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(71) Applicant: **Mondo Marine Eng. Srl**
17100 Savona (IT)

(72) Inventors:
- **Falletta, Calogero**
  16100 Genova (IT)
- **Ausonio, Pierluigi**
  18038 Sanremo (Imperia) (IT)

(74) Representative: **Bosotti, Luciano**
c/o Buzzi, Notaro & Antonielli d'Oulx Srl,
Via Maria Vittoria, 18
10123 Torino (IT)

(54) Stabilizing fin for watercraft

(57) A stabilizing fin (10) for watercraft is, at least for a part (14) thereof, made of flexible material, such as a composite material, a mesh, a perforated lamina, or a textile material. At least the aforesaid flexible part (14) is selectively controllable, via actuators such as fluid actuators, in a movement between a retracted resting position and an active extended position with respect to the hull of the watercraft. In a preferred way, the fin comprises a fixed part (12) that forms a casing for receiving the mobile part (14) of the fin when said fin is in a retracted resting position.

FIG. 2

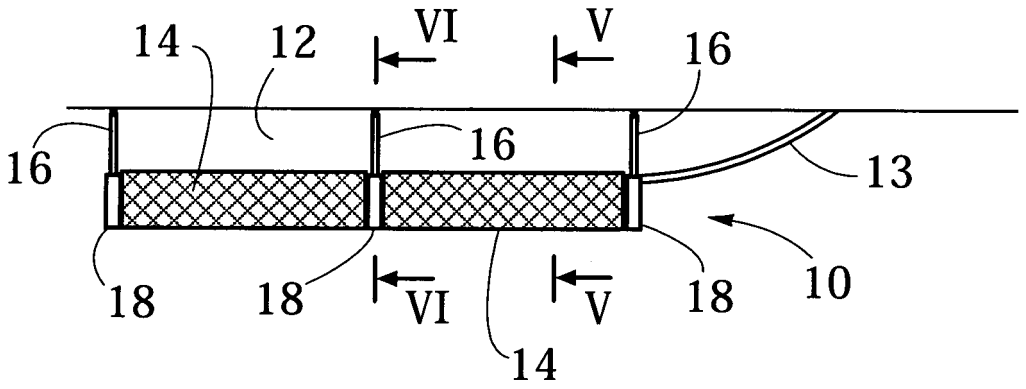

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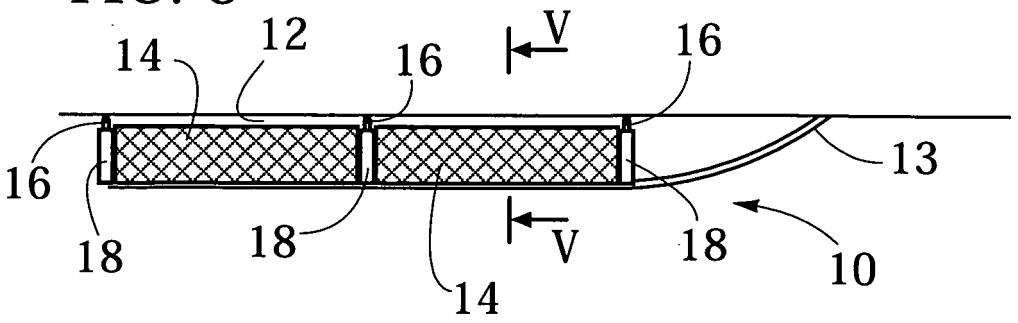
FIG. 3



Description

Field of the invention

[0001] The present invention relates to stabilizing fins for watercraft.

Description of the known art

[0002] The solution of providing stabilizing fins in watercraft corresponds to a widely experimented technique, as emerges from the patent literature, for example, the documents US-A-3 757 723, US-A-5 434 830, or JP-A-60029393.

[0003] In particular, a widely known technique provides for making fins in the form of retractile fins, hence mobile between a resting position and an active position in which, respectively, the fin is retracted and projects from the hull of the watercraft.

[0004] Stabilizing fins of a conventional type have been devised and studied with the intent of countering the movements of roll of the watercraft during navigation. Consequently, these fins are substantially conceived according to a compromise between the stabilizing action, which would require fins of dimensions as wide as possible, and the need to prevent the fin from offering excessive resistance to the advance of the watercraft, a requirement that would call, instead, for minimization of the dimensions of the fin.

[0005] In particular, the fact of possibly making the fin as a retractile structure moves in the direction of enabling the fin to "disappear" when its stabilizing function is not required.

[0006] In the case of watercraft for pleasure boats, the problem of stabilization in regard to the motions about the longitudinal axis through the body of the watercraft (i.e., the "roll-control" function) tends to be perceived from a slightly different standpoint. These are in fact watercraft designed to be used frequently as prestige dwellings proper, particularly in conditions of mooring in a port or in open berth, hence in conditions in which movements of roll, which are normally acceptable in navigation tend to be perceived as in practice intolerable.

[0007] This imposes as practically imperative the choice of providing stabilizing fins of large dimensions, hence ones able to exert their stabilizing action, interacting with the fluid medium in stationary or practically stationary conditions. The fact of providing stabilizing fins of large dimensions in turn induces, however, problems linked to the splaying-out of the fins, which, obviously, must be retractable during navigation.

Object and summary of the present invention

[0008] The object of the present invention is to provide a solution that is able to meet in an ideal way the needs outlined previously, which in themselves are in contrast with one another.

[0009] According to the present invention, that object is achieved thanks to a stabilizing fin having the characteristics called for specifically in the ensuing claims.

[0010] The claims form an integral part of the disclosure of the invention provided herein.

Brief description of the annexed drawings

[0011] The invention will now be described, purely by way of non-limiting example, with reference to the annexed drawings, wherein:

- Figure 1 is a partial cross-sectional view of a watercraft provided with stabilizing fins of the type described herein;
- Figures 2 and 3, approximately corresponding to a cross-sectional view according to the line II-II of Figure 1, illustrate a stabilizing fin of the type described herein, respectively in the resting position, where it is retracted, and in the active position, where it is extended;
- Figure 4 is a cross-sectional view according to the line IV-IV of Figure 2; and
- Figures 5 and 6 are cross-sectional views according to the lines V-V and VI-VI of Figure 3.

Detailed description of examples of embodiment

[0012] In the cross-sectional view of Figure 1, the reference C indicates as a whole the hull of a watercraft in cross-sectional view (the so-called "midship section").

[0013] Of course, Figure 1 shows only part of that section and makes clearly evident, in a particularly advantageous form of use, a stabilizing fin 10 located in a position corresponding to an edge S of the hull C.

[0014] In a particularly preferred embodiment, the fin 10 comprises a fixed part 12 and a mobile part 14.

[0015] The fixed part 12 substantially resembles a fin keel that extends from the hull C and preferentially has "streamlining" (more correctly, favourable fluid-dynamic) characteristics, given, for example, by the presence of a radiusing part 13, located at the end of the fin facing the bow of the watercraft.

[0016] Preferentially, the fixed part 12 of the fin 10 is also designed to constitute a sort of hollow shell that is able to receive inside it the mobile part 14 in the retracted position.

[0017] As may be immediately appreciated from the comparison of the views of Figures 2 and 3, the aforesaid mobile part 14 is selectively mobile between:

- a resting position (represented in Figure 2), in which the mobile part 14 is retracted within the fixed part 12; and
- an active position (represented in Figure 3), in which the mobile part 14 projects on the outside of the fixed part 12.

[0018] As regards the choice of the materials, the fixed part 12 is typically made in the form of a hollow shell made of a material (for example, a structural composite material) of the type commonly used for making the hulls of watercraft, such as pleasure boats.

[0019] The mobile part 14 assumes the form of a flexible element, such as for example a fibre-based composite material.

[0020] Without prejudice to the characteristics of flexibility of the part 14, for construction thereof alternative choices are of course possible, such as for example a mesh, a perforated lamina, or also textile materials, such as, for example, the materials used for making sails.

[0021] The movement of splaying-out of the mobile part 14 of the fin 10 is controlled via actuators, constituted, for example, by three fluid jacks 16, mounted within the fixed part 12, the cylinders 18 of which support the mobile part 14 of the fin 10 in positions distributed along its longitudinal extension.

[0022] Just to give an idea (of course, without this implying any limitation of the scope of the invention), the fin 10 can have an overall length (common to the fixed part 12 and to the mobile part 14, hence neglecting the radiusing part 13) of in the region of four to six metres.

[0023] The "width" of the mobile part 14 (and hence the homologous dimension of the fixed part 12 that receives it in the retracted position) can be in the region of approximately 50 cm. This means that, in the extended position (Figure 3), the fin 10 as a whole projects from the hull C for an amount equal to approximately one metre.

[0024] Instead, in the retracted position of Figure 2, the fin 10 (with the mobile part 14 retracted within the fixed part 12) projects with respect to the hull by an amount equal to approximately 50 cm.

[0025] The dimensions indicated above (which are not intended in a limiting sense) in any case give quite a precise idea of the fact that the movement of splaying-out of the mobile part 14 (more fully represented in the sequence of Figures 4 to 6), involves the translation of the stems of the jacks 16 with extents of travel on somewhat extensive relative distances, distances which, in the presence of a mobile rigid part 14, would easily give rise to phenomena of jamming, with consequent jamming of the fin.

[0026] In the solution described herein, possible phenomena of jamming are prevented precisely because the mobile part 14 is flexible (and possibly also very flexible).

[0027] The choice of making the mobile part 14 with a flexible material is in open contrast with the most evident choices linked to the construction of stabilizing fins of a traditional type, designed to be used during navigation. Fins of this type, made with characteristics of flexibility, would in fact have a very adverse effect on the characteristics of advance of the watercraft.

[0028] At the same time, the fact that the mobile part 14 is flexible also facilitates reception of the same mobile part 14 in the retracted position within the fixed part 12 (or, possibly - according to a possible variant embodiment (not illustrated) - directly within the hull).

[0029] Even though the figures presented herein refer to a mobile part 14 that substantially maintains its shape during the movement between the extended position and the retracted position, the flexibility of the fin also makes it possible to impart thereon possible deformations in the sense of at least partial folding, with consequent reduction of the volume occupied in the retracted condition.

[0030] The embodiment illustrated herein, with the fin 10 comprising a fixed part 12 and a mobile part 14, presents two important advantages:

- it enables creation of a stabilizing fin of a hybrid type, usable both in navigation (with the mobile part 14 retracted within the fixed part 12), and at anchor (with the mobile part 14 splayed out on the outside of the fixed part 12); and
- it enables the installation of the fin 10 also on already existing hulls; the assembly comprised of the fixed part 12 and the mobile part 14 can in fact constitute a sort of self-contained kit that may be applied on a pre-existing hull, preferentially in an edge position.

[0031] The reference number 20 designates ultrasound generators (represented just in Figure 1), located in a position corresponding to the area around the opening of the fixed part 12, through which the movement of extension of the mobile part 14 is obtained. The generators 20 are designed to perform an counteracting function with respect to the formation of encrustations and of deposits of micro-organisms, seaweed etc., which could jeopardize free movement of extension and retraction of the mobile part 14.

[0032] Of course, without prejudice to the principle of the invention, the details of construction and the embodiments may vary widely with respect to what is described and illustrated herein, without thereby departing from the scope of the present invention, as defined by the annexed claims. For example, even though the embodiment illustrated herein envisages that the fin 10 is flexible only in the mobile part 14, the invention also applies to the case where the entire fin 10 presents characteristics of flexibility and/or where the entire fin is retractile within the hull. Furthermore, it is possible to envisage that, in particular conditions of use, the movement of splaying-out of the fin will occur only partially, i.e., without reaching the position of complete extension.

Claims

1. A stabilizing fin (10) for watercraft, **characterized in that** it is, at least for a part (14), flexible.

2. The fin according to Claim 1, comprising a flexible part (14) constituted by a flexible structure.

3. The fin according to Claim 1 or Claim 2, comprising a flexible material chosen between a composite material, a mesh, a perforated lamina, and a textile material.

4. The fin according to any one of the preceding claims, in which, at least in said flexible part (14), the fin (10) is selectively controllable (16) in a movement between a retracted resting position and an active extended position.

5. The fin according to Claim 4, coupled to at least one actuator element (16) for controlling said movement between said retracted resting position and said active extended position.

6. The fin according to Claim 4, with associated thereto a plurality of actuator elements (16) acting on said fin (10) in a position corresponding to a flexible part (14) of the fin (10) itself.

7. The fin according to Claim 5 or Claim 6, in which said at least one actuator element (16) is a fluid actuator.

8. The fin according to any one of the preceding claims, comprising:

- a fixed part (12); and
- a mobile part (14), selectively controllable (16) in a movement between a retracted resting position and an active extended position.

9. The fin according to Claim 8, in which said fixed part (12) forms a casing for receiving said mobile part (14) in said retracted resting position.

FIG. 1

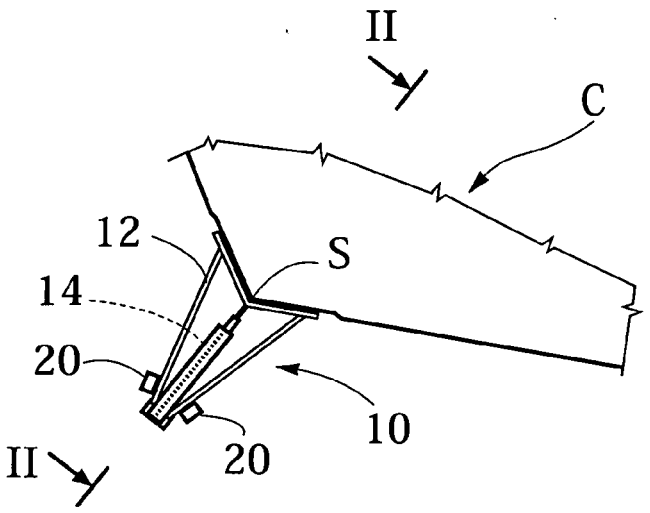


FIG. 2

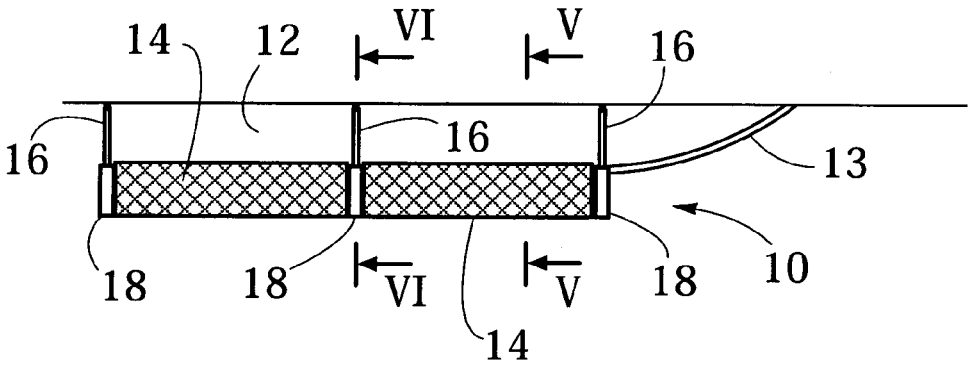


FIG. 3

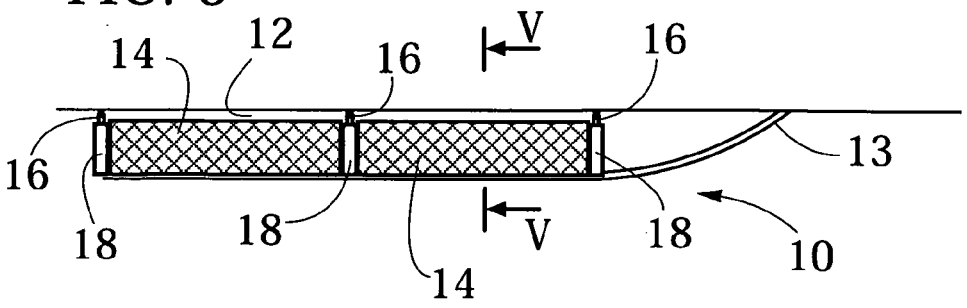


FIG. 4

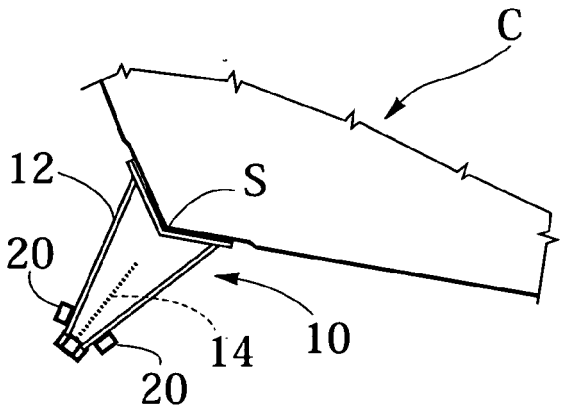


FIG. 5

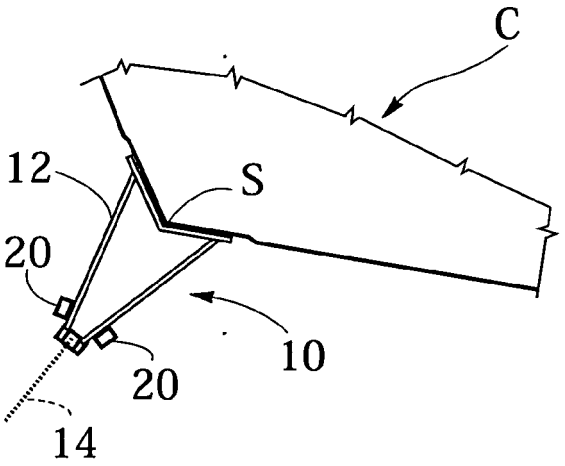
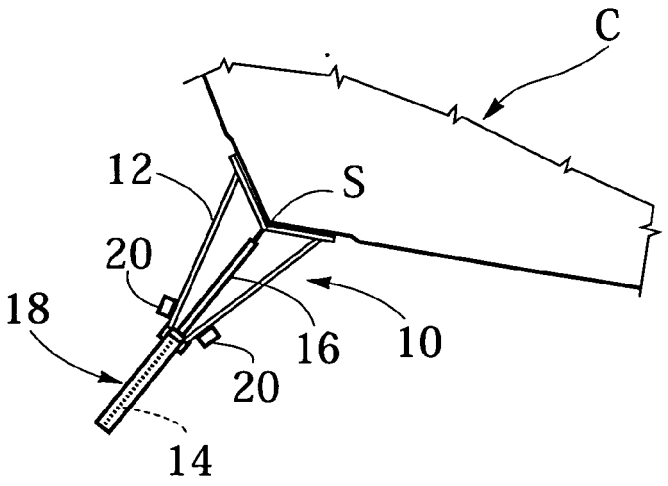


FIG. 6



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EUROPEAN SEARCH REPORT

Application Number
EP 07 42 5280

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	GB 2 322 334 A (BRYANT STEPHEN JAMES [GB]) 26 August 1998 (1998-08-26) * abstract; figures * -----	1-3	INV. B63B3/44 B63B39/06
X	WO 2004/043774 A (GIBBS TECH LTD [GB]; JENKINS NEIL GRAHAM [GB]) 27 May 2004 (2004-05-27) * abstract; figures * -----	1-3	

TECHNICAL FIELDS SEARCHED (IPC)

B63B

~~The present search report has been drawn up for all claims~~

Place of search	Date of completion of the search	Examiner
Munich	19 October 2007	Nicol, Yann

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
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P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
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& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

European Patent Office

Application Number
EP 07 42 5280

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

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

see sheet B

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

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

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

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

1-3

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

European Patent Office

LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 07 42 5280

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

1. claims: 1-3

Flexible stabilizing fin
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2. claims: 4-9

Retractable stabilizing fin

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 07 42 5280

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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19-10-2007

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 2322334 A	26-08-1998	NONE	
WO 2004043774 A	27-05-2004	AU 2003301976 A1	03-06-2004
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EPO FORM P0459

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

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 3757723 A **[0002]**
- US 5434830 A **[0002]**
- JP 60029393 A **[0002]**