



(51) International Patent Classification:

B63B 35/79 (2006.01) *B63B 39/00* (2006.01)
B63B 35/73 (2006.01)

(21) International Application Number:

PCT/AU2015/050241

(22) International Filing Date:

14 May 2015 (14.05.2015)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

2014901808	15 May 2014 (15.05.2014)	AU
2015901152	30 March 2015 (30.03.2015)	AU
2015901529	29 April 2015 (29.04.2015)	AU

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(81) Designated States (unless otherwise indicated, for every kind of national protection available):

AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available):

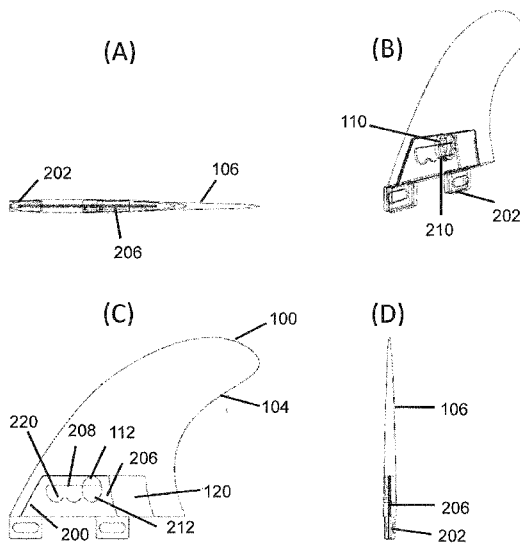
ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

(54) Title: ADJUSTABLE FIN SYSTEM

Figure 2



(57) Abstract: An adjustable fin for use on a surfboard, the adjustable fin comprising: a base which comprises a mounting means for mounting the adjustable fin to a surfboard, and a member extending in a direction contrary to the mounting means. The adjustable fin further comprises a fin section comprising two outer fin surfaces which meet at a leading edge and a trailing edge; an underside surface comprising an opening to an internal cavity, the internal cavity configured to house the member and enable slidable movement of the member in a direction towards the leading edge or the trailing edge; and a locking means that is manipulate and which projects into the internal cavity, wherein the locking means can releasably couple to the member at one of two or more locking positions thereby preventing slidable movement of the member. The fin section can be adjusted relative to the base by manipulating the locking means to uncouple the locking means from the member at a first locking position, slidably move the member through the internal cavity, and releasably couple the locking means to the member at a second locking position.

WO 2015/172199 A1

Adjustable Fin System

Technical Field

The present invention relates to an adjustable fin for a surfboard. More particularly, the invention relates to a surfboard fin or dual surfboard fin that
5 can be adjusted by hand without the need for any tools.

Background Art

[0001] The following discussion of the background art is intended to facilitate an understanding of the present invention only. The discussion is not an acknowledgement or admission that any of the material referred to is
10 or was part of the common general knowledge as at the priority date of the application.

[0002] A surfboard, stand-up paddleboard (SUP), or similar type of board for use in water sports and other activities can be viewed in one sense as a summation of hydrodynamic surfaces. The surface of the bottom of the board
15 in contact with water generates lift and affects speed. More importantly though, it is the fins working in collaboration with rail and bottom contour that most influence the feel of the board when changing direction. Since the form shape of surfboards including the rails and bottom surface has undergone finer and finer adjustments over the past few decades, the largest gains that
20 can still be made to a board's performance is in fin modification.

[0003] Predominant factors that influence the effect of the fins include (i) foil shape, and the curve from leading to trailing edge as it changes from base to tip; (ii) template shape, which is the combination of depth, width, and rake that make up the profile of the fin; (iii) stability and flex, which can depend on
25 the materials from which a fin is made; and (iv) fin placement, which comprises tow and camber of the fins, the distance between the fins, and the distance of the fins from the rear of the board.

[0004] Foils comprise surfaces which affect lift and drag. Where one surface of a foil is curved and the other, predominantly flat (a 'flat foil'), it takes less

effort (drag) for liquid to flow past the flat surface as the path of least resistance than the curved surface. As a result, more water will flow past the flat surface of the foil creating an area of high pressure. Conversely, an area of low pressure is created adjacent to the curved surface of the foil. This difference in pressure creates lift towards the curved side of the foil. The more curve a foil has, the more drag it induces over the curved surface which means that a foil with greater curvature will have more lift at lower speeds. The problem is at higher speeds that additional drag will develop turbulence and stall the flow across the foil. Side fins on a surfboard are usually flat foils which are oriented with the flat face of the foil facing towards the centre or stringer of the board. The resulting pressure differential assists to pull the board fins and rail of the surfboard down into the water. Therefore, thicker, more curved foils are preferred by surfers for slow waves, and flatter, finer foils for faster waves.

[0005] Template shape affects stability and control. As an example, fins that are deeper, with a wider base and more rake provide greater stability and control as a result of a relatively large surface area. However, more surface area causes greater drag and slows a board down. As a generalisation known amongst surfers, fins with a greater surface area are more preferred for steep and heavy waves, choppy and irregular conditions, for heavier surfers, and/or surfers with a flowing style. Alternatively, fins with less surface area are more preferred for sloped, clean and glassy waves, for lighter surfers, and/or surfers that exercise extreme and radical manoeuvres.

[0006] The flex of a surfboard fin can affect stability in turns. For example, a flexible tip on a fin can dampen or smooth out some of the bite when a surfer changes direction on a surf board. But a stable fin base is crucial to prevent or minimise turbulence which can generate drag and disturb the lift causing loss of fin control, making the board slow and out of control. Less flex can make turns more off a pivot.

[0007] 'Toe' can be considered in terms of the angle the base of the side fins are pointed in towards the centre of the board relative to the leading edge and trailing edge at the base. 'Cant' can be considered in terms of the

angle the body of a fin is set at relative to the bottom surface of the board in a plane perpendicular to the direction of the stringer. Both toe and cant affect the 'angle of attack' of fin foils in their movement through the water. A greater angle forces more water flow around the outside curved surface of the foil at
5 lower speeds making it easier to initiate turns on slower waves. However, too much angle at higher speeds increases turbulence and drag slowing down the board.

[0008] Since the introduction of removable fins about two decades ago by FCS[®], there has been a greater interest from surfers and particularly
10 professional surfers in fin placement in addition to the other factors described above. While fin placement is often left to convention, for example, with many board shapers following the benchmark for approximate location set by Simon Anderson more than thirty years ago, many other board shapers have their personal preference for each surf board model they shape. There are,
15 however, subtle differences in most boards and in all riders. An adjustment of the position of a fin as small as a 4 mm fin movement fore or aft in either or both the centre fin or side fins can have a profound effect on the performance of a board, similar to a change of fin size or template. In general terms, moving a fin towards the rear of the board will stiffen the board,
20 allowing it to handle greater speed and irregular water conditions. Moving a fin forward will loosen the board allowing it to turn on a tighter radius for easier changes in direction, and is preferable in glassy water conditions and short beach surf breaks.

[0009] Removable fin arrangements and systems have therefore been
25 designed, with some available for purchase, which allow a surfer to adjust the position of a fin on their surfboard, and in some cases, even the tow and cant of the fin. However, these removable and adjustable fin arrangements commonly attach to their own unique and custom fin box or plug requiring a new board or modifications to an existing board. Many of these adjustable fin
30 arrangements also require tools to be carried by the surfer to adjust the position of the fins on the board. As a result, there has been a relatively small

uptake of these adjustable fin arrangements by the millions of surfers and other board riders around the world.

Summary of the Invention

First Aspect

5 [0010] In a first aspect, the invention provides an adjustable fin for use on a surfboard, the adjustable fin comprising:

a base comprising:

a mounting means for mounting the adjustable fin to a surfboard; and

a member extending in a direction contrary to the mounting means;

10 a fin section comprising:

two outer fin surfaces which meet at a leading edge and a trailing edge;

15 an underside surface comprising an opening to an internal cavity, the internal cavity configured to house the member and enable slidable movement of the member in a direction towards the leading edge or the trailing edge; and

20 a locking means that is manipulable and which projects into the internal cavity, wherein the locking means can releasably couple to the member at one of two or more locking positions thereby preventing slidable movement of the member;

25 wherein the fin section can be adjusted relative to the base by manipulating the locking means to uncouple the locking means from the member at a first locking position, slidably move the member through the internal cavity, and releasably couple the locking means to the member at a second locking position.

[0011] In a preferred embodiment, the locking means is biased towards being releasably coupled to the member at a locking position.

[0012] In another preferred embodiment, the locking means is manipulable from an outer fin surface. The locking means preferably comprises a button at an outer fin surface for manipulating the locking means, and depressing the button uncouples the locking means from the member. Releasing the
5 button preferably releasably couples the locking means to the member at a locking position.

[0013] The member is preferably substantially planar, comprising a flat or substantially flat surface. Preferably, the planar member is approximately 1 mm thick. In a preferred embodiment, the member comprises a hole, and the
10 hole is configured to receive the locking means. Preferably, the locking means releasably couples to the member at any one of two or more locking positions in the hole. More preferably, the locking means passes through the hole which maintains engagement between the base and the fin section.

[0014] In a preferred embodiment, the hole in the member comprises one or
15 more teeth, wherein either side of a tooth can be a valley, and a valley can form a locking position. The peak of the teeth may be pointed or rounded in shape. Preferably, the one or more teeth are aligned substantially parallel to the underside surface, and point in a direction contrary to the underside surface. That is, the peak of the one or more teeth preferably point in a
20 direction contrary to the underside surface and mounting means.

[0015] At least a portion of the locking means is preferably received at a locking position in a valley thereby coupling the locking means to the member. Depressing the button preferably aligns the teeth with a slot in the locking means, the slot having a width through which the teeth may slidably
25 move, therein uncoupling the locking means from the member and enabling slidable movement of the teeth through the slot. An upper portion of the locking means preferably extends above the valley and the height of the peaks of the adjacent teeth, and a lower portion of the locking means is positioned within the valley. Preferably the lower portion and only part of the
30 upper portion of the locking means comprises the slot. More preferably, the button comprises the slot. Therefore, when the locking means has been uncoupled from the member when the button has been depressed, the slot

aligns with the teeth enabling slidable movement of the teeth through the slot. Preferably, releasing the button when the locking means is aligned with a valley releasably couples the locking means to the member, wherein the valley comprises a locking position.

- 5 [0016] A surface of the undepressed button is preferably aligned flush with the outer fin surface. That surface comprises the top of the button which a user can depress to manipulate the locking means. As the button is aligned flush with the outer fin surface, no additional drag is preferably created adjacent to that outer fin surface. The button may be constructed from a
- 10 variety of materials. Preferably, the button is constructed from the same material as the fin section.

[0017] A user can preferably apply sufficient manual force by hand to depress the button and adjust the position of the fin section relative to the base when the adjustable fin is mounted to a surfboard.

15 Second Aspect

[0018] In a second aspect, the invention provides an adjustable fin for use on a surfboard, the adjustable fin comprising:

a base comprising:

- 20 a mounting means for mounting the adjustable fin to a surfboard;
and

a member extending in a direction contrary to the mounting means, the member comprising an extension;

a fin section comprising:

- 25 two outer fin surfaces which meet at a leading edge and a trailing edge;

an underside surface comprising an opening to an internal cavity, the internal cavity configured to house the member and enable

slidable movement of the member in a direction towards the leading edge or the trailing edge;

a channel in the internal cavity configured to house the extension to maintain engagement between the base and the fin section, and enable slidable movement of the extension in a direction towards the leading edge or the trailing edge,

the internal cavity containing a resiliently deformable material that restrains movement of one or both of the member and the extension within the internal cavity;

wherein when an application of manual force on the fin section in a direction away from the base overcomes the restrained movement of one or both of the member and the extension by the resiliently deformable material, the fin section may be slidably moved relative to the base in a direction towards the leading edge or the trailing edge.

[0019] The resiliently deformable material is preferably an elastic polymer. More preferably, the resiliently deformable material is neoprene. In one non-limiting example, the neoprene is of similar or the same resilience and deformability as neoprene used in other commercially available surf products such as surfboard leashes or wetsuits. Part or all of the resiliently deformable material in the adjustable fin of the invention may be replaceable.

[0020] In a preferred embodiment, the member extending from the base is preferably substantially planar, or more preferably comprises a substantially planar plate. Preferably, the planar member is approximately 1 mm thick. This can allow the construction of a relatively thin adjustable fin of the invention which is preferable for reducing fin drag. The internal cavity of the fin section preferably comprises a slot configured to house the substantially planar member and through which the member can slidably move.

[0021] The extension preferably comprises a flange. The flange is preferably attached to a planar portion of the member. More preferably, the position of the flange is substantially perpendicular to a planar portion of the

member and substantially parallel to the underside surface. The flange is preferably positioned on the member approximately half-way between where the member joins the mounting means and the opposite end of the member. Preferably, the flange is approximately 1 mm thick. The channel in the
5 internal cavity is preferably configured to house the flange and enable slidable movement of the flange through the channel.

[0022] In an embodiment of the invention, the resiliently deformable material is located in the internal cavity and restrains movement of the member in the internal cavity. In a preferred embodiment, the channel contains the
10 resiliently deformable material restraining movement of the extension in the channel. Even more preferably, the extension is a flange on a planar member and the resiliently deformable material is situated between the flange and the surface of the channel nearest to the underside surface. The resiliently deformable material preferably holds the flange with elastic
15 pressure against the surface of the channel furthest from the underside surface and as a result of frictional force, holds the member and base in position relative to the fin section. The elastic pressure is preferably sufficient to prevent movement of the fin section relative to the base when the adjustable fin is attached to a surfboard and the surfboard is in normal use.
20 When the adjustable fin is mounted to a surfboard, the underside surface preferably abuts or is aligned with the outside surface of the surfboard.

[0023] In a preferred embodiment of this second aspect of the invention, a user of the adjustable fin can apply sufficient manual force by hand to adjust the position of the fin section relative to the base in a direction towards the
25 leading edge or the trailing edge. When the adjustable fin is mounted to a surfboard, the user of the surfboard can adjust the fin by hand whether on land or in water, without any requirement for tools or any other equipment, to move the position of the fin section, relative to the base, towards the front or rear of the surfboard. Upon removal of the manual force, the resiliently
30 deformable material again restrains movement of one or both of the member and the extension within the internal cavity, therein holding the fin section in the recently adjusted position and preferably preventing movement of the fin

section relative to the base when the adjustable fin is attached to a surfboard and the surfboard is in normal use.

[0024] Sufficient manual force as described herein comprises force able to overcome the elastic pressure of the resiliently deformable material and allow slidable movement of the member and extension within the internal cavity and channel, respectively, and therefore adjustment of the position of the fin section relative to the base. More preferably, sufficient manual force as described herein comprises force against the elastic pressure of the resiliently deformable material that is able to separate the extension from the surface of the channel furthest from the underside surface, allowing slidable movement of the extension through the channel.

[0025] The length of the channel will determine the distance the fin section may be adjusted by slidable movement towards the leading edge or the trailing edge, relative to the base. Preferably, the channel allows up to approximately 10 mm to 30 mm of movement of the fin section relative to the base in a direction towards the leading edge or the trailing edge. More preferably, the channel allows up to approximately 20 mm of movement of the fin section relative to the base in a direction towards the leading edge or the trailing edge. The amount of slidable movement will depend on the size and shape of the fin section which will limit the length of the channel possible within the fin section. Upon removal of the sufficient manual force, the elastic pressure of the resiliently deformable material will again force the extension against the surface of the channel furthest from the underside surface holding the position of the fin section relative to the base in place by frictional force. Means for showing the user the position of the fin section relative to the base are also within the scope of the invention, for example, to enable a user to adjust two or more fins on a board equally.

[0026] In a further embodiment of the invention, the member comprises one or more teeth which can be received by teeth-shaped recesses in the internal cavity. The teeth assist the resiliently deformable material by providing an additional means to restrain movement of the member in the internal cavity, and therefore the fin section relative to the base. Preferably, the adjustable

fin of the invention comprises one or more teeth at the end of the member furthest from the mounting means, said teeth corresponding to recesses in the internal cavity that can receive the teeth and assist to restrain movement of the member in the internal cavity. When applying sufficient manual force to
5 adjust this embodiment of the adjustable fin, the application of sufficient manual force will further comprise movement of the fin section in a direction away from the base, against the elastic pressure of the resiliently deformable material, to dislocate the one or more teeth from the recesses to enable slidable movement of the member within the internal cavity, and the
10 extension within the channel.

[0027] The teeth are preferably positioned at the end of the member proximal to the trailing edge of the fin section, and the application of sufficient manual force will further comprise movement of the fin section in a direction away from the base at the rear or trailing end of the fin section to dislocate
15 the teeth from the recesses in the internal cavity. Upon removal of the sufficient manual force, the elastic pressure of the resiliently deformable material against the extension will force the movement of the fin section in a direction towards the base and recesses in the internal cavity can receive any adjacent teeth on the base. The number and position of the teeth will
20 determine the position the fin section may be adjusted to relative to the base.

Third Aspect

[0028] In a third aspect, the invention provides a dual fin comprising a fin section, a second fin section and a base, the base comprising a mounting means for attaching the dual fin to a surfboard.

25 [0029] In preferred embodiments of the third aspect of the invention, a second fin section is attached to the fin section according to either the first aspect of the adjustable fin of the invention or the second aspect of the adjustable fin of the invention, the second fin section comprising two outer fin surfaces which meet at a leading edge and a trailing edge, and an underside
30 surface.

[0030] The second fin section is preferably attached to the fin section by one or more attachment means. Attachment means may, in some non-limiting examples, comprise rods, plates, pins, bars, and/or be formed from a portion of either the fin section or the second fin section. More preferably, the one or more attachment means comprise one or more ribs. The one or more attachment means preferably preserve a minimum distance between the fin section and the second fin section of between approximately 0.1 mm and 5 mm. The one or more attachment means preferably preserve a minimum distance between the fin section and the second fin section of between approximately 0.25 mm and 1.5 mm. The one or more attachment means more preferably preserve a minimum distance between the fin section and the second fin section of approximately 1 mm. The attachment means preferably reduce or remove any fluttering effect on either fin section caused by water passing around and between the fin section and the second fin section.

[0031] The second fin section is preferably positioned substantially parallel to the fin section and offset such that the leading edge of the second fin section is not aligned with the leading edge of the fin section. The fin section preferably comprises a flat foil having a substantially flat outer fin surface, and a curved outer fin surface. The second fin section also preferably comprises a flat foil having a substantially flat outer fin surface, and a curved outer fin surface. In a preferred embodiment, the substantially flat outer fin surface of the fin section and substantially flat outer fin surface of the second fin section substantially face the same direction, and the leading edge of the fin section is in a position forward of the leading edge of the second fin section. Preferably, the leading edge of the fin section is forward of the leading edge of the second fin section by approximately 5 mm to 25 mm, and more preferably by approximately 10 mm.

[0032] The second fin section preferably comprises at least one passage through which water can pass. The passage comprises an opening on each outer fin surface of the second fin section through which water can enter and exit. The passage preferably comprises an opening on the substantially flat

outer fin surface, and an opening on the curved outer fin surface, and the opening on the curved outer fin surface is located between the trailing edge of the second fin section and the minimum distance between the fin section and the second fin section. Preferably, the opening of the passage on the substantially flat outer fin surface of the second fin section is located closer to the leading edge of the second fin section than the opening of the passage on the curved outer fin surface of the second fin section. This will mean that when in normal use on a surfboard, water will preferentially enter the opening on the substantially flat outer fin surface, pass through the passage, and exit through the opening on the curved outer fin surface. A passage and an opening to a passage through the second fin section is preferably not round or another shape that would cause water passing through the passage to form a vortex. The openings and passages may be created from drilling or cutting holes or perforations through the second fin section or from the shape of a mould used to make the fin section.

[0033] An adjustable dual fin according to the third aspect of the invention is preferably mounted in the position of a side fin on a surfboard wherein:

the fin section and second fin section comprise flat foils having a substantially flat outer fin surface facing the centre line or stringer of the surfboard, and a curved outer fin surface facing the adjacent rail of the surfboard;

the fin section is in a position closer to the adjacent rail of the surfboard than the second fin section; and

the leading edge of the fin section is positioned closer to the front of the board than the leading edge of the second fin section.

[0034] Two or more adjustable dual fins according to the third aspect of the invention may be mounted to a surfboard.

[0035] In a preferred embodiment, the second fin section comprises at least one passage comprising an opening on the substantially flat outer fin surface, and an opening on the curved outer fin surface of the second fin

section through which water can pass. When the adjustable dual fin of the third aspect of the invention is mounted to a surfboard which is moving in a substantially forward direction through water during normal use, the at least one passage in the second fin section is preferably configured to:

- 5 enable water to enter an opening on the substantially flat outer fin surface of the second fin section, pass through the passage, and exit through an opening on the curved outer fin surface in a location between the trailing edge of the second fin section and the position of the minimum distance between the fin section and the second fin
- 10 section; and
- substantially prevent water passing in the reverse direction through the passage.

[0036] The openings preferably comprise holes or perforations on the surface of the substantially flat and curved outer fin surfaces of the second

15 fin section through which water can enter and exit, respectively. Preferably, the opening on the substantially flat outer fin surface of the second fin section is positioned closer to the leading edge than the opening on the curved outer fin surface.

[0037] In an alternative embodiment of the third aspect of the adjustable

20 dual fin of the invention, both the fin section and the second fin section are attached to the base. The fin section may be an adjustable fin according to either the first aspect or second aspect of the invention. The second fin section may be an adjustable fin according to either the first aspect or second aspect of the invention.

25 [0038] The second fin section may be the same size or a different size to the fin section. The second fin section may have a different fin template to the fin section. Preferably, the size and template of the second fin section is similar or the same as the size and template of the fin section.

Mounting Means

[0039] The mounting means for an adjustable fin of the invention as herein described may comprise a variety of means known for mounting or attaching a fin to a surfboard or another board.

5 [0040] In a preferred embodiment, the mounting means comprises one or more mounting blocks for attaching to one or more surfboard fin plugs and/or fin boxes. The one or more mounting blocks are preferably compatible with commercially available fin plug and/or fin box systems. Preferably, the one or more mounting blocks can be mounted to commercially available FCS[®] fin plugs and/or Futures[®] fin boxes.

10 [0041] In another preferred embodiment, the mounting means comprises a base attachment surface and an adhesive wherein the adhesive directly and fixedly secures the base attachment surface to the outer bottom surface of the surfboard. The adhesive is preferably Araldite[®] or another epoxy or non-latex construction silicone adhesive that can maintain an adhesive
15 connection between an adjustable fin of the invention and a surfboard or another board, particularly when exposed to water. Preferably, one or more screws additionally secure the adhered base attachment surface to the surfboard. Said screws are preferably placed in front of the leading edge of the adjustable fin and adjacent to each outer fin surface. The screws can
20 preferably be turned with a hex or Allen key and screw plugs, for example, plastic screw plugs, and may be pre-set in the surfboard into which the screws can be driven and embedded to secure the base of the adjustable fin to the surfboard. Alternatively, the base attachment surface may be 'fiberglassed' onto the surfboard using traditional 'glassing' methods known
25 in the art. For example, comprising placing 'rovings' around the outer edge or border of the base attachment surface.

[0042] The base attachment surface may also be used to attach a non-adjustable fin to a surfboard, for example a non-adjustable fin with a removable fin section.

30 Adjustment Indicators

[0043] Means for showing the user the position of the fin section relative to the base are also within the scope of the invention. Such means may include adjustment indicators, markings or numbering on the fin section, transparent portions of the fin section, or a combination of these, as some non-limiting
5 examples. These means would, for example, enable a user to determine whether two or more adjustable fins mounted as side fins on a board have been adjusted equally. In another example, a user could identify by these means the position of a fin section relative to its base when an adjustable fin of the invention is mounted to a board, without having to manipulate or even
10 touch the adjustable fin.

Elevated Fin Section

[0044] In an embodiment of any of the first, second, or third aspects of the invention as herein described, the underside surface of the fin section abuts or aligns flush to the outer surface of a surfboard the adjustable fin is
15 mounted to.

[0045] In another embodiment of any of the first, second or third aspects of the invention as herein described, the adjustable fin comprises an extended base which forms a gap between the underside surface of the fin section and the outer surface of a surfboard on which it is mounted. The length of the gap
20 between the underside surface of the fin section and the outer surface of the surfboard is preferably between approximately 5 mm and 25 mm. The length of the gap is more preferably approximately between approximately 10 mm and 20 mm. The length of the gap is more preferably approximately 15 mm. Without wanting to be limited by any one theory, a benefit of elevating a fin
25 section from the outer surface of a surfboard on which it is mounted is to reduce drag, when compared to a fin section which abuts or aligns flush with the outer surface of a surfboard.

Board Type

[0046] The adjustable fin of any of the first, second or third aspects of the
30 invention as herein described may be mounted to any one of the boards in the group comprising: surfboard, shortboard, kneeboard, longboard, minimal,

soft board, kiteboard or a board used for kite surfing, wind surfer, stand up paddleboard, wakeboard, rescue board, bodyboard, or another board used in surface water sports or activities. Reference herein to a surfboard can also include reference to any one of these other boards.

5 Fin Arrangement

[0047] More than one adjustable fin according to any of the aspects and embodiments of the invention as described herein may be mounted to a surfboard. For example, a thruster fin setup on a surfboard may comprise up to three adjustable fins of the invention as described herein. In some other
10 non-limiting examples, other arrangements may include:

Three adjustable fins according to the first aspect of the invention wherein the two side fins are flat foils and the three adjustable fins are in a 'thruster' arrangement;

15 Three adjustable fins according to the second aspect of the invention wherein the two side fins are flat foils and the three adjustable fins are in a 'thruster' arrangement;

Two adjustable fins according to embodiments of the first or second aspect of the invention which are flat foils, and a non-adjustable centre fin;

20 An adjustable centre fin according to embodiments of the first or second aspects of the invention, and two non-adjustable side fin flat foils in a 'thruster' or another arrangement;

25 An adjustable centre fin according to an embodiment of the first or second aspect of the invention, and two adjustable dual side fins according to an embodiment of the third aspect of the invention;

Adjustable side fins according to embodiments of the first or second aspects of the invention, and a dual centre fin according to an embodiment of the third aspect of the invention; or

Another possible combination.

[0048] Therefore, various combinations are possible for using adjustable fins of the invention exclusively, or in combination with non-adjustable or other types of fins on a surfboard.

5 Process for Mounting a Fin of the Invention

[0049] The present invention further provides a process of mounting to a surfboard or another board, an adjustable fin of the invention as herein described. The present invention also provides a process of mounting an adjustable fin of the invention to a surfboard by mounting the adjustable fin
10 using a mounting means as described herein.

Process for Manufacturing a Fin of the Invention

[0050] The present invention also provides a process of manufacturing an adjustable fin of the invention as described herein. The adjustable fin of the invention is preferably constructed from common materials used to make
15 surfboard fins. In one embodiment of the invention, part or all of the base is constructed from a metal or a metal alloy. This metal is preferably strong, light weight, and incapable of rusting or significant corrosion. In one example, the metal is aluminium. The fin section may be formed from two halves joined together.

20 [0051] Similarly to the large number of different fins currently available for mounting to a surfboard or another type of board described herein, an adjustable fin of the invention can comprise a variety of different: shapes or templates or even cants; outer fin surface shapes or features; sizes; types of foils; colours; materials from which the fin section is constructed; rakes;
25 depths; widths; cants; cut-outs; and other designs and extensions including channels, 'tunnels' and 'wings', amongst others. In this regard, a user can select and mount an adjustable fin of the invention to a board with attributes that is desired by the user or suitable for the user's requirements and appropriate for the board the adjustable fin or fins are mounted on.

[0052] In developing the present invention, the inventor addressed many issues that have prevented successful uptake of adjustable fin systems by surfers and other board riders.

[0053] A first benefit is that no tools are required to adjust the position of the adjustable fin on the surfboard. This means that a surfer or another board rider can easily adjust the position of one or more adjustable fins of the invention on their board without leaving the water. This allows the 'fine tuning' of their board to adjust to a much greater range of swell sizes and conditions without paddling in to the beach to swap fins and/or surfboards, and no need for tools or equipment.

[0054] A second benefit is that the adjustable fin of the invention can incorporate mounting blocks that attach to existing fin plug and fin box arrangements such as FCS[®] fin plugs or Futures[®] fin boxes. As a result, surfers and other board riders do not have to purchase a new board having a specific fin plug or box arrangement but can use one or more adjustable fins of the invention in their current boards, and without any modifications to their boards.

[0055] The adjustable fin according to an embodiment of the third aspect of the invention provides a third benefit of directing thrust in a direction substantially towards the front of the board with an aim of increasing board speed on a wave.

Brief Description of Drawings

Figure 1. are illustrations showing oblique views of an exploded (A) and assembled (B) embodiment of the first aspect of the adjustable fin of the invention. Mounting means comprises mounting blocks which attach to FCS[®] fin plugs.

Figure 2. are illustrations showing a top view (A), oblique view (B), side view (C) and front view (D) and the internal mechanism of an embodiment of the first aspect of the adjustable fin of the

invention. Mounting means comprises mounting blocks which attach to FCS[®] fin plugs.

- 5 Figure 3. are illustrations showing oblique views of an exploded embodiment of the first aspect of the adjustable fin of the invention (A) and when mounted to a surfboard (B). Mounting means comprises a base attachment surface and an adhesive.
- 10 Figure 4. are illustrations showing side view cross sections of an embodiment of the second aspect of the adjustable fin of the invention with the base in the (A) front position, (B) during adjustment between positions, and (C) back position, relative to the fin section. Mounting means comprises mounting blocks which attach to FCS[®] fin plugs.
- 15 Figure 5. are illustrations showing a side view cross section and a top view cut-away cross section of one half of a fin section of an embodiment of the second aspect of the adjustable fin of the invention.
- Figure 6. are illustrations showing a side view cross section and a top view cut-away cross section of the other half of the fin section of Figure 5.
- 20 Figure 7. are illustrations with measurements (in mm) of a front, side and partial bottom view of an embodiment of the base of the second aspect of the adjustable fin the invention. Mounting means comprises mounting blocks which attach to FCS[®] fin plugs.
- 25 Figure 8. are illustrations with measurements (in mm) of a front, side and partial bottom view of an alternative embodiment to Figure 7 of the base of the second aspect of the adjustable fin of the invention. Mounting means comprises mounting blocks which attach to FCS[®] fin plugs.

- Figure 9. (A) is a photograph of the side view of half a fin section and a base as illustrated in Figure 4(C); (B) is a photograph of the side view of half a fin section and a base as illustrated in Figure 4(A); (C) is a photograph of an end view of an embodiment of the second aspect of the adjustable fin of the invention showing the underside surface of the fin section with opening to the internal cavity, and the base. Mounting means comprises mounting blocks which attach to FCS[®] fin plugs.
- 5
- 10 Figure 10. are illustrations showing a side view (A), the opposing side view (B), front view (C) and top view (D) of an embodiment of the third aspect of the adjustable dual fin of the invention. Mounting means comprises mounting blocks which attach to FCS[®] fin plugs.
- 15 Figure 11. are illustrations showing an oblique view (A), blueprint of the oblique view (B), side view (C), blueprint of the side view (D), and an exploded oblique view (E) of an embodiment of the third aspect of the adjustable dual fin of the invention. Mounting means comprises mounting blocks which attach to FCS[®] fin plugs.
- 20
- Figure 12. are illustrations showing side, front, and bottom views of an embodiment of the base of the third aspect of the adjustable dual fin of the invention. Mounting means comprises mounting blocks which attach to FCS[®] fin plugs.
- 25 Figure 13. are illustrations showing oblique view (A), oblique exploded view (B), and (clockwise from top left) top, side, oblique and front view (C) of adjustable fins of the invention mounted by a base attachment surface and an adhesive to a surfboard, with adjustable dual fins of an embodiment of the third aspect of the invention mounted as side fins, and an adjustable fin of an embodiment of the first aspect of the invention mounted as the
- 30
- centre fin.

Description of Preferred Embodiments

[0056] Those skilled in the art will appreciate that the invention described herein is susceptible to variations and modifications other than those specifically described. It is to be understood that the invention includes all
5 such variations and modifications. The invention also includes all of the steps, features, compositions and compounds referred to or indicated in the specification, individually or collectively and any and all combinations or any two or more of the steps or features.

[0057] The present invention is not to be limited in scope by the specific
10 embodiments described herein, which are intended for the purpose of exemplification only. Functionally equivalent products, compositions and methods are clearly within the scope of the invention as described herein.

[0058] Throughout this specification, unless the context requires otherwise, the word "comprise", or variations such as "comprises" or "comprising", will
15 be understood to imply the inclusion of a stated integer or group of integers but not the exclusion of any other integer or group of integers.

[0059] Other definitions for selected terms used herein may be found within the detailed description of the invention and apply throughout. Unless
20 otherwise defined, all other scientific and technical terms used herein have the same meaning as commonly understood to one of ordinary skill in the art to which the invention belongs.

[0060] Features of the invention will now be discussed with reference to the following preferred embodiments.

First Aspect of the Invention

25 [0061] A preferred embodiment of the first aspect of the adjustable fin of the invention is shown in Figure 1. Figure 1A illustrates an exploded view (and Figure 1B an assembled view) wherein the fin section 100 has a leading edge 102 and a trailing edge 104 and outer fin surfaces 106 of which only one is visible in Figures 1A and 1B.

[0062] The base 200 comprises two mounting blocks 202 which are compatible with the existing commercially available FCS[®] fin plugs fitted to a majority of existing surfboards. When the adjustable fin is mounted on to a surfboard, the mounting blocks 202 are secured within FCS[®] fin plugs and
5 the underside surface 108 of the fin section 100 and bottom surface 204 of the base abut, i.e. align with the bottom surface of the surfboard.

[0063] The base 200 comprises a member 206 which extends in a direction contrary to that of the mounting blocks 202. The member 206 comprises a planar surface with a hole 208 cut out. The hole 208 is shaped to comprise
10 teeth 210 and valleys 212.

[0064] The fin section 100 comprises a locking means 110 which is shown in Figure 1A disassembled into three components, one component comprising the button 112 of the locking means 110. Figure 1B shows that the button 112 on the assembled fin lies flush to the outer fin surface 106.
15 The underside of the button 112 comprises a slot 114 which when the button 112 is depressed on the assembled adjustable fin, the slot 114 aligns with the teeth 210 enabling the teeth 210 which have a width thinner than the width of the slot 114, to pass through the slot 114. The button 112 is biased towards releasably coupling the locking means 110 to the member 206, and
20 lying flush to the outer fin surface 106.

[0065] Figure 2 illustrates the internal mechanism and interaction between fin section 100 and base 200 when this preferred embodiment of the first aspect of the adjustable fin of the invention is assembled.

[0066] In Figure 2, the locking means 110 is releasably coupled in a locking
25 position formed by a valley 212 in the hole 208 of the member 206. The internal cavity 120 in the fin section 100 is configured to enable the member 206 to slidably move by manual force in a direction towards the trailing edge 104. This can take place after the locking means 110 is uncoupled from the member 206 when the button 112 is depressed by manual force and the slot
30 in the button 112 is aligned with the teeth 210 allowing the teeth 210 to pass through the slot of the button 112. When the locking means 110 is in

alignment with another locking position, for example, formed by a second valley 220, release of the button 112 will move the slot of the button 112 out of alignment with the teeth 210 and the teeth 210 will no longer be able to pass through the slot of the button 112. As a result, the locking means 110
5 will be restrained in the locking position formed by the second valley 220 and therefore releasably coupled to the member 206.

[0067] Figure 3A shows an illustration of an embodiment of the first aspect of the adjustable fin of the invention with a mounting means on the base 200 which comprises a base attachment surface 230 to which an adhesive and,
10 in some non-limiting examples, screws, are used to attach the adjustable fin to a surfboard (Figure 3B).

Second Aspect of the Invention

[0068] An embodiment of the second aspect of the adjustable fin of the invention is shown in Figure 4 with the fin section 300 in three different
15 positions relative to the base 400. The base 400 comprises a front mounting block 410 and a rear mounting block 420 which can attach to existing available FCS[®] fin plugs. The base 400 also comprises a planar member 430, and attached to which is a flange 440 which extends in a direction perpendicular to the planar member 430. The fin section 300 comprises a
20 leading edge 310 and a trailing edge 320, and an underside surface 330 which abuts the base and outer surface of a surfboard to which it is mounted on. The cross sections through the centre of the adjustable fin from leading edge 310 to trailing edge 320 of the fin section 300 show the internal cavity 340 comprising an opening 350 on the underside surface through which the
25 planar member 430 can enter and be housed by the internal cavity 340.

[0069] As shown in the three cross sections, the internal cavity 340 is configured to allow slidable movement of the base 400 towards the leading edge 310 and a 'front' position, or towards the trailing edge 320 and a 'rear' position upon application of sufficient manual force on the fin section 300 in
30 opposition to the base 400.

[0070] This embodiment of the adjustable fin of the invention further comprises fixing teeth 450 at the end of the planar member 430 furthest from the mounting blocks 410, 420. Recesses 360 in the internal cavity 340 are able to receive the teeth 450 on the member to assist to restrain movement
5 of the member in the internal cavity 340. When applying sufficient manual force to adjust this embodiment of the adjustable fin, the application of sufficient manual force will further comprise movement of the fin section 300 in a direction away from the base 400, against the elastic pressure of the resiliently deformable material, to dislocate the one or more teeth 450 from
10 the recesses 360 to enable slidable movement of the planar member 430 within the internal cavity 340, and the flange 440 within the channel as shown in the centre cross section. As the teeth 450 are positioned at the end of the planar member 430 in closest proximity to the trailing edge 320 of the fin section 300, the application of sufficient manual force will further comprise
15 movement of the fin section 300 in a direction away from the base 400 at the leading edge 310 or trailing edge 320 of the fin section 300. To provide for this movement of fin section 300 away from the base 400 to dislocate the teeth 450, the flange 440 is preferably curved at each one or both ends.

[0071] An embodiment of the second aspect of the adjustable fin of the invention is shown in Figure 5. The fin section 300 comprises a channel 370 for housing an extension, and preferably a flange, wherein the channel 370 contains a resiliently deformable material 372. An extension such as a flange is situated in the gap 374 between the resiliently deformable material 372 and the upper wall 376 of the channel 370. The resiliently deformable
25 material 372 forces the flange against the upper wall 376 of the channel 370 to restrict movement of the base relative to the fin section 300. Measurements for the embodiment of the adjustable fin in Figure 5 are shown (in mm).

[0072] The other half of the fin section of Figure 5 is shown in Figure 6. This
30 half of the fin section 300 in Figure 6 shows the outline of the internal cavity 340 and measurements for this embodiment of the adjustable fin are shown (in mm).

[0073] Figure 7 and 8 show two alternative versions of bases for embodiments of the second aspect of the adjustable fin of the invention with measurements in mm. The bases comprise mounting blocks which can attach to existing available FCS[®] fin plugs.

5 [0074] The photographs in Figure 9A and Figure 9B show cross sections of embodiments of a fin section and a base as illustrated in Figure 4A and Figure 4B, respectively. The photograph in Figure 9C shows an embodiment of the second aspect of the adjustable fin of the invention with the underside surface of the fin section and the planar member of base projecting from the
10 internal cavity. The bases comprise mounting blocks which can attach to existing available FCS[®] fin plugs.

Third Aspect of the Invention

[0075] In an embodiment of the third aspect of the present invention, an adjustable dual fin is shown in Figure 10. The adjustable dual fin comprises
15 the adjustable fin of the first aspect of the invention with a fin section 500 and a base 600, wherein a second fin section 550 is attached to the fin section 500 by five ribs 510 of different lengths. Both the fin section 500 and the second fin section 550 are flat foils with substantially flat outer fin surfaces on one side and curved outer fin surfaces on the other side. The leading edge of
20 the fin section 500 is positioned forward of the leading edge of the second fin section. Leading edge passages 552 and trailing edge passages 554 through the second fin section 550 are angled towards the curved outer fin surface which forces water to pass through the passage and into the gap between the fin section 500 and second fin section 550. The embodiment further
25 comprises an extended base member 610 such that when the adjustable dual fin is mounted on a surfboard, there is a gap between the outer surface of the surfboard and the underside surfaces of the fin section 500 and second fin section 550. The bases of the embodiment comprise mounting blocks which can attach to existing available FCS[®] fin plugs.

30 [0076] Without wanting to be limited by any one theory, it is believed that this embodiment of the adjustable dual fin of the third aspect of the invention

provides a benefit of increased thrust and therefore speed in a direction substantially towards the front of a surfboard it is mounted to when in normal use, for the following reasons.

[0077] As shown in the embodiment in Figure 10, the distance between the flat outer fin surface 520 of the fin section 500, and the curved outer fin surface 560 of the second fin section 550 is nearest at the peak 562 of the curved outer fin surface 560 of the second fin section 550. This distance is preferably between approximately 0.1 mm and 5 mm, more preferably between approximately 0.25 mm and 1.5 mm, and even more preferably approximately 1 mm. The proximity and position of the fin section 500 and the second fin section 550 forms a V-shaped channel 564 between the peak 562 and the leading edge 566 of the fin section 500 and the leading edge 568 of the second fin section 550, the V-shaped channel 564 extending along the curved length of the fin sections to their tips 570. On the other side of the peak 562 is a rear chamber 572 formed between the peak 562 and the trailing edge 574 of the fin section 500 and the trailing edge 576 of the second fin section 550.

[0078] During normal use when mounted on a surfboard, water passes into the V-shaped channel but only a small amount of this water can pass between the thin gap between the fin section and the second fin section. The majority of the water is forced along the length of the V-shaped channel towards the tip of the fin sections at a higher velocity than the normal speed that water is passing the fin sections. This higher velocity is generated due to the higher pressure behind the water forced into the channel than the pressure of the water in front of the water leaving the channel adjacent to the tips of the fin sections according to Newton's 2nd law. In accordance with Bernoulli's principle, the increase in the velocity of the water occurs simultaneously with a decrease in pressure. Therefore, a region of low pressure is created in this V-shaped channel.

[0079] Conversely, some water passes through the thin gap between the fin section and the second fin section, and passages direct water through the second fin section from the side of the substantially flat outer fin surface into

the rear chamber. The effect of forcing all of this water into the limited space of the rear chamber results in the creation of a region of high pressure.

[0080] The pressure differential between the area of low pressure in the V-shaped channel and the area of high pressure in the rear chamber results in a lift force acting perpendicular to the direction of the fluid flow in the V-shaped channel. That is, in a direction towards the front of the fin on a slight downward angle. The thrust provided by this lift force acts to increase the overall speed of the fins in this direction, and therefore, the board through the water.

10 [0081] Figures 11B and 11D show the internal structure and mechanism from different views of the same embodiment of the third aspect of the adjustable dual fin of the invention shown in Figures 11A and 11C, respectively. Figure 11E shows an exploded view of the same embodiment. The bases comprise mounting blocks which can attach to existing available
15 FCS[®] fin plugs.

[0082] An alternative embodiment of the base of an adjustable dual fin of the invention is shown in Figure 12. The base comprising two members and extensions which can be housed within the internal cavities of two independent fin sections that are adjustable according to the second aspect
20 of the invention as described herein. Measurements are shown (in mm). The base comprises mounting blocks which can attach to existing available FCS[®] fin plugs.

[0083] Embodiments of the adjustable fin and adjustable dual fin of the invention which have been mounted onto a surfboard are shown in Figure
25 13. The mounting means for these embodiments comprises a base attachment surface which attaches to the surfboard by an adhesive. An adjustable fin according to the first aspect of the invention is mounted to the surfboard as a centre fin. Mounted to the surfboard as side fins are adjustable dual fins according to embodiments of the third aspect of the
30 invention.

The Claims Defining the Invention are as Follows

1. An adjustable fin for use on a surfboard, the adjustable fin comprising:
 - a base comprising:
 - at least one mounting means for mounting the adjustable fin to a surfboard; and
 - a member extending in a direction contrary to the mounting means;
 - a fin section comprising:
 - two outer fin surfaces which meet at a leading edge and a trailing edge;
 - an underside surface comprising an opening to an internal cavity, the internal cavity configured to house the member and enable slidable movement of the member in a direction towards the leading edge or the trailing edge; and
 - a locking means that is manipulable and which projects into the internal cavity, wherein the locking means can releasably couple to the member at one of two or more locking positions thereby preventing slidable movement of the member;

wherein the fin section can be adjusted relative to the base by manipulating the locking means from an outer fin surface to uncouple the locking means from the member at a first locking position, slidably move the member through the internal cavity, and releasably couple the locking means to the member at a second locking position.

2. An adjustable fin according to claim 1, wherein the locking means is biased towards being releasably coupled to the member at a locking position.

3. An adjustable fin according to claim 1 or claim 2, wherein the locking means comprises a button at an outer fin surface for manipulating the locking means, and depressing the button uncouples the locking means from the member.
4. An adjustable fin according to claim 3, wherein releasing the button releasably couples the locking means to the member.
5. An adjustable fin according to any one of claims 1 to 4, wherein the member is substantially planar.
6. An adjustable fin according to any one of claims 1 to 5, wherein the member comprises a hole, and the hole is configured to receive the locking means.
7. An adjustable fin according to claim 6, wherein the locking means releasably couples to the member at any one of two or more locking positions in the hole.
8. An adjustable fin according to claim 6 or claim 7, wherein the hole comprises one or more teeth, wherein either side of a tooth is a valley, and a valley forms a locking position.
9. An adjustable fin according to claim 8, wherein the one or more teeth are aligned substantially parallel to the underside surface.
10. An adjustable fin according to claim 8 or claim 9, wherein the one or more teeth point in a direction away from the underside surface.
11. An adjustable fin according to any one of claims 8 to 10, wherein at least a portion of the locking means is received at a locking position in a valley thereby coupling the locking means to the member, and depressing the button aligns the teeth with a slot in the locking means uncoupling the locking means from the member and enabling slidable movement of the teeth through the slot.

12. An adjustable fin according to claim 11, wherein releasing the button when the locking means is aligned with a valley releasably couples the locking means to the member.
13. An adjustable fin according to any one of claims 3 to 11, wherein a surface of the undepressed button is flush with the outer fin surface.
14. An adjustable fin according to any one of the preceding claims, wherein a second fin section is attached to the fin section, the second fin section comprising two outer fin surfaces which meet at a leading edge and a trailing edge, and an underside surface.
15. An adjustable fin according to claim 14, wherein the second fin section is attached to the first fin section by one or more attachment means.
16. An adjustable fin according to claim 15, wherein the one or more attachment means comprise one or more ribs.
17. An adjustable fin according to claim 15 or claim 16, wherein the one or more attachment means preserves a minimum distance between the fin section and the second fin section of between approximately 0.25 mm and 1.5 mm.
18. An adjustable fin according to claim 15 or claim 16, wherein the one or more attachment means preserves a minimum distance between the fin section and the second fin section of approximately 1 mm.
19. An adjustable fin according to any one of claims 14 to 18, wherein the second fin section is positioned substantially parallel to the fin section and offset such that the leading edge of the second fin section is not aligned with the leading edge of the fin section.
20. An adjustable fin according to claim 19, wherein the fin section comprises a flat foil having a substantially flat outer fin surface, and a curved outer fin surface.

21. An adjustable fin according to claim 19 or claim 20, wherein the second fin section comprises a flat foil having a substantially flat outer fin surface, and a curved outer fin surface.
22. An adjustable fin according to claim 21, wherein the flat outer fin surface of the fin section and flat outer fin surface of the second fin section substantially face the same direction.
23. An adjustable fin according to any one of claims 19 to 22, wherein the leading edge of the fin section is forward of the leading edge of the second fin section.
24. An adjustable fin according to any one of claims 14 to 22, comprising at least one passage through the second fin section through which water can pass, wherein the passage comprises an opening on each outer fin surface of the second fin section through which water can enter and exit.
25. An adjustable fin according to any one of claims 21 to 23, comprising at least one passage through the second fin section, wherein the passage comprises an opening on the substantially flat outer fin surface, and an opening on the curved outer fin surface, and the opening on the curved outer fin surface is located between the trailing edge of the second fin section and the minimum distance between the fin section and the second fin section.
26. An adjustable fin according to claim 25, wherein the opening of the passage on the substantially flat outer fin surface is located closer to the leading edge of the second fin section than the opening of the passage on the curved outer fin surface of the second fin section.
27. An adjustable fin according to claim 25 or claim 26, wherein water can enter the opening on the substantially flat outer fin surface, pass through the passage, and exit through the opening on the curved outer fin surface.

28. An adjustable fin according to any one of claims 1 to 27 comprising an extended base, wherein when the adjustable fin is mounted on a surfboard, the extended base forms a gap between the outer surface of the surfboard and the underside surface of the fin section.
29. An adjustable fin according to claim 28, wherein the length of the gap is between approximately 10 mm and 20 mm.
30. An adjustable fin according to claim 28, wherein the length of the gap is approximately 15 mm.
31. An adjustable fin according to any one of the preceding claims, wherein the one or more mounting means are mounting blocks capable of attaching to commercially available fin plug and fin box systems.
32. An adjustable fin according to any one of claims 1 to 28, wherein the the mounting means comprises a base attachment surface and an adhesive for mounting the adjustable fin to an outer surface of a surfboard.
33. An adjustable fin according to any one of the preceding claims, wherein a user can apply sufficient manual force by hand to depress the button and adjust the position of the fin section relative to the base when the adjustable fin is attached to a surfboard.
34. An adjustable fin according to any one of the preceding claims for mounting to any one of the boards in the group comprising: surfboard, shortboard, kneeboard, longboard, minimal, soft board, kiteboard, wind surfer, stand up paddleboard, wakeboard, rescue board, bodyboard, or another board used in surface water sports or activities.
35. A process comprising the step of mounting an adjustable fin according to any one of claims 1 to 32, to any one of the boards in the group comprising: surfboard, shortboard, kneeboard, longboard, minimal, soft board, kiteboard, wind surfer, stand up paddleboard, wakeboard,

rescue board, bodyboard, or another board used in surface water sports or activities.

36. The process of manufacturing an adjustable fin according to any one of claims 1 to 33.
37. An adjustable fin, substantially as hereinbefore described having reference to Figures 1-3, 10-11, and 13.

Figure 1

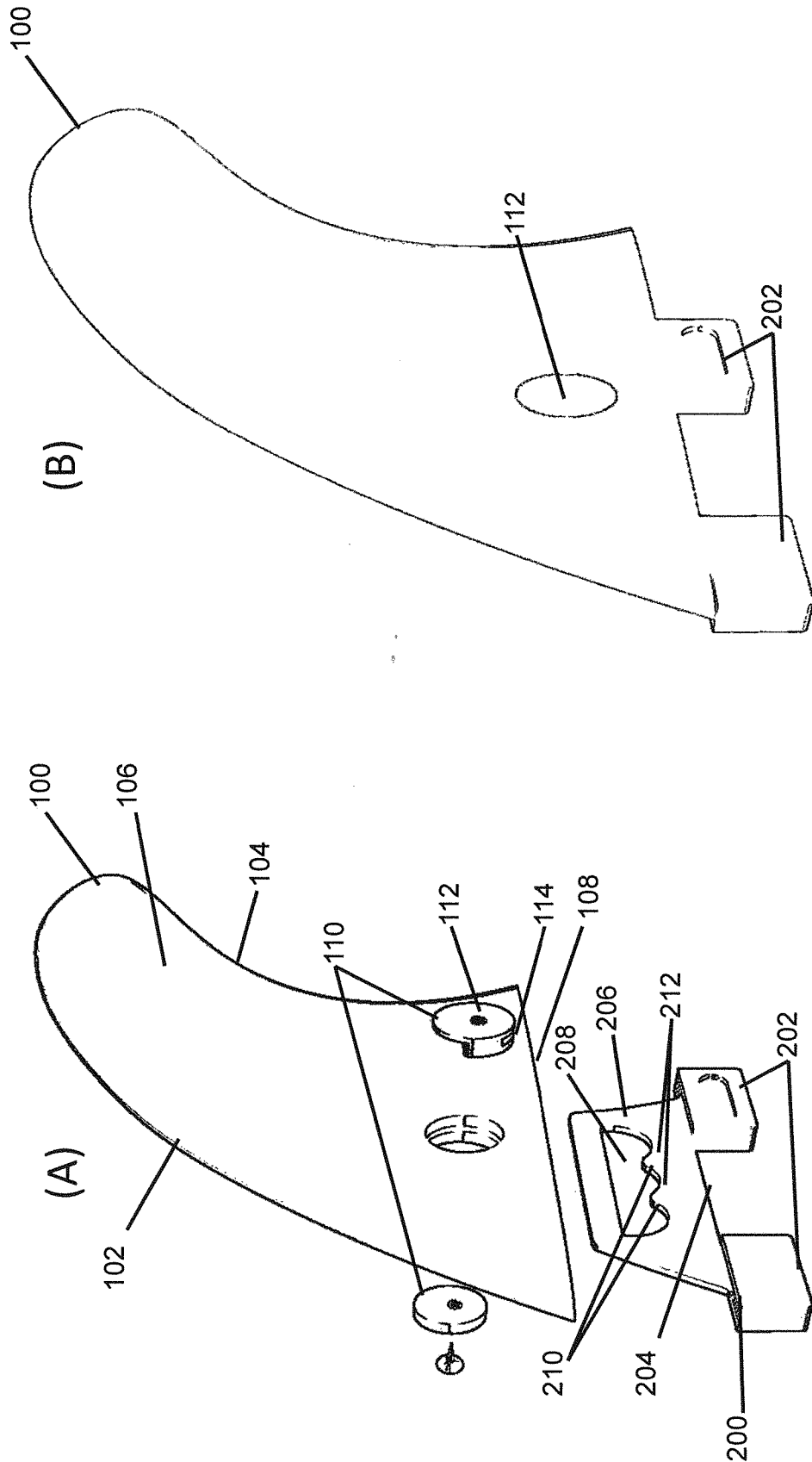


Figure 2

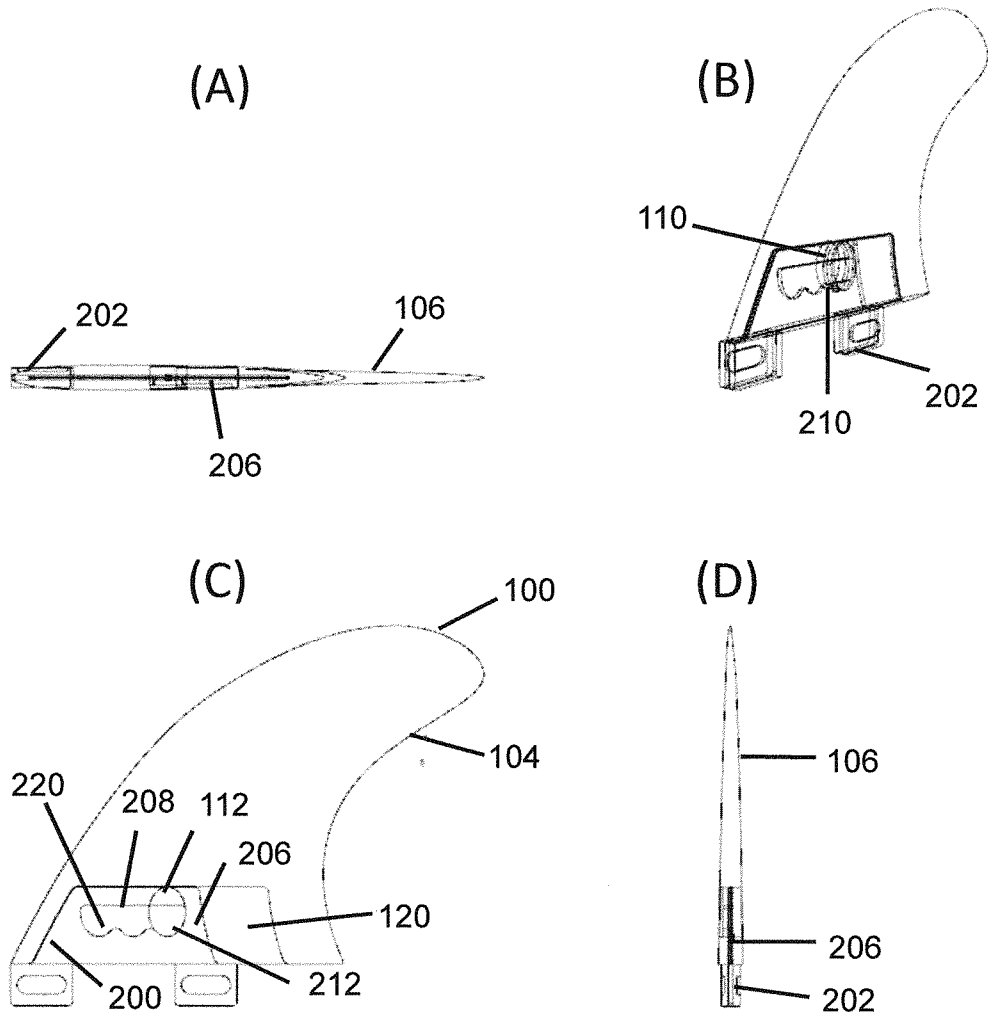
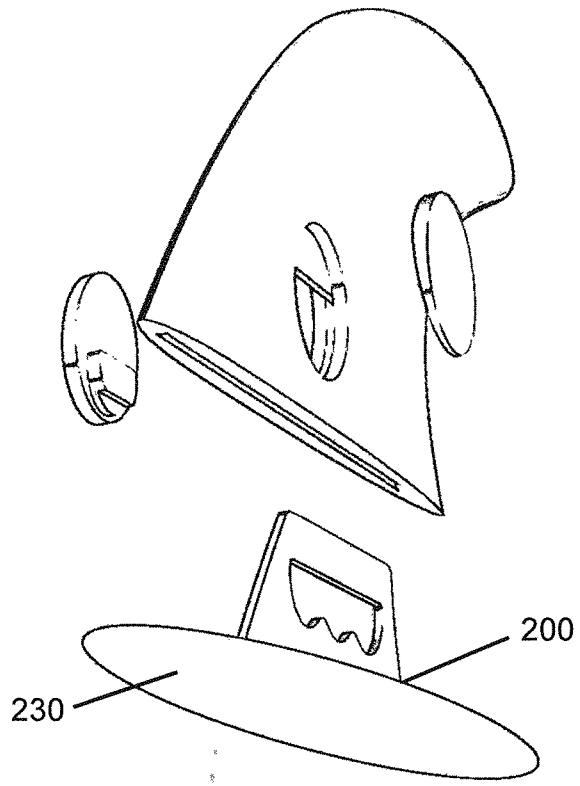
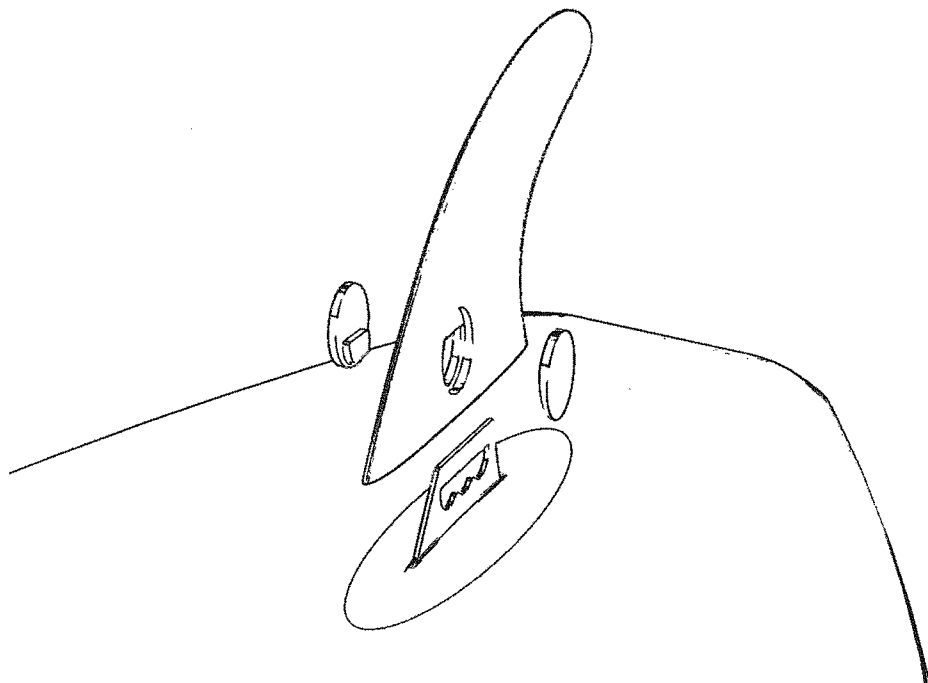


Figure 3



(A)



(B)

Figure 4

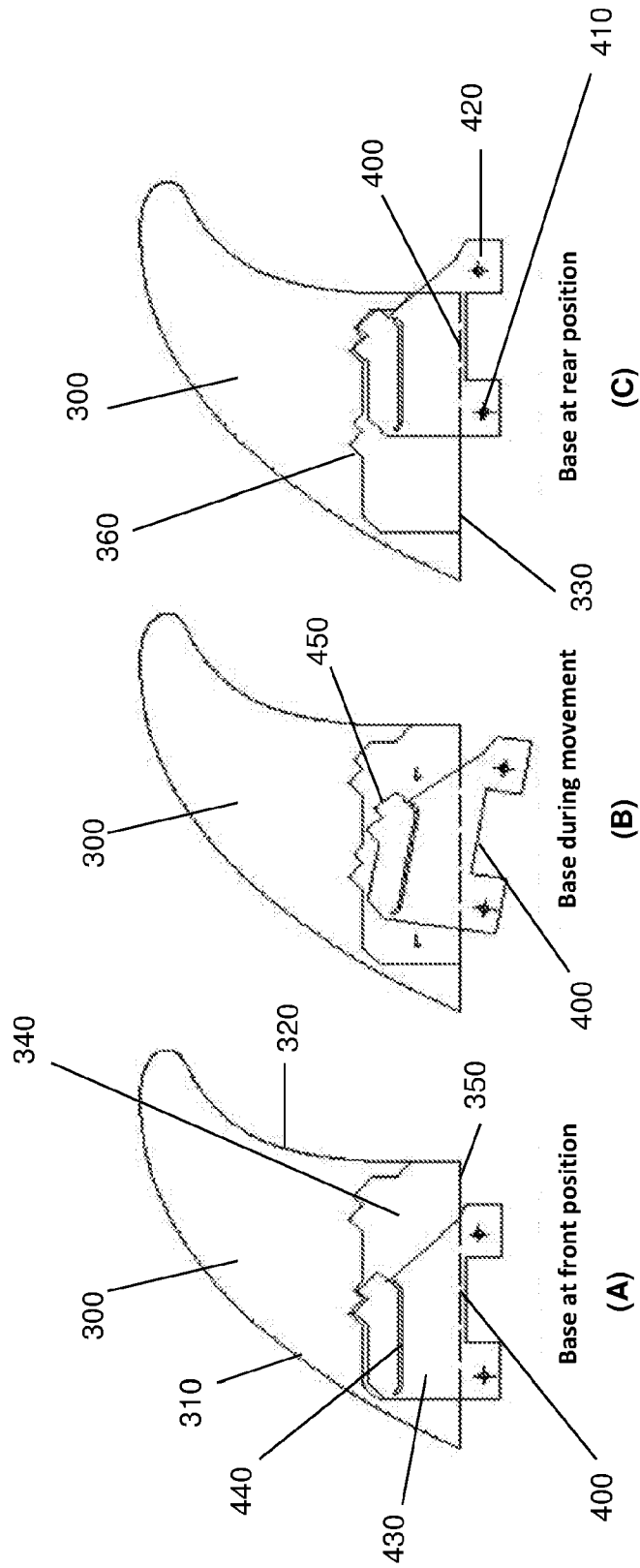


Figure 5

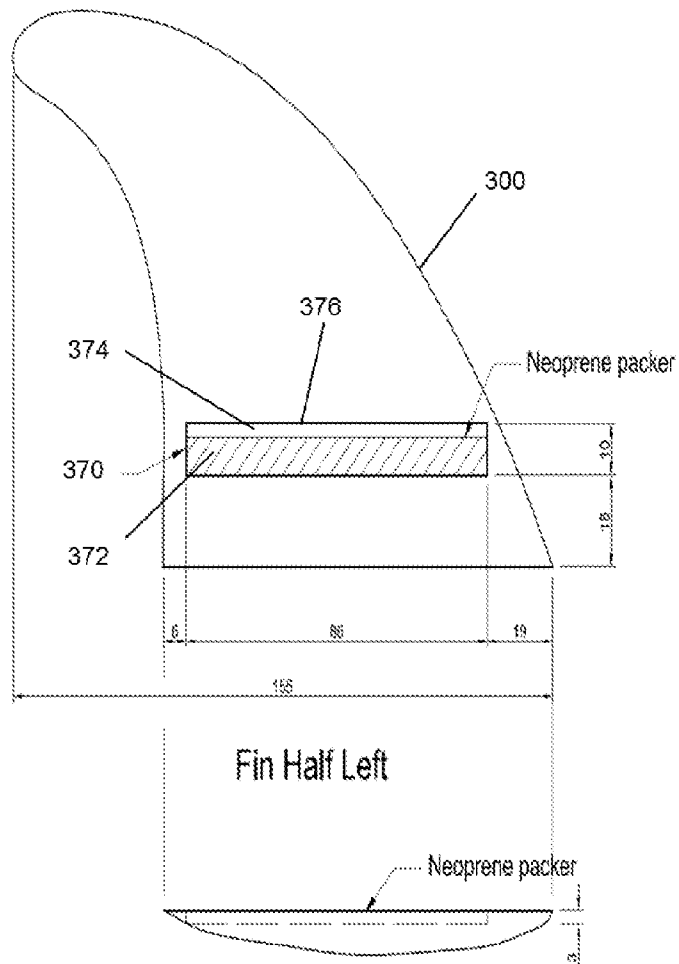


Figure 6

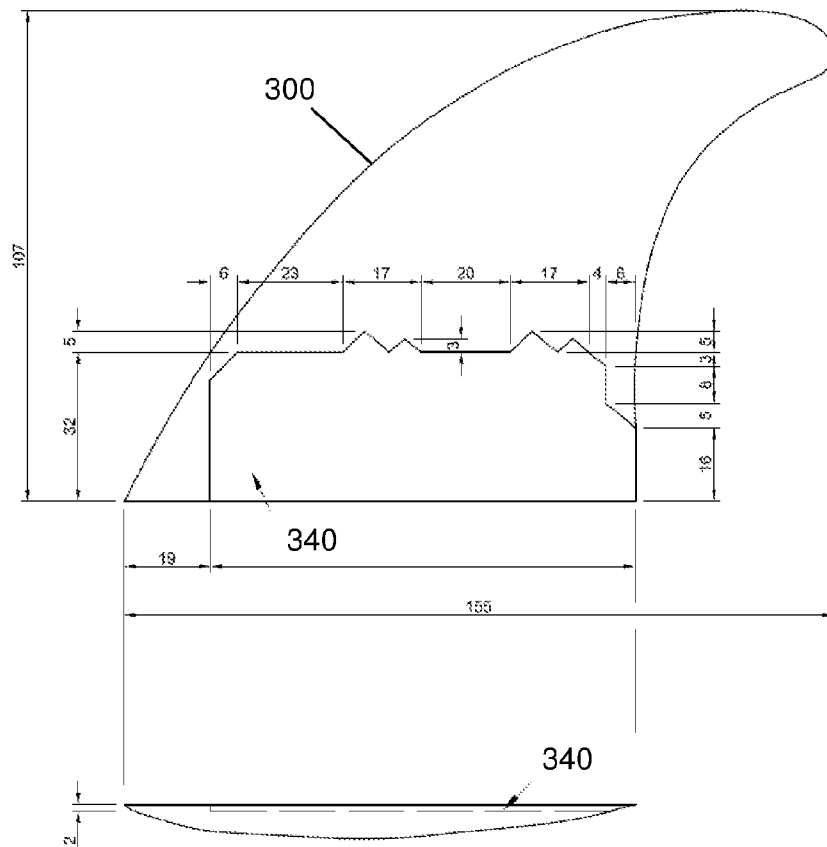


Figure 7

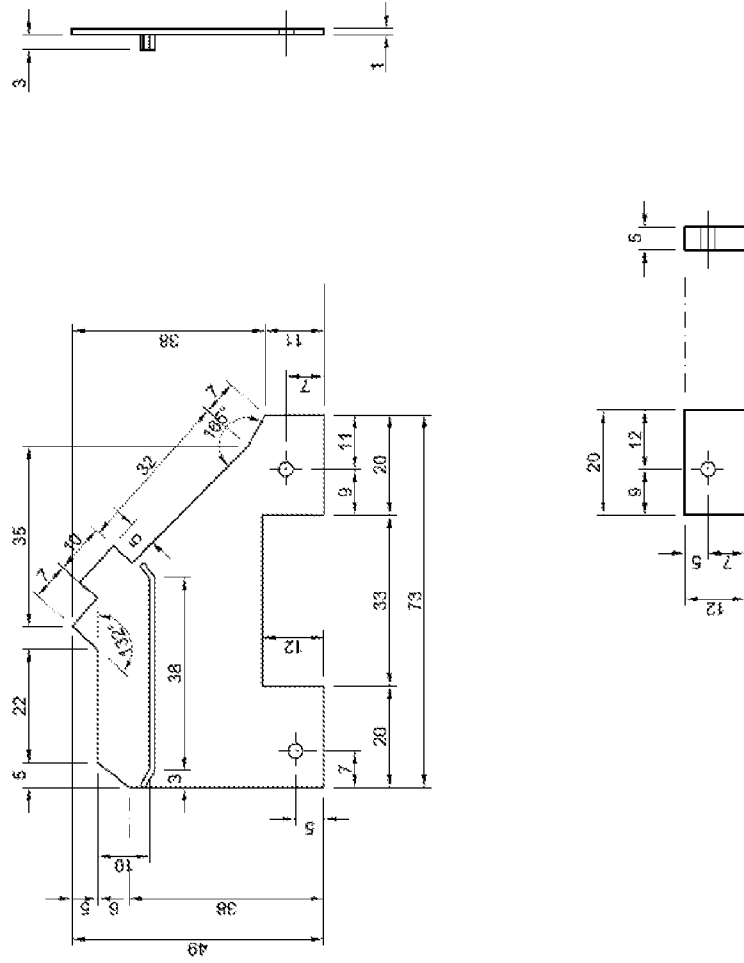
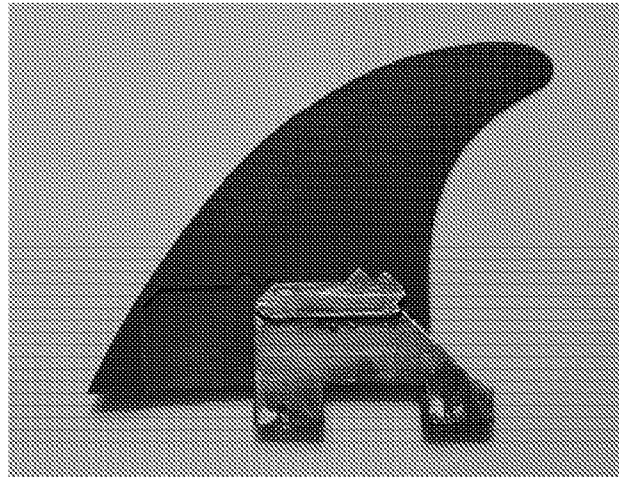
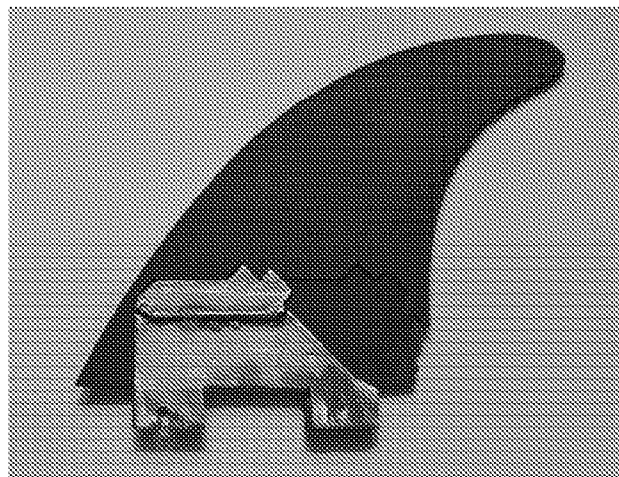


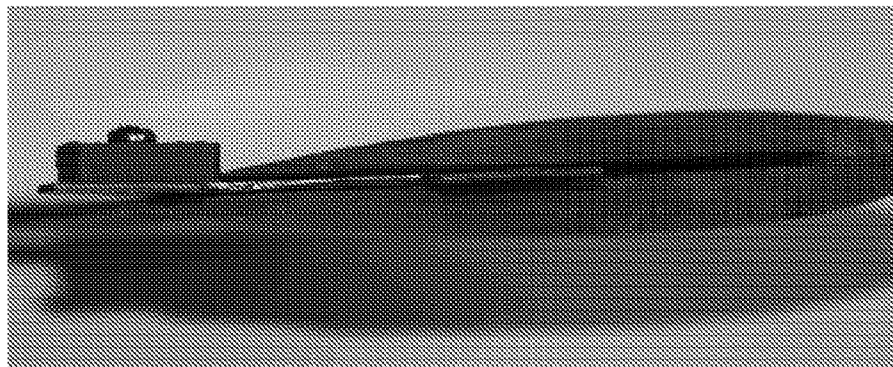
Figure 9



(A)



(B)



(C)

Figure 10

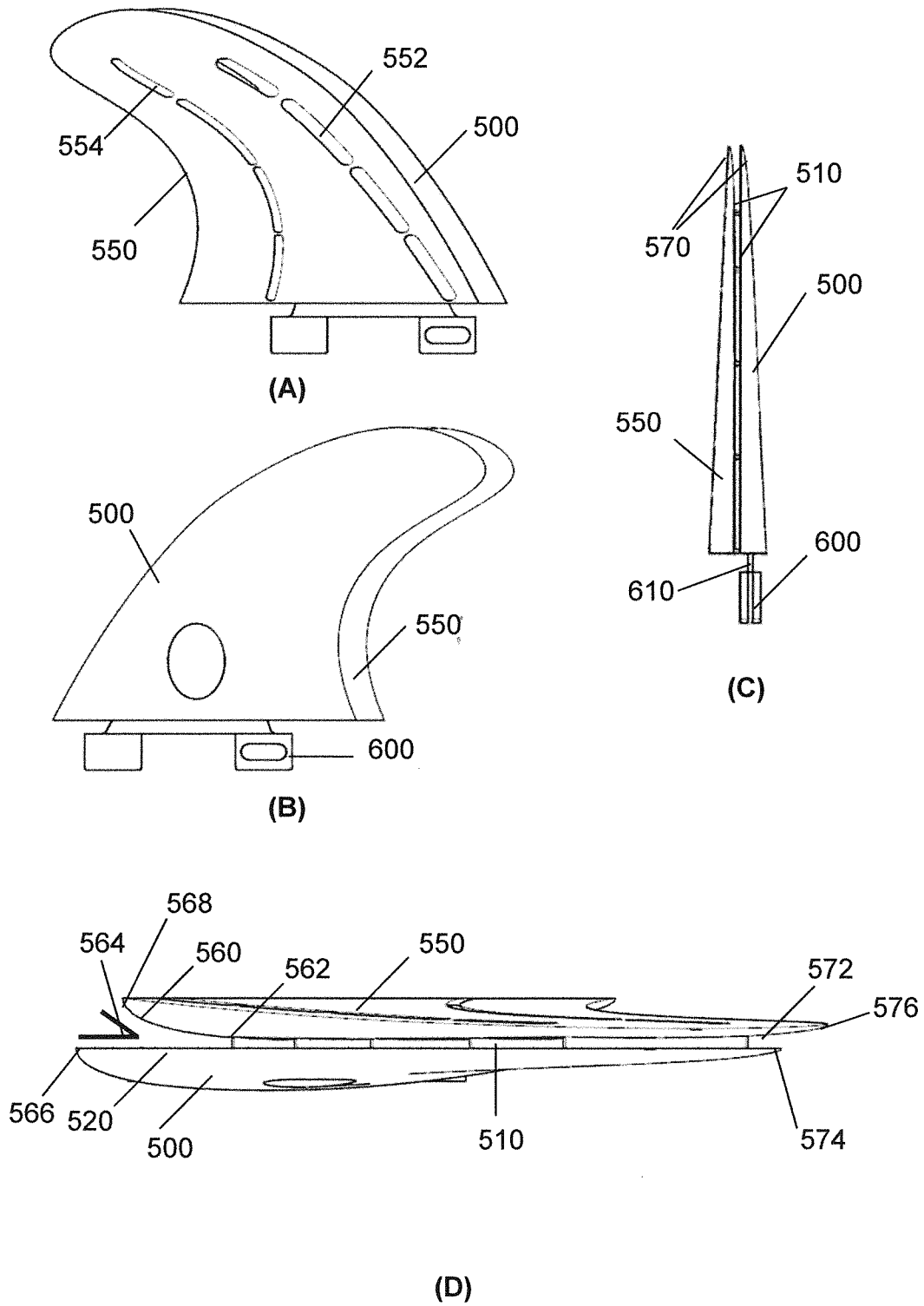


Figure 11

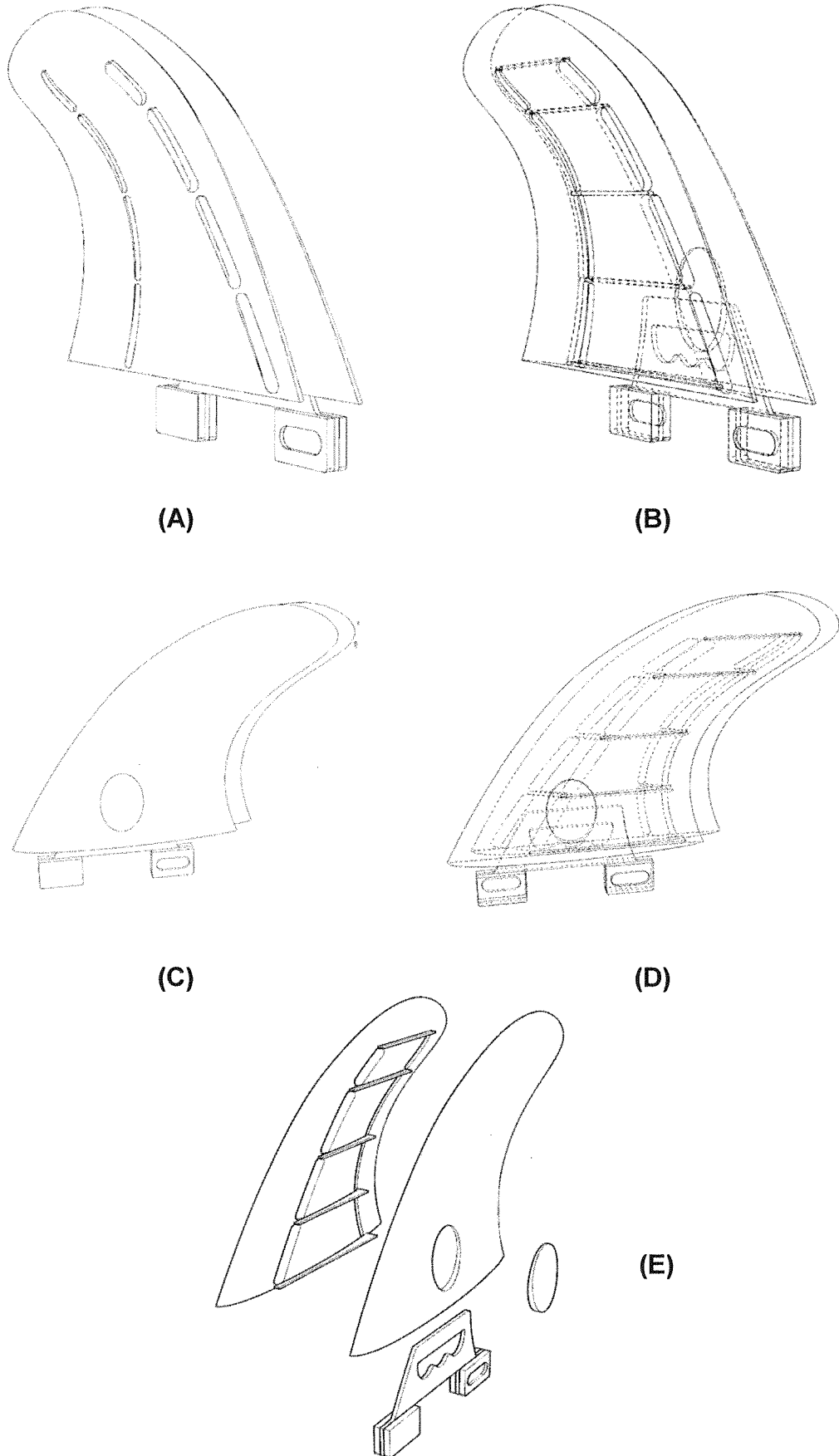
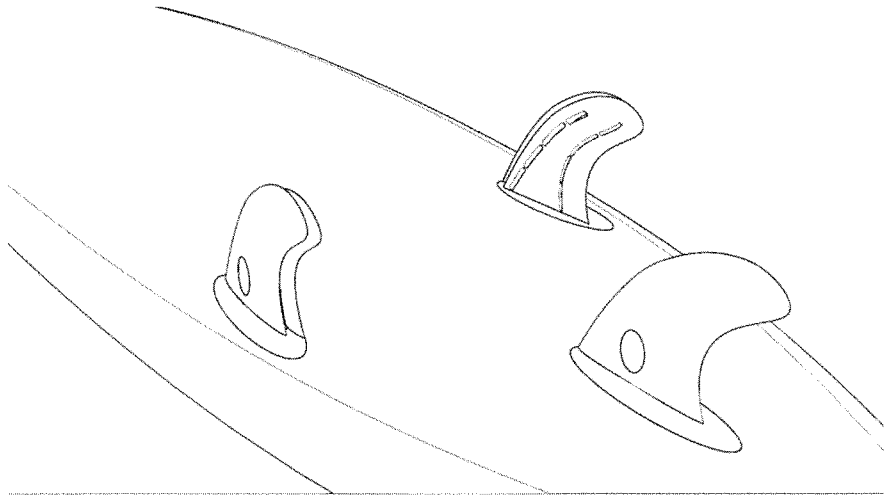
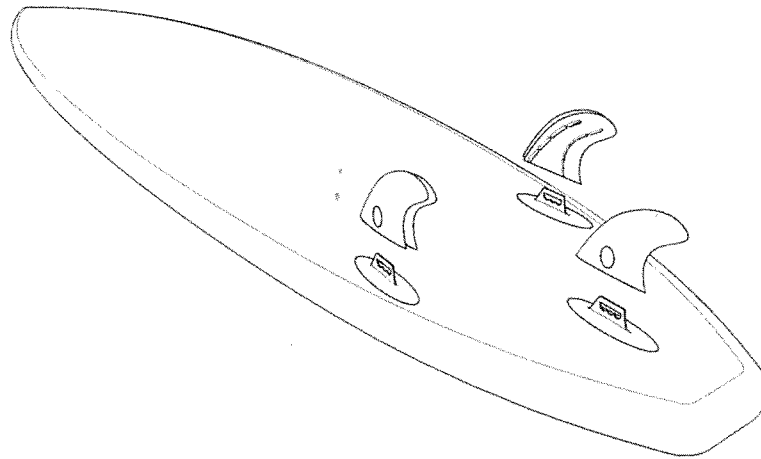


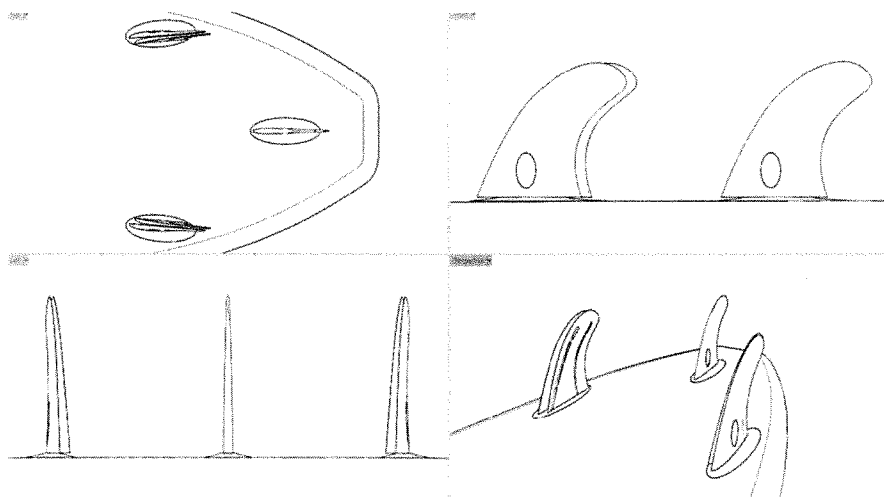
Figure 13



(A)



(B)



(C)

A. CLASSIFICATION OF SUBJECT MATTER

B63B 35/79 (2006.01) B63B 35/73 (2006.01) B63B 39/00 (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPIAP, EPODOC: IPC, CPC: B63B35/793, B63B35/79, B63B35/73, B63B35/7923, B63B35/7926, B63B2035/813, B63B2035/818. Keywords: fin, aero_foil, wing, skeg, foil, cavity, hollow, void, chamber, adjust, change, move, moving, alter, slide, sliding, translate, reposition, relocate, surf_board, body_board, wake_board, short_board, knee_board, long_board, kite_board, wind_surf, paddle_board and like terms. Esp@ce keywords: Applicant and Inventor search: "Flying Fin Systems", "Glennndin Miller", "Miller, Glennndin". PAMs NOSE: Keywords: "Flying Fin Systems", "Glennndin Miller", "Miller, Glennndin". Google Patents: Keywords: adjustable surfboard fin, surfboard fin cavity and like terms. Google and Google image: Keywords: adjust surf board fin and like terms. Ultracombi on relevant documents.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Documents are listed in the continuation of Box C		

 Further documents are listed in the continuation of Box C See patent family annex

* Special categories of cited documents:		
"A" document defining the general state of the art which is not considered to be of particular relevance	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E" earlier application or patent but published on or after the international filing date	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means	"&"	document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search
1 July 2015Date of mailing of the international search report
01 July 2015

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Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
the subject matter listed in Rule 39 on which, under Article 17(2)(a)(i), an international search is not required to be carried out, including
2. Claims Nos.: **37**
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
See Supplemental Box
3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

C (Continuation).

DOCUMENTS CONSIDERED TO BE RELEVANT

PCT/AU2015/050241

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2012/0040575 A1 (SCHULTZ III) 16 February 2012	
A	US 4325154 A (COLLUM JR) 20 April 1982	
A	US 8083560 B2 (FOULKE) 27 December 2011	
A	US 2010/0120305 A1 (POSNER et al.) 13 May 2010	
A	US 2003/0220030 A1 (JOLLY) 27 November 2003	

Supplemental Box**Continuation of Box II**

Claim 37 does not comply with Rule 6.2(a) because it relies on references to the description and/or drawings.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/AU2015/050241

This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	Publication Date	Publication Number	Publication Date
US 2012/0040575 A1	16 February 2012	US 8556670 B2	15 Oct 2013
		US 2014106634 A1	17 Apr 2014
		US 8951080 B2	10 Feb 2015
US 4325154 A	20 April 1982	AU 6889381 A	08 Oct 1981
		BR 8101884 A	06 Oct 1981
		DE 3112152 A1	04 Feb 1982
		FR 2479007 A1	02 Oct 1981
		GB 2073120 A	14 Oct 1981
		IT 1226166 B	19 Dec 1990
		JP S56151075 A	21 Nov 1981
		ZA 8101967 A	28 Apr 1982
US 8083560 B2	27 December 2011	US 8083560 B2	27 Dec 2011
		US 2012071048 A1	22 Mar 2012
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		CN 102378716 B	02 Jul 2014
		EP 2448641 A2	09 May 2012
		JP 2012513925 A	21 Jun 2012
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		TW I433796 B	11 Apr 2014
		WO 2010056706 A2	20 May 2010
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		AU 2002350947 A1	12 Dec 2003
		JP 2005526664 A	08 Sep 2005
		US 2004043681 A1	04 Mar 2004
		US 6793548 B2	21 Sep 2004
		WO 03099650 A1	04 Dec 2003

End of Annex

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

Form PCT/ISA/210 (Family Annex)(July 2009)