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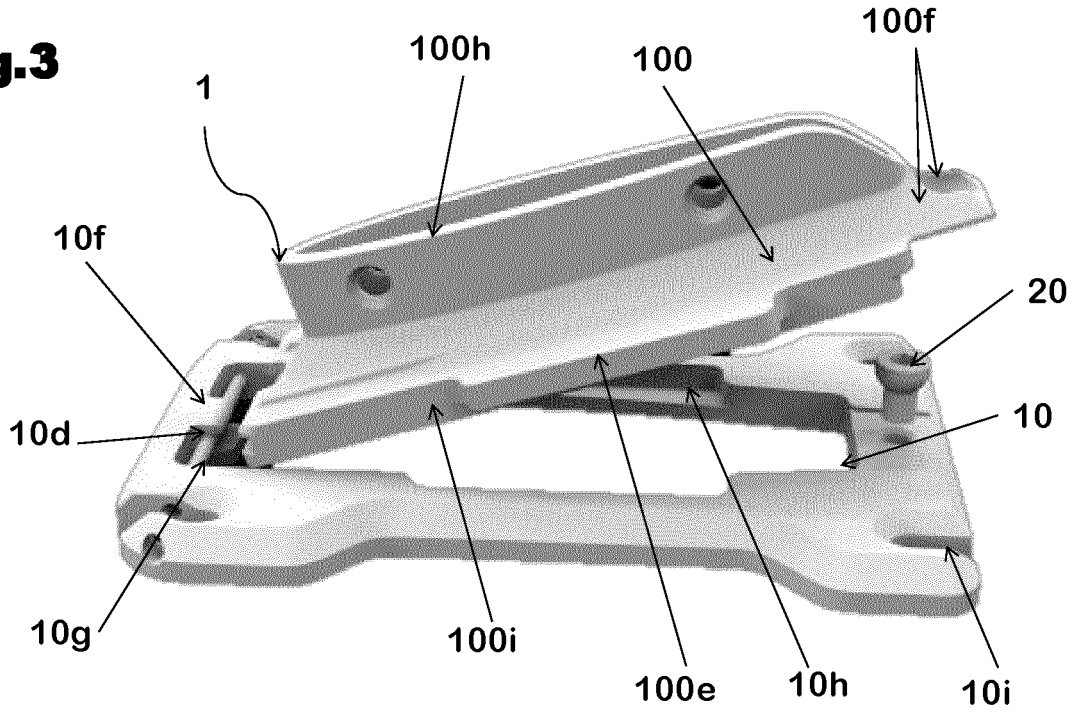
(54) **CONNECTION SYSTEM FOR MOUNTING AN APPENDIX ON A BOARD FOR WATER SPORTS**

(57) Connection system for mounting an appendage on a water sports board comprising a fixing plate and a connecting element. The connecting element being shaped so as to be inclined so as to be attached to said fixing plate, and comprising a rear end with a hole which, when said connection element is attached to said fixing plate, are located at a rear recess and a threaded recess of the plate respectively fastening. To complete the connection of the connection element to the fixing plate, the connection system also includes a screw that binds the two parts together.

Fig.3



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Description

[0001] The present invention has as its object a system of connection for mounting an appendage on a water sports board, for simplicity's sake also referred to as just a board, in particular a board that can be used for gliding sports such as *surfing, kitesurfing, windsurfing,* and *wingsurfing,* also with the use of propulsion systems, e.g. paddling as in the case of so-called SUP (*Standing Up Paddle*), using with the board at least one appendage attached to its submerged surface and protruding from it, such as derails and rudders and in particular appendages of the *hydrofoil, or foil for* short, type, i.e. foil dinghies and rudders, which allow the board to glide raised above the surface of the water.

[0002] Here and in the following, hydrofoil or foil means a wing surface immersed in water and attached to the keel of the board by means of a rigid protruding support, often referred to as a mast or *mast.*

[0003] As part of the connection systems for the mounting of appendages on water sports boards, there is a need to simplify the method of attachment between the board and the appendage by minimising the parasitic turbulence generated by this connection system and the vibrations due to any mechanical play between the various components of the connection system.

[0004] To meet this need, numerous solutions have been developed to make the connection systems for mounting appendages on water sports boards as simple as possible and efficient.

[0005] The fastening systems comprise at least one fastening seat consisting of a plate, and a fastener that allows the insertion and locking of the foot or base of the appendage itself at the table.

[0006] An example of a fastening system is described in International Patent Application No. WO 2021/069355 A1, which involves inserting the foot of the mast by tilting the fastener
in relation to the plate so that this foot is inserted in a recess of the plate.

[0007] Another example is described in German patent application No. 102 018 106 212 A1 for a hydrofoil with a connection to a water sports board, in which the connection system between the mast foot and the attachment plate involves a snap mechanism that does not require the foot to be tilted in order to be engaged with the attachment plate.

[0008] Disadvantageously, this fixing plate includes rails on which the shaft foot must be inserted. The presence of rails implies a very precise positioning of the connection system, which is not always easily achievable in assembly phase, during which one could find oneself on the beach and exposed to the wind. Should the mechanical play envisaged be such as to make easy connection, even in the absence of a perfect alignment between the plate and the foot of the appendix, would mean that the entire system would be subject to high vibrations and therefore poor fluid-dynamic performance.

[0009] Another method of fixing with a snap-action mechanism, which involves tilting the foot of a driftwood into a sport board shell aquatic is described in US Patent No. 6,695,662 B2.

[0010] This is done by tilting the fin backwards so that a tooth from the rear end of the foot is inserted into a recess, then the foot is pressed into the recess so that a movable tooth on the front end, mounted in an elastic support, slides into another recess where it is blocked by the elastic force of its support; however, it can be freed by pushing back a protrusion of this support, thus freeing the front tooth from its seat.

[0011] This invention, although very suitable for classic appendages, would appear to be sub-optimal for foil appendages, where such a simple attachment mechanism might not be sufficient to counteract the forces exerted on the wing portion of the foil and there would be a risk of the appendage detaching from the board.

[0012] A fastening system similar to the previous one, but not snap-on, is described in U.S. Patent No. 5,215,488 A, which provides a system for attaching a fin to a surfboard, a fin that has a foot that is inserted into a recess and a screw clamping system acting on one end of the foot, while the opposite end is embedded in a recess in the recess itself. Disadvantageously, this type of system of connection is not suitable for water sports boards with hydrofoils, which usually have a fastening system located on the outside of the board and very small thicknesses.

[0013] Further fin connection systems are described in International Application No. WO 90/013.472 A, including a locking mechanism that acts transversely with a spring and provides a release screw.

[0014] The technical problem underlying this invention is to provide a connection system for mounting an appendage on a water sports board that avoids the disadvantages mentioned with reference to the known technique.

[0015] This problem is solved by a connection system for mounting an appendage on a water sports board as specified above, which is characterised by the fact that it includes a mounting plate connected to the board. The fixing plate in turn comprises a rear side comprising a threaded cavity and a rear recess.

[0016] The connection system also includes a connection element, remotely connected to said attachment plate and to said appendix. The connecting element is shaped so as to be inclined in order to be coupled to said fixing plate and includes in turn a rear end comprising a hole. Said rear end and said hole, when said connecting element is inserted and attached to **said fixing plate, are** located at said rear recess and said threaded cavity respectively; when said connecting element is connected to said fixing plate, said rear recess prevents movement of the connecting element in a geometric plane parallel to that table.

[0017] To prevent transverse displacements of said connection element to said geometric plane parallel to

said board, attaching said connection element to said fixing plate, the connection system includes a locking screw which is fixed in said threaded cavity through said hole.

[0018] The main advantage of the connection system according to the present invention lies in comprising said posterior recess and said posterior end, which by coupling stabilise the appendage by minimising displacements undesirable and optimise the fluid-dynamic performance of the connection system.

[0019] The present invention will be described below according to a preferred example of its realisation, provided for illustrative purposes and not limiting with reference to annexed drawings where:

*Figure 1 shows a perspective view of a connection system according to the invention;

* Figure 2 shows a perspective view of a detail of the connection system in figure 1;

* Figure 3 shows another perspective view of the connection system according to the invention;

* Figure 4 shows a side view of the connection system according to the invention;

* Figure 5 shows a perspective view of an exploded of system of connection according to invention;

* Figure 6a shows a perspective view of a table with an appendix and the connection system according to the invention; and

*Figure 6b shows a bottom view of a table according to the invention.

[0020] With reference to the figures, a preferred form of connection system for mounting an appendix 3 on a water sports board 2 is shown with 1.

[0021] The connection system 1 for mounting an appendix 3 on a water sports board 2 comprises a mounting plate 10 which is connected to said board 2 and which has in turn time a rear side 10a comprising a threaded cavity 10b and a rear recess 10c.

[0022] According to the form of realisation shown in the figures, said fixing plate 10 has a substantially rectangular shape, filled in at of the sides and hollow in the central area, with cracks 10i at the four angles required to connect plate 10 to table 2.

[0023] Preferably, plate 10 is removably connected to table 2 via said cracks 10i.

[0024] Preferably, plate 10 is made of aluminium.

[0025] Connection system 1 also includes a connection element 100, removably connected to said fixing plate 10 and to said appendix 3. The connection element 100 is shaped so as to be inserted into and engaged with said fixing plate 10 by tilting it. The connecting element 100 in turn comprises a rear end 100a having a hole 100d. When the connection element 100 is attached to the fixing plate 10, said rear end 100a and said hole 100d are respectively in at rear recess 10a and threaded cavity 10b.

[0026] Preferably, this connecting element 100 is made of aluminium, or other material suitable for performance and resistance to the corrosion.

[0027] According to some embodiments shown in the figures, the connecting element 100 has a main body 100i with respect to which said rear end 100a is protruding and with respect to which has a smaller transverse extension.

[0028] In fact, said main body 100i, when connection element 100 is attached to the fixing plate 10, is essentially housed in the hollow portion of plate 10, while the rear end 100a is located at the rear recess 10c made in the rear side 10a of plate 10.

[0029] Said rear end 10a having a solid portion extended longitudinally as much as the rear end 100a.

[0030] The connection system 1 also comprises a locking screw 20 capable of being fixed in said threaded cavity 10b through said hole 100d, locking said connection element 100 in said fixing plate 10.

[0031] In this way, when the connection element 100 is connected to said fixing plate 10, said rear recess 10a prevents displacement of the connecting element 100 in a geometric plane substantially parallel to the table 2, and the locking screw 20 prevents its movement transverse to said geometric plane parallel to said table 2.

[0032] The locking screw 20 can be a round-headed screw made of aluminium.

[0033] This rear recess 10c can be milled from the solid of the fixing plate 10, to create a suitable housing for clamping the rear end 100a of the connecting element 100.

[0034] The rear end 100a is manufactured in such a way as to insert flush into rear recess 10c.

[0035] Fixing plate 10 also includes a side frontal 10a' with an asymmetric 'c'-shaped attachment protrusion 10d, in which the lower end 10e of the attachment protrusion 10d, proximal to the board, has dimensions greater than the upper end 10f of the coupling projection 10d; said lower end 10e of said coupling projection 10d may be made of elastomeric material.

[0036] Between the lower end 10e and the end top 10f of the coupling projection 10d passes a through pin 10g extended perpendicularly to said coupling projection 10d.

[0037] Preferably, said 10g pass-through pin is made of stainless steel.

[0038] The connecting element 100 comprises a front end 100b comprising a first front recess 100c shaped to accommodate the coupling protrusion 10d and at least a second front recess 100c' suitable to accommodate said pin 10g.

[0039] Said first front recess 100c combines/couples with coupling projection 10d in such a way as to prevent displacement of the connecting element on said geomet-

ric plane substantially parallel to said table 2.

[0040] Preferably, said second front recess 100c' are two second front recesses 100c', which by coupling with said through-bolt 10g, prevent transverse movement of connection element 100 with respect to said geometric plane substantially parallel to table 2.

[0041] Therefore, said coupling protrusion 10d is the male element which couples with the first front recess 100c, i.e. the female element; said through-pin 10g is the male element which mates with the second front recess 100c', the female element.

[0042] Optionally, said lower end 10e of said coupling projection 10d is slightly larger than the first front recess 100c of the connecting element 100, so that, when the connecting element 100 is connected to said fixing plate 10, the lower end 10e fits into the first front recess 100c due to its deformation elastic and exerts a slight pressure on the first front recess 100c itself, so as to stabilise said connection element 100 and absorb the vibrations of appendix 3 when using table 2.

[0043] The fastening plate 10 comprises side recesses 10h perpendicular to the front end 100b and rear end 100a and said connection element 100 comprises side projections 100e which, when said connection element 100 is connected to said fastening plate 10, are accommodated in said lateral recesses 10h, preventing the displacement of said fastener 100 on said geometric plane substantially parallel to said board 2.

[0044] **The coupling between the side recesses** 10h and said side projections 100e cooperates with the coupling between the rear end 100a and the rear recess 10c to minimise displacement of connection element 100 on said geometric plane substantially parallel to table 2, optimising the performance of connection system 1.

[0045] Advantageously, when said connecting element 100 is connected to said fastening plate 10, the system is in the engaged position and its surface distal from the board has no discontinuity, so that the plate 10 and the connecting element are flush, so as to minimise turbulence when using board 2 in the water.

[0046] In fact, at said bore 100d, connection element 100 includes some continuity elements 100f extending from connection element portion 100 including a 100h fixing base of a possible appendix 3. In this way the discontinuities created on the surface of the element of connection 100, due to hole 100d and screw are screened by these continuity elements 100f which convey the fluid flow downstream of this portion of connection system 1.

[0047] In a second aspect, the present invention relates to a board 2 for water sports comprising at least one frame 4, a fastening system 1 as described above and an appendix 3.

[0048] Preferably called appendix 3 is an appendix foils, in particular a foil 3 drift.

[0049] Drift foil 3 includes a drift shaft 5 which in turn includes a mast foot 6 rigidly connected to said connecting element 100 via said fixing base 100h, and at least one wing element 7 positioned at a distal end of the shaft drift 5, with an airfoil 7 capable of generating enough lift to lift the board 2 off the surface of the water under certain speed conditions.

[0050] According to the reported embodiments of the invention

[0051] In the figures, table 2 comprises two recesses 4, each recess 4 extending longitudinally to a slot. The recess 4 includes an insertion section 8 for the insertion of coupling elements, in the present example at least one nut studs for each slot 4, or preferably two stud nuts.

[0052] Connecting element 100 is removably fixed to said board 2 by means of four screws 9, in this case four screws 9 arranged at the four slots 10i of the fastening plate 10 (figure 5), which are to be connected to the coupling elements contained in the recesses 4, i.e. the above-mentioned stud nuts.

[0053] The rigid connection between shaft 5 and connection element 100 can be removable, or the two elements can be constructed in one piece.

[0054] Connection element 100 can be positioned by moving the fixing screws longitudinally 9 and the respective nuts along studs 4, so as to move the connecting element between the bow 2a and stern 2b ends.

[0055] To the above-described connection system 1 for mounting an appendage on a water sports board, a branch technician, in order to meet additional and contingent requirements, may make numerous further modifications and variations, all of which are within the scope of protection of the present invention as defined by the appended claims.

Claims

1. Connection system (1) for mounting an appendix (3) on a water sports board (2), comprising:

   - a fixing plate (10) connected to said table (2), which in turn has a rear side (10a), comprising a threaded cavity (10b), and a rear recess (10c) ;

   • an element of connection (100), capable of being removably connected to said fixing plate (10) and to said appendix (3), shaped so as to be inserted into and hooked onto said fixing plate (10) by tilting it, the connecting element (100) comprising a in turn, a rear end (100a) having a hole (100d), said rear end (100a) and said hole (100d), when said connection element (100) is coupled to said fixing plate (10), being at said posterior recess (10a) and said threaded cavity (10b) respectively;

   • a locking screw (20) capable of being fixed at said cavity threaded (10b) through said hole (100d), locking said connection element (100) into said fix-

ing plate (10),

so that when the connection element (100) is connected to said fixing plate (10), said rear recess (10a) prevents movement of the connecting element (100) in a geometric plane substantially parallel to said table (2), and said locking screw (20) prevents its transverse movements to said geometric plane parallel to said table (2).

2. Connection system according to claim 1, in which said fixing plate (10) presents:

• a front side (10a') comprising an asymmetrical 'c'-shaped projection (10d) with the lower end (10e) of the projection (10d), proximal to the table (2), is larger than the upper end (10f) of the attachment projection (10d); and
• a pivot through-pin (10g) between the end lower end (10e) and upper end (10f) of the coupling projection (10d) and extending perpendicular to it,

and in which said connecting element (100) comprises a front end (100b) comprising: a first front recess (100c) suitable to accommodate said coupling projection (10d), at least a second front recess (100c') suitable to accommodate said pin (10g).

3. Connection system according to claim 2, in which said lower end (10e) of said coupling projection (10d) is made of elastomeric material.

4. Connection system according to claim 3, wherein said lower end (10e) of said coupling projection (10d) has slightly larger than the first front recess (100c) of said connecting element (100), so that when said connection (100) is connected to said fixing plate (10), the lower end (10e) engages in the first front recess (100c) due to its elastic deformation and exerts a light pressure on the first front recess (100c) itself, so as to stabilise this connection element (100) and absorb vibrations of the appendix (3) when using the board (4).

5. Connection system (1) according to any one of the preceding claims, wherein said fixing plate (10) comprises side recesses (10h) perpendicular to the front (100b) and rear (100a) ends; and
said connection element (100) includes lateral projections (100e) which, when said connection element (100) is connected to said fixing plate (10), are accommodated in said lateral recesses (10h), preventing the displacement of said connection element (100) on said geometric plane parallel to the table (2).

6. Connection system (1) according to any of the preceding claims, wherein, when said connection element (100) is connected to said fastening plate (10), the system (1) is in the engaged position and its surface distal to the board (2) has no discontinuity, so that the plate (10) and the connection element (100) are flush, thus to minimise turbulence when using the board (2) in the water.

7. Connection system (1) according to any of the preceding claims in which the connection element (100) comprises a fixing base (100h) for an appendix (3) and two continuity elements (100f) extending from said fixing base (100h) around/in at said hole (100d), so that discontinuities created on the surface of the connecting element (100) due to the hole (100d) and the locking screw (20) are screened by said continuity elements (100f) conveying the fluid flow downstream of the connection system (1).

8. Connection system (1) according to any of the preceding claims, in which said fixing plate (10) has a shape substantially rectangular, solid near the sides and hollow in the central area, and comprises of cracks (10i) in correspondence of four corners, necessary to connect the plate (10) to table (2).

9. Connection system (1) according to any one of the preceding claims, wherein said connection element (100) has a main body (100i) in relation to which said rear end (100a) is protruding and in relation to which to which it has a smaller transverse extension, and when the connecting element (100) is hooked onto the fixing plate (10), it is essentially housed in the hollow portion of the plate (10), while the rear end (100a) is in at the rear recess (10c) made in the rear side (10a) of the fixing plate (10).

10. Table (2) for water sports comprising at least one box (4), a connection system (1) of any of the preceding claims

11. Table (2) according to claim 10, wherein said appendix (3) is a foil drift comprising at least one wing element (7) positioned at a distal end of the drift shaft (5), with a wing profile capable of generating enough lift to lift board 2 off the surface of the water at certain speed conditions.

12. Table (2) according to claims 10 and 11, each comprising two sets (4) extends longitudinally in the form of a slot; the (4) includes an insertion section (8), preferably at least one captive nut per slot (4).

13. Table (2) according to claims 10 to 12, in which the connecting element (100) is removably attached to said table (2), by means of fixing screws (9) capable of being connected to the coupling elements contained in the recesses (4).

Amended claims in accordance with Rule 137(2) EPC.

1. A connection system (1) for assembling an appendix (3) on a board (2) for water sports, comprising:

• a fastening plate (10) connected to said board (2), which in turn has a rear side (10a), comprising a threaded cavity (10b), and a rear recess (10c);
• a connection element (100), apt to be removably connected to said fastening plate (10) and to said appendix (3), shaped so as to be inserted and hooked to said fastening plate (10) by tilting it, the connection element (100) in turn comprising a rear end (100a) having a hole (100d), said rear end (100a) and said hole (100d), when said connection element (100) is hooked to said fastening plate (10), being respectively at said rear recess (10a) and said threaded cavity (10b);
• a locking screw (20) apt to be fastened in said threaded cavity (10b) through said hole (100d), by locking said connection element (100) in said fastening plate (10),
thereby, when the connection element (100) is connected to said fastening plate (10), said rear recess (10a) prevents the motions of the connection element (100) on a plane substantially parallel to said board (2), and said locking screw (20) prevents its motions transversal to said geometrical plane parallel to said board (2).

2. The connection system according to claim 1, wherein said fastening plate (10) has:

• a front side (10a') comprising a hooking projection (10d) with profile shaped like an asymmetric "c", wherein the lower end (10e) of the hooking projection (10d), proximal to the board (2), has greater sizes than the upper end (10f) of the hooking projection (10d); and
• a through pin (10g) between the lower end (10e) and the upper end (10f) of the hooking projection (10d) and being extended perpendicularly thereto, and wherein said connection element (100) comprises a front end (100b) including: a first front recess (100c) suitable to house said hooking projection (10d), at least a second front recess (100c') suitable to house said pin (10g).

3. The connection system according to claim 2, wherein said lower end (10e) of said hooking projection (10d) is made of elastomeric material.

4. The connection system according to claim 3, wherein said lower end (10e) of said hooking projection (10d) has slightly greater sizes than the first front recess (100c) of said connection element (100), so that, when said connection element (100) is connected to said fastening plate (10), the lower end (10e) inserts in the first front recess (100c) thanks to its elastic deformation and exerts a slight pressure on the first front recess (100c) itself, so as to stabilize said connection element (100) and to absorb the vibrations of the appendix (3) upon using the board (4).

5. The connection system (1) according to any one of the preceding claims, wherein said fastening plate (10) comprises side recesses (10h) perpendicular to the front (100b) and rear (100a) ends; and said connection element (100) comprises side projections (100e) which, when said connection element (100) is connected to said fastening plate (10), are housed in said side recesses (10h), by preventing said connection element (100) from moving on said geometrical plane parallel to the board (2).

6. The connection system (1) according to any one of the preceding claims, wherein, when said connection element (100) is connected to said fastening plate (10), the system (1) is in hooking position and its surface distal from the board (2) has not discontinuities, so that the plate (10) and the connection element (100) are flush, so as to minimize the turbulences upon using the board (2) in water.

7. The connection system (1) according to any one of the preceding claims wherein the connection element (100) comprises a fastening base (100h) for an appendix (3) and two continuity elements (100f) extending from said fastening base (100h) around/at said hole (100d), so that the discontinuities created on the surface of the connection element (100), due to the hole (100d) and to the locking screw (20) are shielded by said continuity elements (100f) which vehiculate the flow of the fluid downwards the connection system (1).

8. The connection system (1) according to any one of the preceding claims, wherein said fastening plate (10) has a substantially rectangular shape, solid in proximity of the sides and hollow in the central area, and comprises slots (10i) at the four angles, required to connect the plate (10) to the board (2).

9. The connection system (1) according to any one of the preceding claims, wherein said connection element (100) has a main body (100i) with respect thereto said rear end (100a) projects and with respect thereto it has a smaller transversal extension and when the connection element (100) is hooked to the fastening plate (10), is substantially housed in the hollow portion of the plate (10), whereas the rear end (100a) is at the rear recess (10c) implemented in the rear side (10a) of the fastening plate (10).

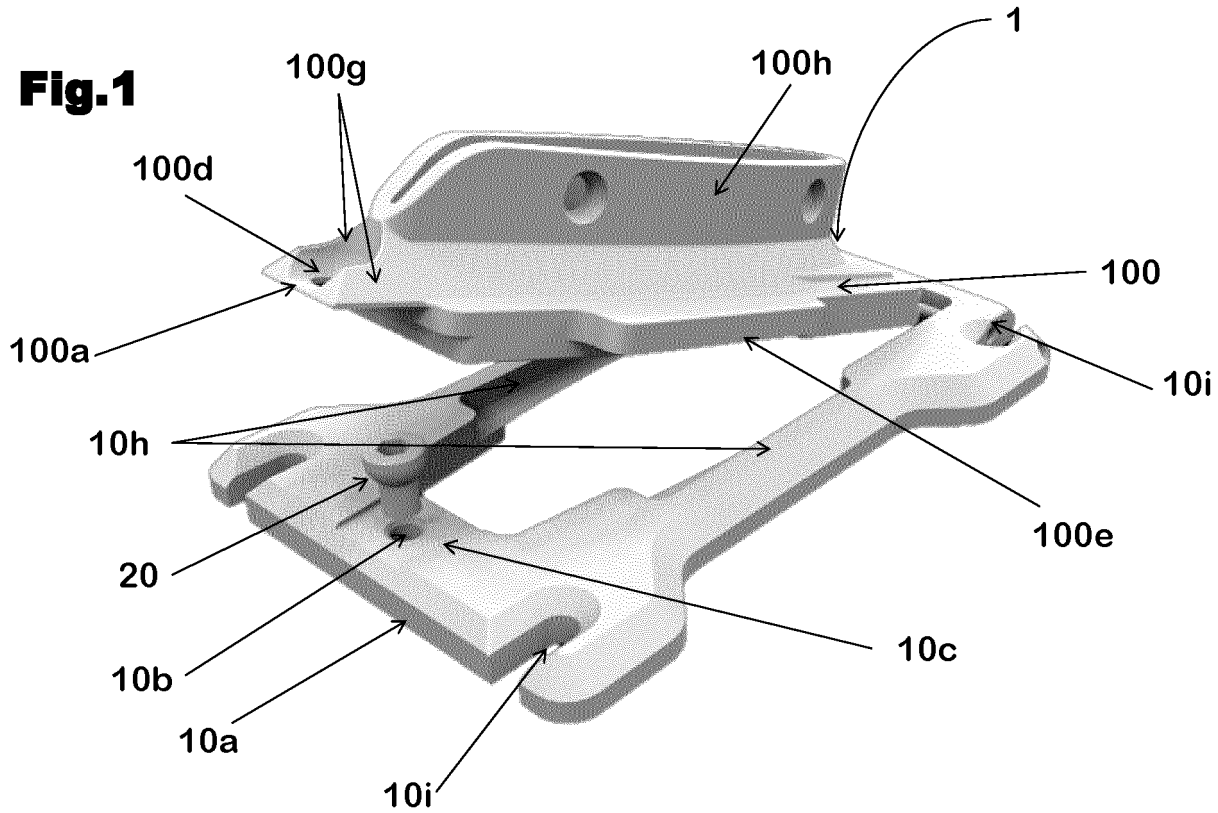
10. A board (2) for water sports comprising at least a mast casing (4), a connection system (1) according to any one of the preceding claims.

11. The board (2) according to claim 10, wherein said appendix (3) is a foil drift comprising at least a wing element (7) positioned at a distal end of the drift shaft (5), with a wing profile capable of generating a carrying capacity so as to raise, under determined speed conditions, the board 2 from the water surface.

12. The board (2) according to claims 10 and 11 comprising two mast casings (4), each mast casing (4) extending longitudinally like a slot; the mast casing (4) comprises an insertion section (8), preferably at least a stud bolt for each mast casing (4) .

13. The board (2) according to claims 10 to 12, wherein the connection element (100) can be fastened removably to said board (2), through fastening screws (9) apt to be connected to the coupling elements contained in the mast casings (4).

Fig.1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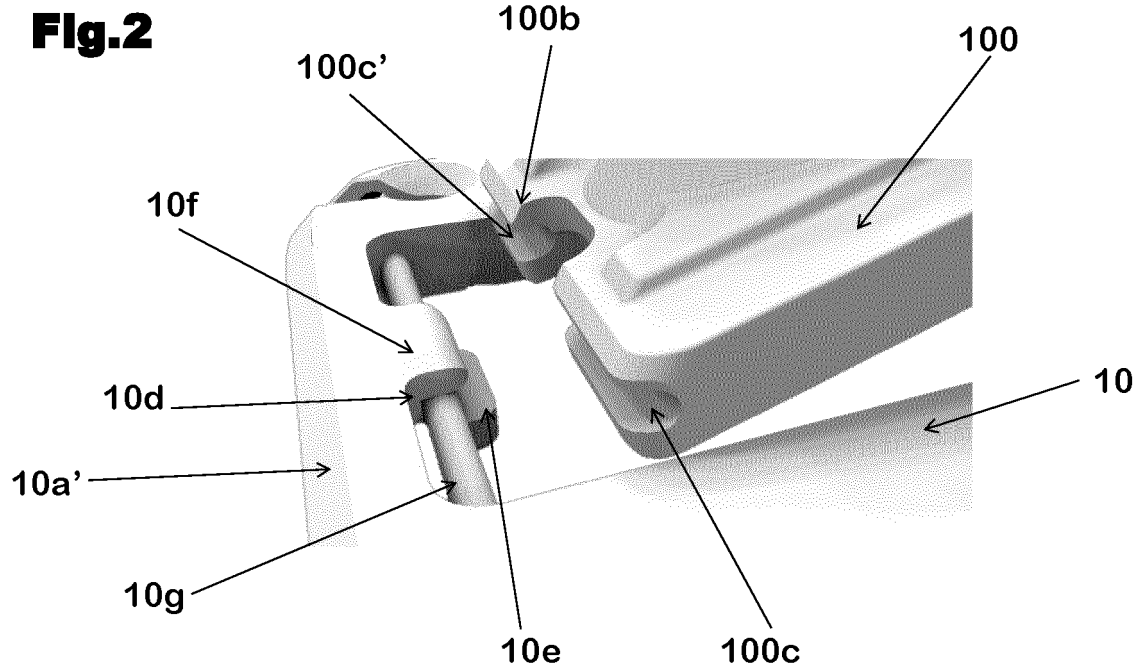
100d
100
100a
10i
10h
100e
20
10c
10b
10a
10i

Fig.2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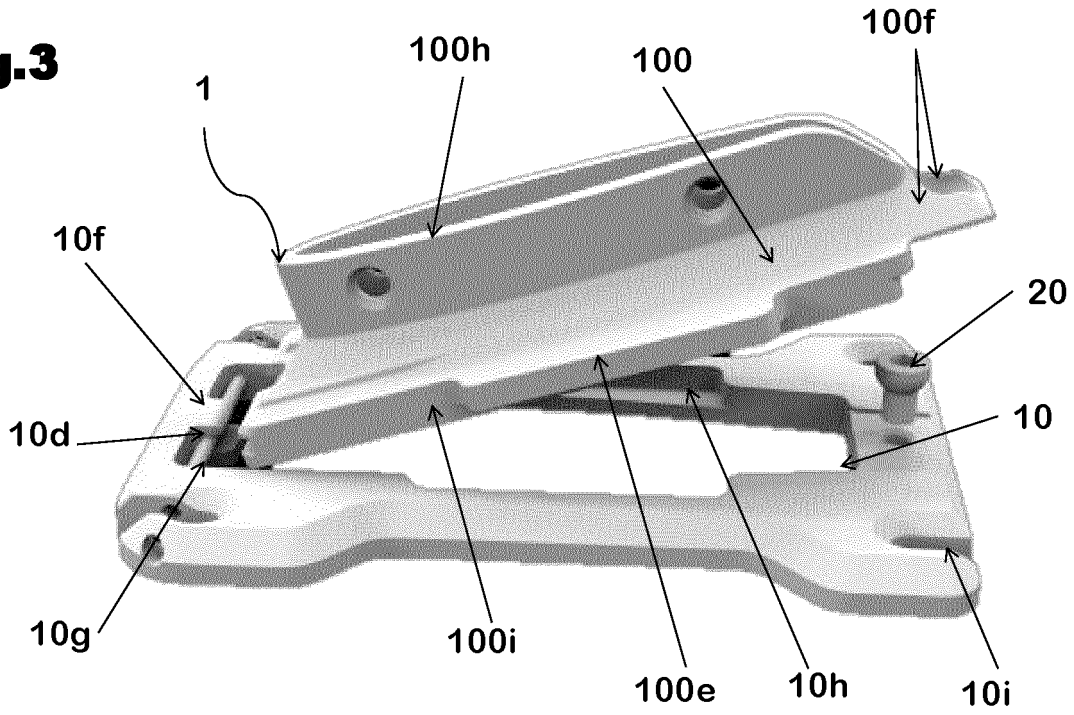
100c'
10f
10
10d
10a'
10g
10e
100c

Fig.3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10f
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10d
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10g
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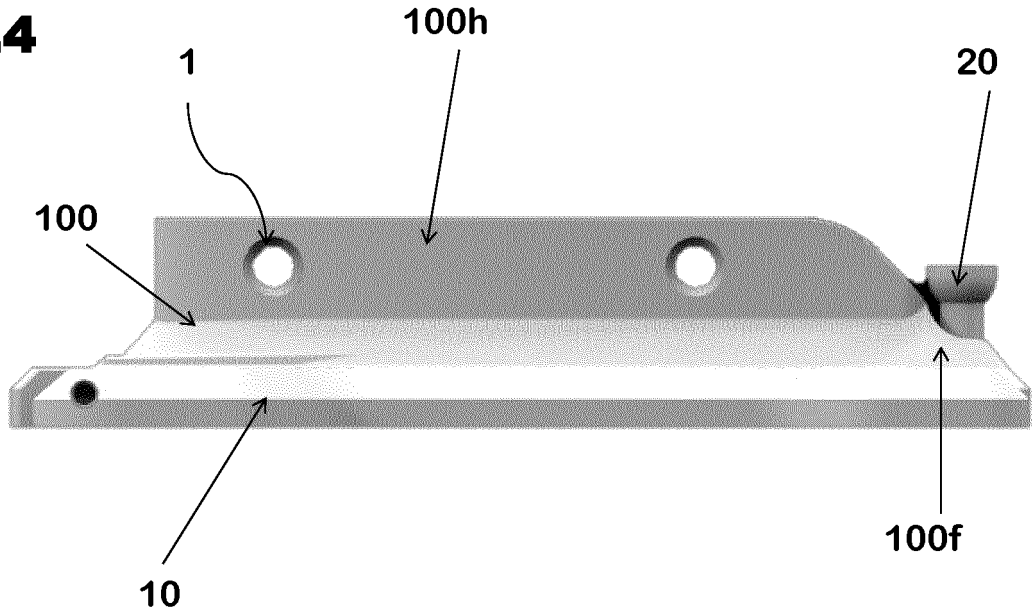
10i

Fig.4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100f
10

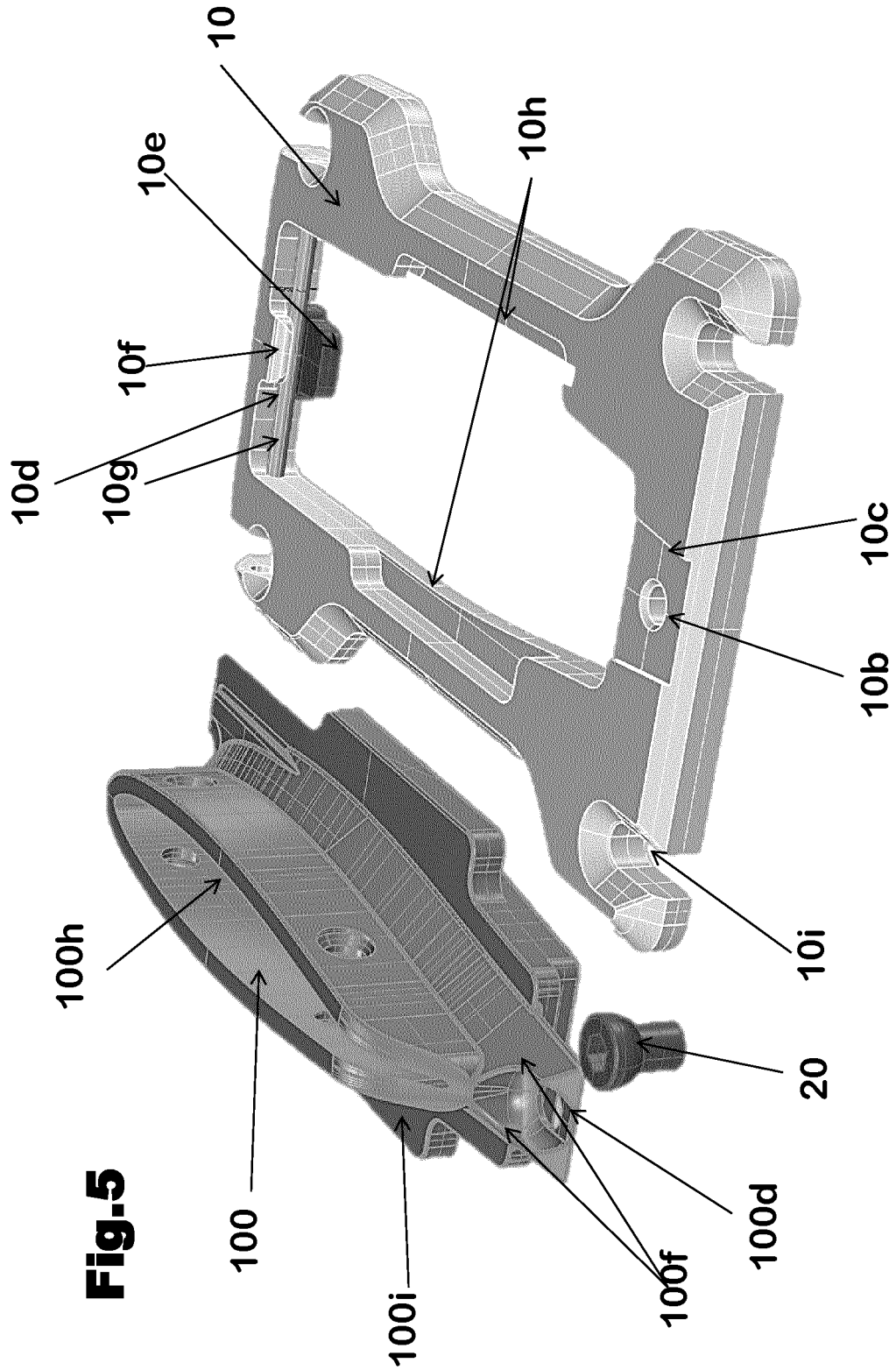

Fig.5

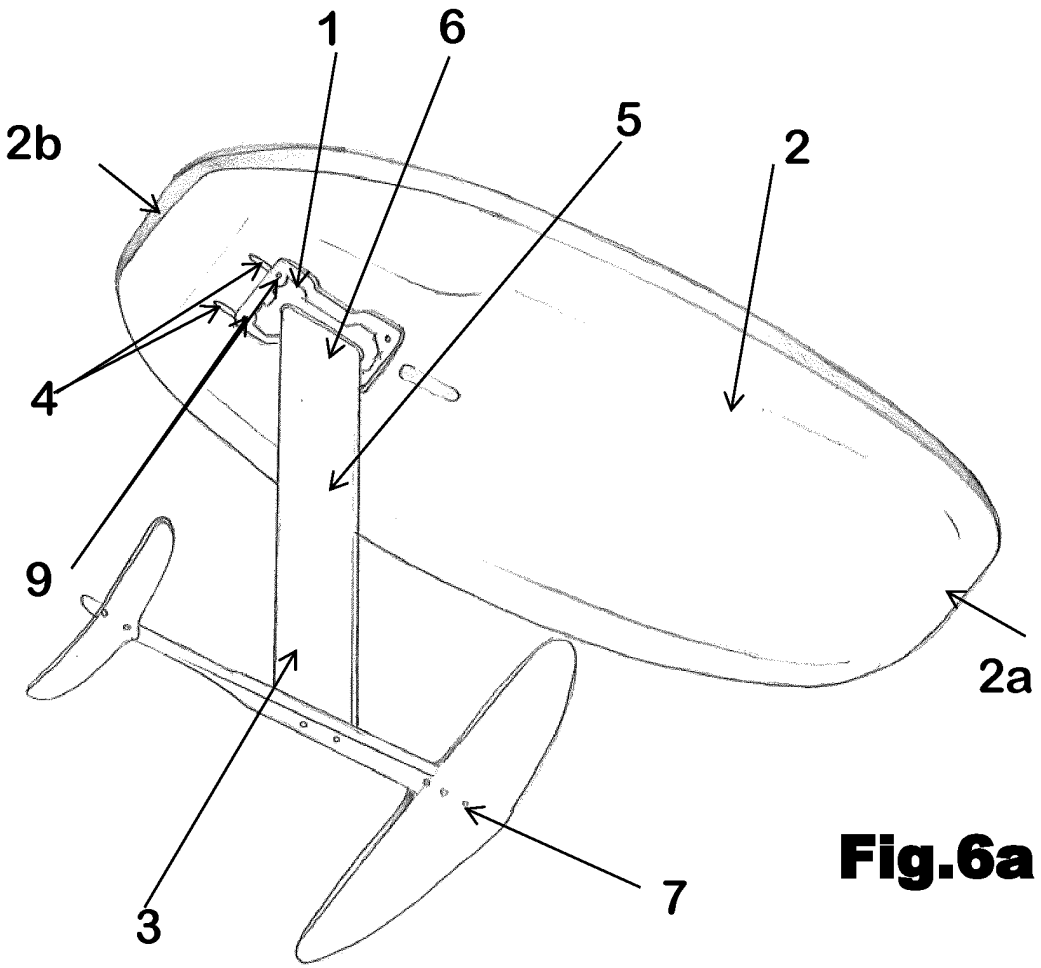

Fig.6a

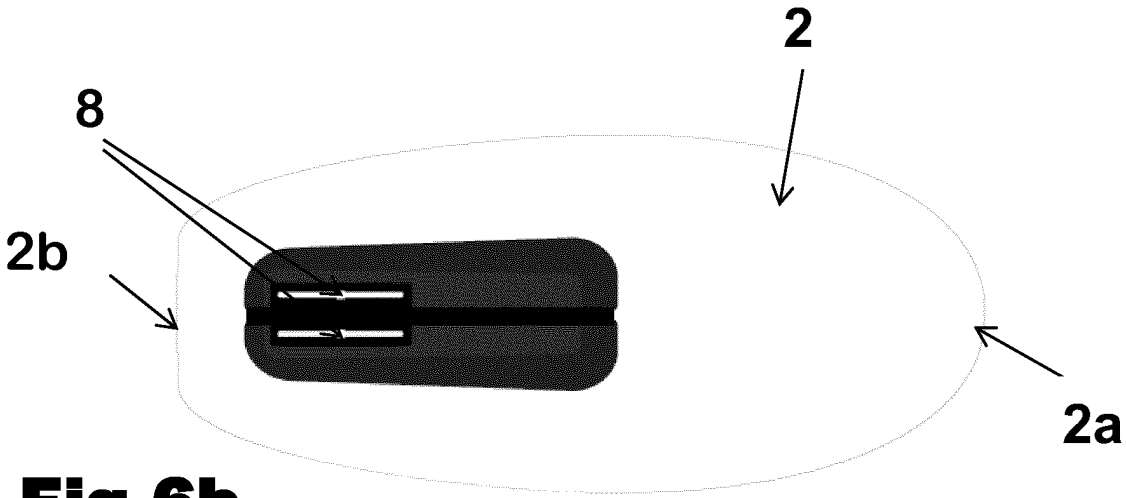

Fig.6b

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EUROPEAN SEARCH REPORT

Application Number
EP 23 02 0209

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,D	WO 2021/069355 A1 (BOARDS & MORE GMBH [AT]) 15 April 2021 (2021-04-15)	1,5,6,8, 9	INV. B63B32/66
Y	* page 5, line 32 - page 9, line 17 *	10-13	
A	* figures *	2-4,7	
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