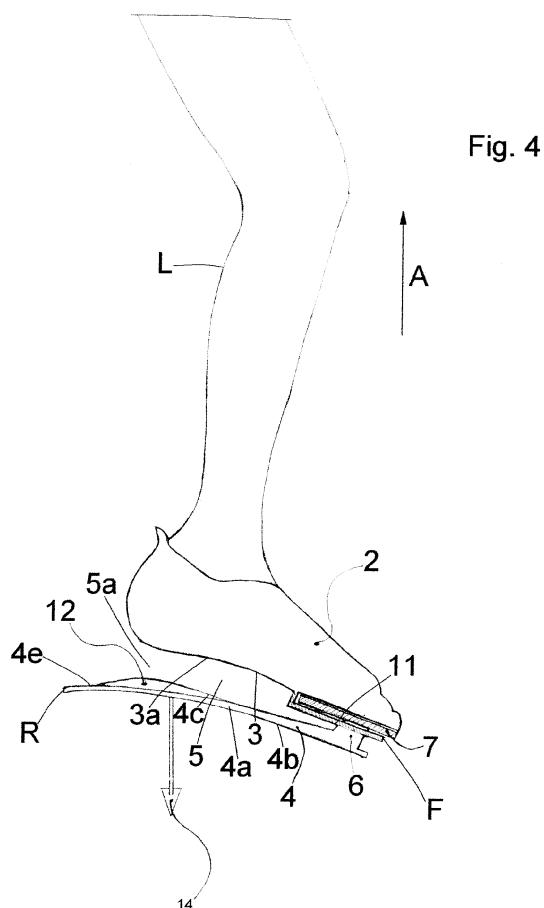
(57) The present invention relates to a device (1) for strengthening the muscles and for stretching the rachis and the lower limbs while swimming, comprising:

- a shoe component (2) having a sole (3) with a lower surface (3a);

- a substantially rigid or slightly flexible blade or hull component (4);

the blade or hull component (4) being fixable to the shoe component (2) and including a base member (4a) having an inner surface (4b) facing towards the shoe component (2), and an outer surface (4c) facing far from the shoe component (2),

the base member (4a) being spaced from the sole of the shoe component (2), thereby delimiting therewith a tunnel or channel (5) for water flowing having at least one water inlet end (5a) at the rear (R) of the device (1) and at least one outlet end (5b) at the front (F) of the device (1).



Description

[0001] The present invention relates to a device and a method for strengthening the muscles and stretching the rachis and lower limbs when swimming is performed.

[0002] To date, many devices, which can be worn by swimmers while swimming and are arranged to carry out different functions for assisting the sport activity, have been proposed. Quite often, such devices/tools are structured in such a way as to impact water, thereby affecting the swim dynamic, see for example the patents and patent applications US-5 102 120, FR-2 926 469, US-2002/132708, US-5 338 275, US-4 813 668, US-4 521 011, US-5 795 204, US-3 867 734, US-895 451, US-3 107 372, US-3 789 448, and the international application WO-2010/123345.

[0003] None of the solutions taught or proposed according to such documents makes it possible to force and train the leg muscles; they rather aim at assisting the swimmer to improve his performance while swimming.

[0004] A main object of the present invention is therefore to provide a device to be worn on the foot and suitable for efficiently and targetly enhance while swimming the muscles involved during the normal swimming action.

[0005] Another object of the present invention is to provide a device to be worn on the foot and suitable for stretching or lengthening the rachis and the lower limbs.

[0006] Another object of the present invention is to provide a method of specific training for strengthening the muscles involved during the normal swimming action and for stretching the rachis and the lower limbs.

[0007] According to a first aspect of the present invention, there is provided a device for strengthening the muscles and for stretching the rachis and the lower limbs while swimming, comprising:

- a shoe component having a sole with a lower surface;
- a substantially rigid or slightly flexible blade or hull component,

the blade or hull component being fixable to the shoe component and including a base member having an inner surface facing towards the shoe component and an outer surface facing far from the shoe component, the base member being spaced from the sole of the shoe component, thereby delimiting therewith a water tunnel or channel having at least one water inlet end at the rear and/or rear-side of the device and at least one outlet end at the front and/or front-side of the device.

[0008] Advantageously, the flow tunnel or channel is delimited underneath the shoe component between the lower surface of the sole of the shoe component and the inner surface of the blade or hull component.

[0009] According to another aspect of the present invention, there is provided a method for strengthening the muscles involved during the normal swimming action and stretching the rachis and the lower limbs, comprising the

following steps:

- applying a device as above defined according to the present invention to a respective foot wearing thereon the shoe component of the device;
- swimming for generating a motive power in an advance direction, thereby causing a water impact onto the inner surface of the base member, water entering into the tunnel at the inlet end and water leaving from the outlet end thus generating a resisting force applied to the device, and, consequently to the swimmer's foot, a resisting force having a direction opposite to the motive power in the advance direction, the opposite action of the motive power and resisting force determining a sequential action of stretching and lengthening of the rachis and the lower limbs and simultaneously the strengthening of the muscles involved in the normal swimming action.

[0010] Further aspects and advantages of the present invention will better appear from the following detailed description of specific presently preferred, but not limiting, embodiments of a device to be worn on a foot to strengthen the leg muscles while swimming, description made with reference to the accompanying drawings, in which:

- Figures 1 to 3 are side, top, and front views with parts in transparence, respectively, of a device to be worn on the foot according to the present invention,
- Figure 4 is a side view of the device of Figures 1 to 3 worn on the foot of a user; and
- Figure 5 is a perspective view of another embodiment of a device according to the present invention.

[0011] In the accompanying drawings, equal or similar parts or components were marked with the same reference numerals.

[0012] Referring first to Figures 1 to 4, a device 1 to be worn on the foot for strengthening the muscles and stretching the rachis and lower limbs while swimming is shown, which comprises a shoe component 2, having a sole 3 with a lower surface 3a, and a substantially rigid or slightly flexible blade or hull component 4.

[0013] The blade or hull component 4 is fixable or fixed to the shoe component 2 and has a base member 4a, preferably flat, having an inner surface 4a facing towards the shoe component 2, and an outer surface 4c facing far from the shoe component 2. Advantageously, the base member is underneath the shoe component 2.

[0014] The base member 4a of the blade or hull component 4 is spaced or located at distance from the sole 3 of the shoe component 2, so as to delimit therewith a tunnel or channel 5 for water flowing; preferably, the tunnel 5 is delimited underneath the shoe component, between the lower surface 3a of the sole 3 and the inner surface 4b of the blade or hull component 4.

[0015] The tunnel 5 has at least one water inlet end or

mouth 5a at the rear R (or even at the side-rear portion) of the device 1 and at least one outlet end or mouth 5b at the front F (or even at the front-side portion) of the device 1.

[0016] Preferably, the base member 4a of the blade or hull component 4 has a portion 4e protruding beyond the dimension of the shoe component 2, preferably an end portion 4e protruding with respect to the heel 2a of the shoe component 2, or even laterally in the rear zone, whereas the water inlet end or mouth 5a is at the protruding portion 4e. As will also be explained in the following, the protruding portion diverts water or facilitates the water conveyance towards the inlet end or mouth 5a.

[0017] According to the embodiment shown, the base member 4a has a substantially flat body, which is slightly tilted with respect to, or parallel to, the sole 3. The blade component 4 can be, for example, made of polypropylene or thermoplastic rubber, optionally reinforced with tissue/s suitable for conferring the required flexibility.

[0018] The device 1 can also include a spacing portion 6 for connecting the shoe component 2 and the blade component 4, in such a way that the blade component 4, and more particularly the base member 4 thereof is kept at a predetermined distance from the shoe component 2, the distance substantially corresponding to the height of the connection portion 6. Preferably, the connection portion 6 is made of one or a pair of ribbings or columns 6a, 6b extending at the front F of the device, and having a trim substantially parallel to the front F-rear R direction of the device. More preferably, the connection portion 6 comprises a pair of substantially parallel ribbings 6a, 6b, the outlet end or mouth 5b being delimited therebetween.

[0019] The connection portion 6 is, for example, integral with the blade or hull component 4. If this is the case, the connection portion 6 is connected to the sole 3 of the shoe component, e. g. by means of a plate component 7, as described hereinbelow. The connection portion 6 is, preferably, made of polypropylene or thermoplastic rubber and has a height of about some ten millimeters. As it will be understood, the connection portion 6 must oppose to the water flow the minimal possible resistance, and, at the same time, it should confer a sufficient connection rigidity between shoe component 2 and blade component 4. Of course, the connection portion should not close the passing light of the tunnel, since water must flow from the inlet end 5a to the outlet end 5b. Furthermore, the height of the connection portion delimits the height of the tunnel or channel 5.

[0020] Advantageously, the device comprises locking-releasing means of the base member 4a to the shoe component 2, and thus the base member 4a is removably fixable to the shoe component 2, so that the base member 4a can be replaced or repaired, or furthermore to make it possible to remove by the user the shoe or hull component 4, e. g. to easily walk outside the water.

[0021] The locking-releasing means can include, for example a plate or small-plate element 7 fixable to the

sole 3 at the tip of the shoe component 2, and delimiting a receiving seat for at least one screw 9 to be engaged with the ribbing/s 6a, 6b.

[0022] The screw/s 9 are screw engageable in the ribbing/s 6a, 6b. The plate 7 can be received in a respective seat 10 between a front portion of the lower surface of the sole and a L-shaped stirrup element 11 borne or extending from the same sole. The plate 7 can have a thickness of about some millimeters and can be substantially rectangularly shaped, and it can, for example, be made of metallic or carbon fiber material, whereas the L-shaped stirrup 11 can be, for example, made of hard and resistant propylene material.

[0023] As it has been mentioned above, owing to the locking-releasing means it is possible to release or disassemble the blade or hull component 4 from the shoe component. If this is the case, it is even possible to assemble the base member 4a with a reverse trim, i. e. overturned of about 180° with respect to the trim shown in the Figures, in such a way as to act as a fin.

[0024] The plate 7 can be firmly locked to the shoe component 2 in the respective L-shaped seat 10 by means of one or more screws 8.

[0025] If locking-releasing means are provided for, the base member 4a is fixable to the shoe component 2:

- in a first position, thereby delimiting the tunnel (see in particular Figures 1 and 4); and
- in a second position, overturned of 180° with respect to the first position, thereby overhangingly extending from a front portion of the shoe component 2 towards the front F of the device so as to act as an overhanging fin.

[0026] At the rear R of the device 1, from an intermediate portion of the inner surface of the blade or hull component 4, one or more ribs or reliefs 12 protrude, each rib being a support for the heel 2a of the shoe component 2, particularly when the swimmer uses the shoe for walking in or out the water. For example, two ribs 12 having a thickness lower than the height of the tunnel 5 and delimiting therebetween a longitudinal zone for the water passage can be provided for.

[0027] The base member 4a of the blade component 4 can even include side stiffening ribs 13 designed to provide mechanical strength to the same component.

[0028] The tilting angle α of the blade component 4 with respect to the sole 3 of the shoe component 2 depends upon the geometrical shape of the device.

[0029] With such a device, first a swimmer applies it to a respective foot by wearing the shoe component thereon, and then he swims for generating a motive power in an advance direction A (Fig. 4), and this causes the water impact onto the inner surface 4b of the base member 4, more particularly onto the protruding portion 4e thereof, if present, and thus part of the water enters the tunnel 5 at the end 5a and exits therefrom through the end 5b. Therefore the water causes a braking or resisting

force 14 having a direction opposite with respect to the motive power applied in the advance direction owing to the swimming action, the resisting force 14 being applied to the respective foot and thus leg L or lower limb of the swimmer. The leg L or lower limb of the swimmer and thus the rachis are therefore subjected, on one side, to the motive power caused by the swimmer and generated by the arms in the advance direction A, and, on the other, to the resisting force 14 generated owing to the water impact against the base member 4a and the water flowing along the tunnel 5. The leg L or lower limbs and the rachis are thus subjected to two forces having an opposite direction one with respect to the other, which determine a sequential action of stretching and lengthening.

[0030] Particularly referring to Figure 4, it has been highlighted the bending of the blade component 4, which can be caused owing to the thrust of water. The blade or hull component 4, or better the base member 4a thereof can be thus displaced between a rest position (Fig. 1) and a braking position (Fig. 4), in which it is slightly bent by means of the water thrust. Advantageously, in the braking position (Fig. 4), the base member 4a has a rear portion at a distance from the shoe component 2 higher than in the rest position.

[0031] Of course, the generated braking force will be higher the higher is the speed of the swimmer, and the zone of the blade component on which the water impacts.

[0032] The blade component 4 can include sections and size different as a function of the strength of the desired braking force, of the point of the application of the force on the device and direction thereof to be obtained. Therefore, it will be understood the advantage obtained by an easy replacement of the blade component 2, which can be easily (it is sufficient to remove the screws 8) assembled or disassembled by the swimmer.

[0033] Referring now to Figure 5, it has been shown another embodiment of the device according to the present invention, in which the hull component 4 comprises a side wall 4d protruding from the rear and from the sides of the base member 4a. The side wall 4a, preferably, has a maximum width at the rear of the device, whereas it is tapered in the back R-front F direction at the sides of the device.

[0034] A gap or space 15 for the water flow, which is in fluid communication with the tunnel or channel 5, is delimited between the shoe component 2 and the side wall 4d of the hull component 4, particularly at the rear R of the device.

[0035] As it will be understood, the operation of such a device substantially corresponds to that of the device disclosed with reference to Figures 1 to 4.

[0036] According to the present invention, the shoe component can be a shoe, a sandal, an ankle boot and have different size as a function of the width of the foot; it, further, can be made, for example, of thermoplastic rubber.

[0037] A device to be worn on a foot according to the present invention is, as a matter of fact, a shoe device

suitable for breaking the swimming advancing movement, and thus, should the swimmer wear it, he has to carry out a higher general muscle effort to advance while swimming, thereby strengthening the training action. Moreover, since the braking action is determined by the device at the foot of the swimmer, whereas the advancing force is imparted both by the legs and the arms, the rachis of the swimmer is subjected to relatively high traction thereby causing a beneficial action both to the legs or lower limbs and to the spinal column.

[0038] The above described invention is susceptible to numerous modifications and variations within the protection scope as defined by the claims.

Claims

1. A device (1) for strengthening the muscles and for stretching the rachis and the lower limbs while swimming, comprising:

- a shoe component (2) having a sole (3) with a lower surface (3a);
- a substantially rigid or slightly flexible blade or hull component (4);

said blade or hull component (4) being fixable to said shoe component (2) and including a base member (4a) having an inner surface (4b) facing towards said shoe component (2), and an outer surface (4c) facing far from said shoe component (2),

characterized in that said base member (4a) is spaced from said sole of said shoe component (2), thereby delimiting therewith a tunnel or channel (5) for water flowing having at least one water inlet end (5a) at the rear (R) of said device (1) and at least one outlet end (5b) at the front (F) of said device (1).

2. A device as claimed in claim 1, **characterized in that** said flow tunnel or channel (5) is delimited underneath said shoe component between said lower surface (3a) of said sole (3) of said shoe component (2) and said inner surface (4b) of said blade or hull component (4).

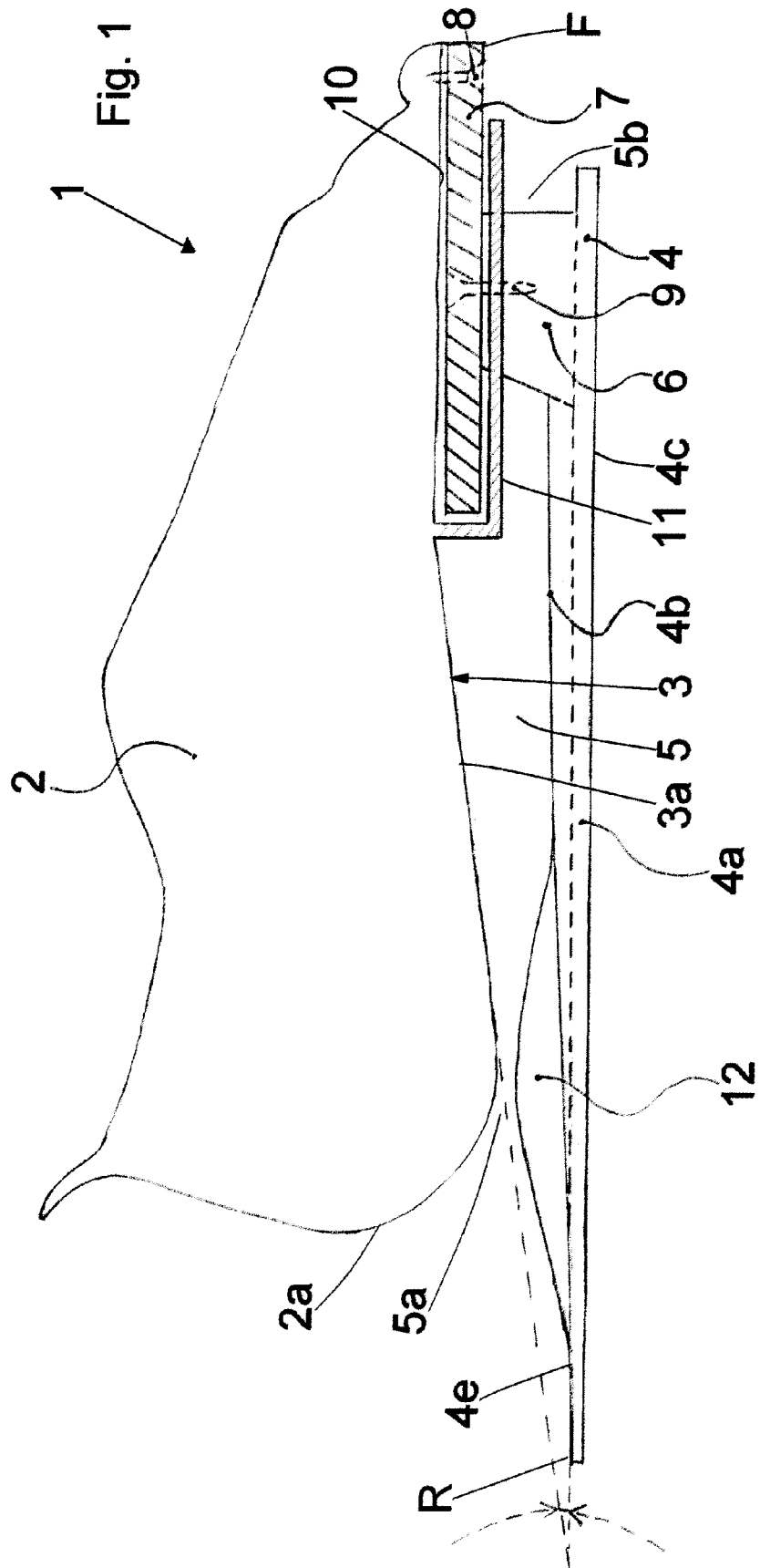
3. A device as claimed in claim 1 or 2, **characterized in that** said base member (4a) of said blade or hull component (4) has a portion (4e) protruding beyond the dimension of said shoe component (2), whereas said water inlet end (5a) is at said protruding portion (4e).

4. A device as claimed in claim 3, **characterized in that** said protruding portion (4e) protrudes beyond the heel (2a), optionally even laterally with respect to said shoe component (2).

5. A device as claimed in any previous claim, **characterized in that** said base member (4a) has a substantially flat body, which is slightly tilted with respect to or parallel to said sole (3).
6. A device as claimed in any previous claim, **characterized in that** it comprises a connection spacing portion (6) between said shoe component (2) and said blade component (4), so that said base member (4a) of said blade component (4) is kept at a predetermined distance from said shoe component (2), said distance substantially corresponding to the height of said connection portion (6).
7. A device as claimed in claim 6, **characterized in that** said connection portion (6) is made integral with said blade or hull component (4).
8. A device as claimed in claim 6 or 7, **characterized in that** said connection portion (6) comprises at least one ribbing or column (6a, 6b) extending at the front (F) of said device (1), and having a trim substantially parallel to the front (F)-rear (R) direction of said device (1).
9. A device as claimed in any previous claim, **characterized in that** it comprises locking-releasing means of said base member to said shoe component.
10. A device as claimed in claim 9, **characterized in that** said locking-releasing means comprises a plate element (7) fixable to said sole (3) at the tip of said shoe component and delimiting a receiving seat for at least one screw (9) for engaging said at least one rib (6a, 6b).
11. A device as claimed in claim 10, **characterized in that** said locking-releasing means comprises a stirrup element (11) borne by said sole (3) and delimiting a seat (10) for said plate (7) with a front portion of said sole (3).
12. A device as claimed in any previous claim, **characterized in that** at the rear (R) of the device (1), from an intermediate portion of said inner surface (4b) of said blade or hull component (4), at least one rib or relief (12) extends, which acts as support for the heel (2a) of said shoe component (2), when the swimmer walks in or out the water.
13. A device as claimed in any claim 9 to 11, wherein said base member (4a) is fixable to said shoe component (2):
- in a first position, thereby delimiting said tunnel; and
 - in a second position, overturned of 180° with respect to said first position, thereby overhang-

ingly extending from a front portion of said shoe component (2) towards the front (F) of said device thereby acting as an overhanging fin.

14. A method of strengthening the muscles and stretching the rachis and the lower limbs while swimming, comprising the following steps:
- applying a device as claimed in any previous claim 1 to 12 to a respective foot wearing thereon the shoe component (2) of said device;
 - swimming for generating a motive power in an advance direction (A), thereby causing the water impact onto said inner surface (4b) of said base member (4a), water entering into the tunnel (5) at said inlet end (5a) and water leaving from said outlet end (5b), thus generating a resisting force (14) applied to the device (1), and, consequently to the foot of the swimmer, the resisting force having a direction opposite to the motive power in the advance direction (A), the opposite action of the motive power and resisting force (14) determining a sequential action of stretching and lengthening of the rachis and the lower limbs.
15. A method as claimed in claim 14, **characterized in that**:
- a device as claimed in claim 3 is applied to the foot; and
 - upon swimming, water impacts against the base member (4a) at said protruding portion (5e), and thereafter water enters said inlet end (5a) of said tunnel (5).



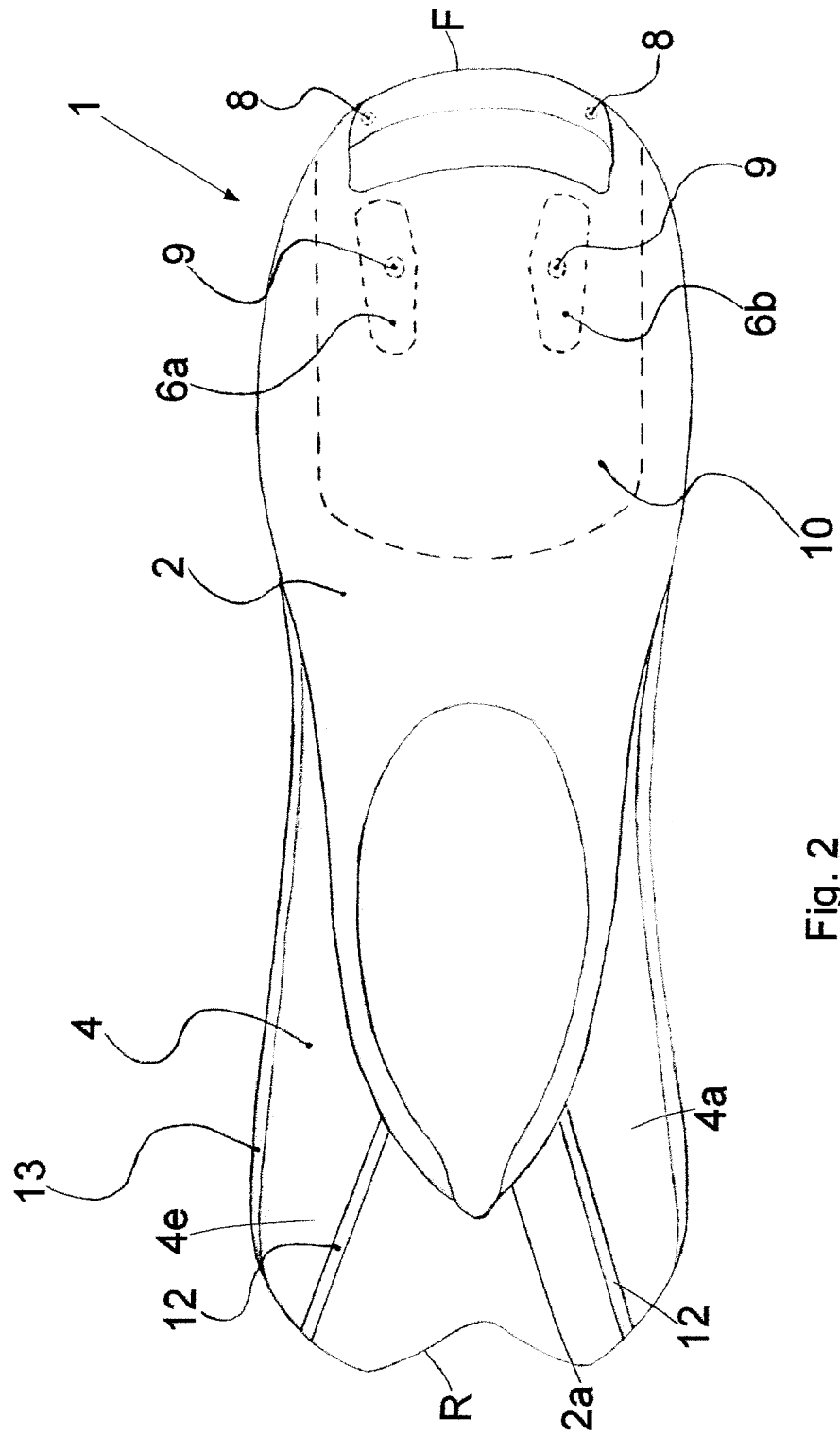


Fig. 2

Fig. 3

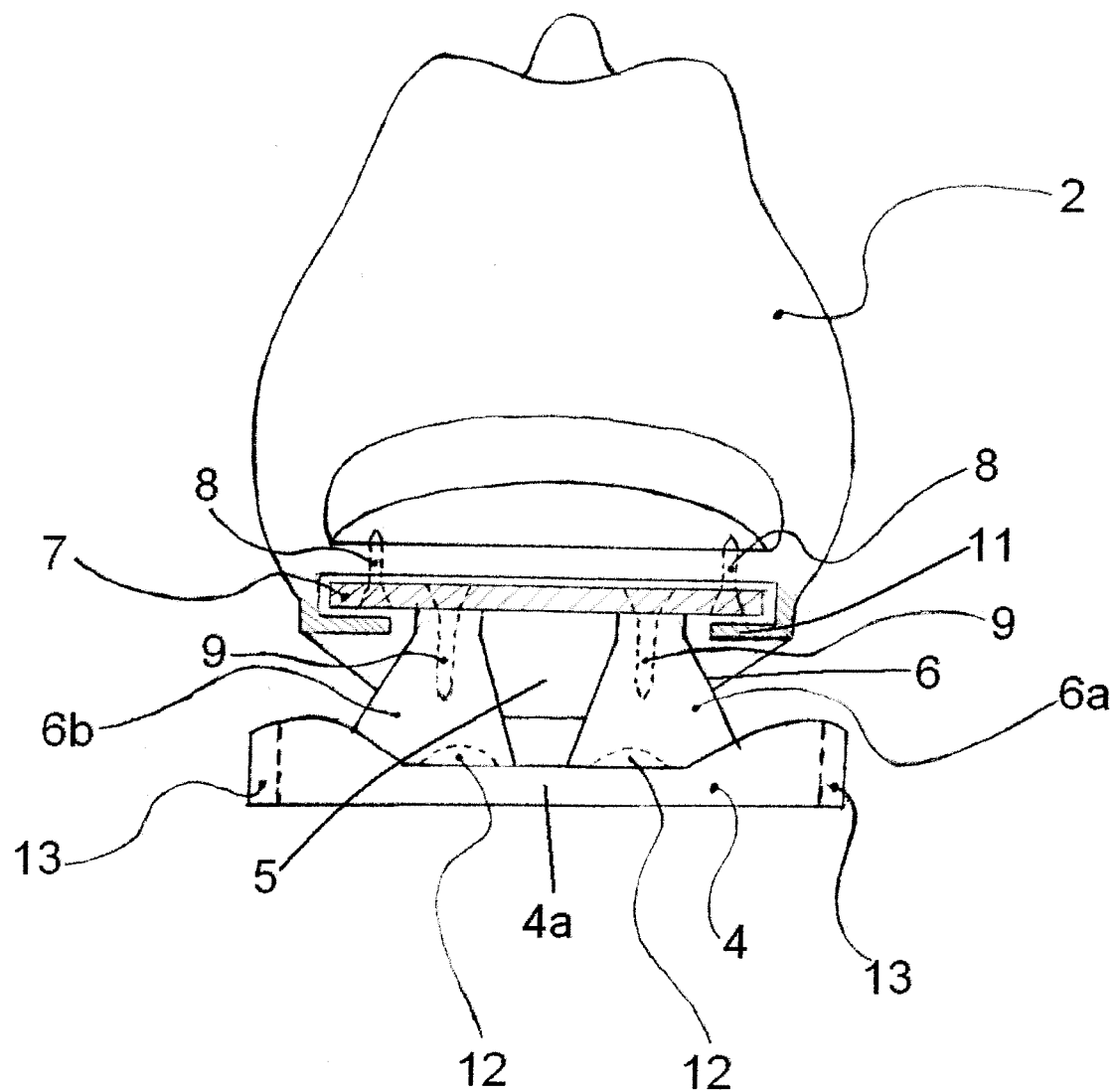
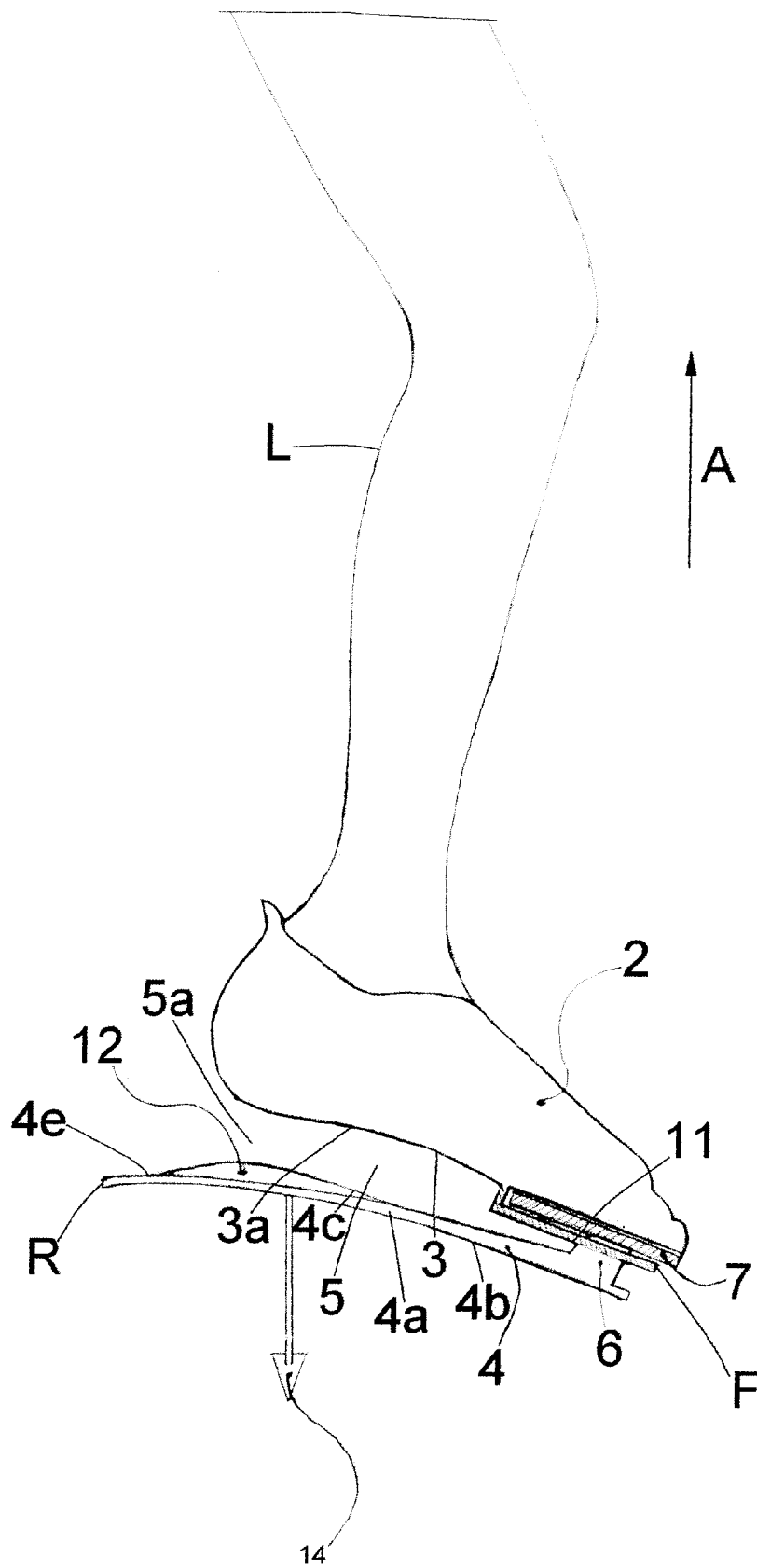


Fig. 4



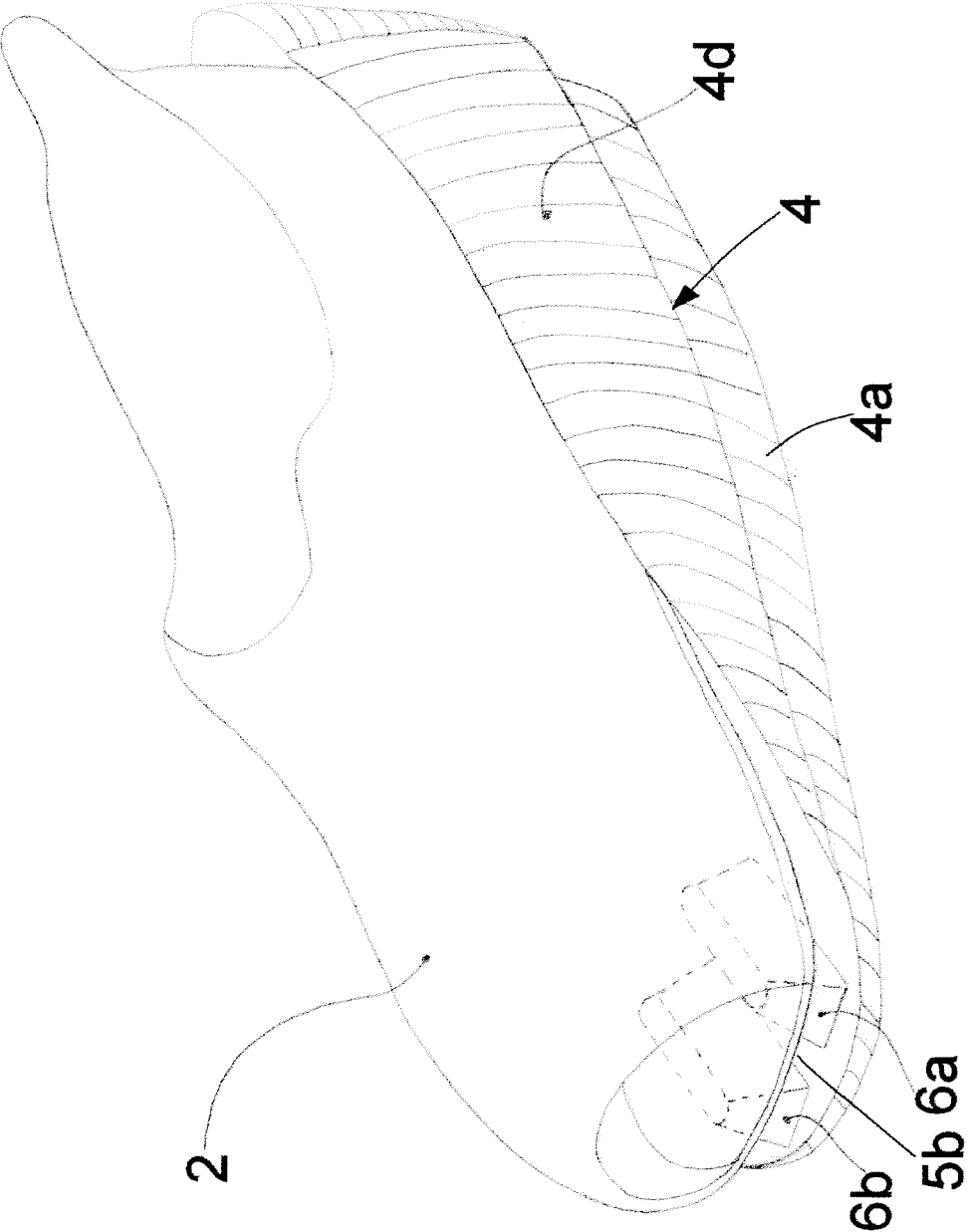


Fig. 5



EUROPEAN SEARCH REPORT

Application Number
EP 11 18 5363

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 5 645 460 A (JOHNSON CARROLL L [US]) 8 July 1997 (1997-07-08) * column 2, line 65 - column 8, line 50; figures 1-8e *	1-9,14, 15	INV. A63B31/11 A63B21/008
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X	US 4 988 094 A (BEASLEY BOB L [US]) 29 January 1991 (1991-01-29) * the whole document *	1,2,5-7, 14	
			TECHNICAL FIELDS SEARCHED (IPC)
			A63B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 23 March 2012	Examiner Squeri, Michele
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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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 11 18 5363

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23-03-2012

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