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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, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, 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, 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.

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(54) **Title:** MOBILE SOLITON WAVE GENERATING APPARATUS

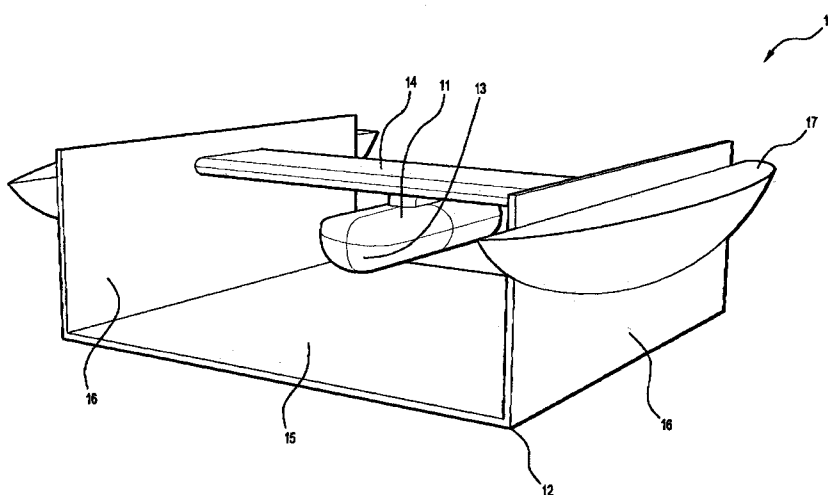


FIG. 1

(57) **Abstract:** A mobile soliton generating apparatus (10) comprising: a water displacement body (11) adapted to generate a soliton as the mobile soliton generating apparatus (10) moves through a body of water; a channel formation (12) associated with the water displacement body (11) and extending beneath the water displacement body (11), wherein the water displacement body (11) and the channel formation (12) are adapted to maintain a fixed positional relationship to one another in use.



MOBILE SOLITON GENERATING APPARATUS

FIELD OF INVENTION

5 The present invention relates to a mobile soliton generating apparatus. In particular, the invention relates to a mobile soliton generating apparatus that includes a water displacement body housed within a channel formation.

BACKGROUND ART

10

Generation of surface waves by movement of a submerged body through the water or hull across the water surface is known. For example, bow waves are generated as the bow of a ship or boat moves through a body of water. As bow waves spread out, they define the outer limits of a ship's wake.

15

A soliton is a type of surface wave that forms in front of a submerged body moving at a certain speed along a narrow channel. The speed of the submerged body combined with depth of the channel determines the magnitude of the resulting soliton. For any given depth of channel there is an exact speed at which a soliton will form.

20

Accordingly, different sized waves are generated depending on the depth of the channel in tandem with a corresponding adjustment in speed. The channel prevents the resulting wave from spreading out laterally and dissipating its energy, which consequently increases in magnitude.

25

With increasing popularity of surfing and crowding of popular surf locations in many countries wave generating machines have been devised. The machines and systems devised have included, for example, circular wave pools where wave are generated by a hull or other wave generating body moving through the water, generally in combination with directional water flow in the pool. In such cases, the physical characteristics of the pool, such as pool floor depth and shape, side wall configuration and so on, may also impact on wave generation and are important aspects of any design.

30

Many of these types of pool are relatively energy intensive in their operation. Also, they are generally not applicable to existing bodies of water. That is, they are a pool and the mechanisms used are not appropriate for application in naturally existing bodies of water.

5

The subject matter claimed herein is not limited to embodiments that solve any disadvantages or that operate only in environments such as those described above. Rather, this background is only provided to illustrate one exemplary technology area where some embodiments described herein may be practice.

10

SUMMARY OF INVENTION

The present invention relates to a mobile soliton generating apparatus. In particular, the invention relates to a mobile soliton generating apparatus that includes a water displacement body housed within a channel formation.

15

According to one aspect of the invention there is provided a mobile soliton generating apparatus comprising:

20

a water displacement body adapted to generate a soliton as the mobile soliton generating apparatus moves through a body of water;

a channel formation associated with the water displacement body and extending beneath the water displacement body;

wherein the water displacement body and the channel formation are adapted to maintain a fixed positional relationship to one another in use.

25

The water displacement body and the channel formation may be entirely separate to one another. For example, the water displacement body may be mounted on a first movable support and the channel formation mounted on a second movable support. However, generally the water displacement body and the channel formation are directly or indirectly connected to one another. For example, the water displacement body may be suspended from a transverse beam that spans the channel formation, although various other arrangements may be equally suitable.

30

The form of the water displacement body is not particularly limited. For example, this may take the form of a wing or other body that extends transversely within the channel formation. In a particular embodiment, the water displacement body comprises a substantially cylindrical body whose longitudinal axis extends longitudinally within the channel formation. The substantially cylindrical body of the water displacement body preferably comprises substantially convex end faces.

The channel formation may also take any suitable form. For example, this may have a curved, parabolic or other contour. In a particular embodiment, the channel formation comprises a floor and opposing side walls extending from the floor. That is, it has a square or rectangular cross section.

In a preferred embodiment, the mobile soliton generating apparatus additionally comprises one or more buoyancy conferring members. For example, the buoyancy conferring members may comprise a pair of buoyant hulls associated with the channel formation, although the invention is not so limited and other forms may be equally suitable. The buoyant hulls are preferably affixed to opposing outer sides of the channel formation.

According to another aspect of the invention there is provided a method for generating a soliton comprising:

moving, a water displacement body through a body of water; and

moving a channel formation through the body of water beneath the water displacement body to form the soliton within the channel formation,

wherein the water displacement body and the channel formation are moved through the body of water at the same speed and at a fixed positional relationship to one another.

In a preferred embodiment, the water displacement body and the channel formation are moved towards an incline in a floor gradient of the body of water. In particular, the water displacement body and the channel formation are preferably moved diagonally towards the incline in the floor gradient of the body of water. According to this embodiment, the soliton is preferably released from the channel formation by slowing the water displacement body and the channel formation as they approach the incline in the floor

gradient of the body of water. This advantageously results in a surfable wave front that breaks progressively in a lateral direction as it approaches the shallower water.

5 The water displacement body and the channel formation are moved through the body of water at a speed predicated by the depth of the channel formation.

The present invention consists of features and a combination of parts hereinafter fully described and illustrated in the accompanying drawings, it being understood that various changes in the details may be made without departing from the scope of the invention or
10 sacrificing any of the advantages of the present invention.

BRIEF DESCRIPTION OF ACCOMPANYING DRAWINGS

To further clarify various aspects of some embodiments of the present invention, a more
15 particular description of the invention will be rendered by references to specific embodiments thereof, which are illustrated in the appended drawings." It is appreciated that these drawings depict only typical embodiments of the invention and are therefore not to be considered limiting of its scope. The invention will be described and explained with additional specificity and detail through the accompanying drawings in which:

20

FIG. 1 illustrates a mobile soliton generating apparatus.

FIG. 2 illustrates a front view of the mobile soliton generating apparatus of Figure 1.

25 FIG. 3 illustrates a plan view of the mobile soliton generating apparatus of Figure 1.

FIG. 4 illustrates another perspective view of the mobile soliton generating apparatus of Figure 1.

30 FIG. 5 illustrates a side view of the mobile soliton generating apparatus of Figure 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention relates to a mobile soliton generating apparatus. In particular, the invention relates to a mobile soliton generating apparatus that includes a water displacement body housed within a channel formation .
5

Hereinafter, this specification will describe the present invention according to the preferred embodiments. It is to be understood that limiting the description to the preferred embodiments of the invention is merely to facilitate discussion of the present invention and it is envisioned without departing from the scope of the appended claims.
10

Referring to the Figures, a mobile soliton generating apparatus 10 is illustrated. The mobile soliton generating apparatus 10 includes a water displacement body 11 and a channel formation 12 extending beneath the water displacement body 11. The water displacement body 11 is substantially cylindrical with convex end faces 13. It is suspended from a beam 14 that spans the channel formation 12. The beam 14 is designed so that it moves through the water with minimal drag. As depicted, the water displacement body 11 and channel formation 12 are indirectly joined through the beam 14. However, as discussed above, these components of the mobile soliton generating apparatus 10 need not be so connected, provided they are adapted to maintain a fixed positional relationship to one another in use.
15
20

The channel formation 12 is rectangular in cross section and includes a floor 15 and two opposing walls 16. The depth of the channel formation 12 is generally determined based on the height of the soliton and resulting wave that is desired.
25

A pair of buoyant hulls 17 is provided, one being disposed on the outer side of each of the side walls 16 of the channel formation 12. The buoyant hulls 17 impart buoyancy to the mobile soliton generating apparatus 10.
30

As the mobile soliton generating apparatus 10 moves through the water, a soliton is generated on the surface of the water within the channel formation 11. In use, the mobile soliton apparatus 10 is moved through the water in a direction diagonally towards an

incline in the gradient of the floor of the body of water. Once the soliton is generated, movement of the mobile soliton generating apparatus 10 is halted, resulting a wave that breaks laterally as it approaches the shallower water.

5 It is envisaged that the mobile soliton generating apparatus 10 may be moved through the body of water using, for example, a system including tracks or rails. Such a system may be driven by any means as would be readily appreciated by a person of skill in the art. For example, a cable may be employed to impart movement to the mobile soliton generating apparatus 10. In such a case, the mobile soliton generating apparatus 10
10 may be mounted on the cable, or other mechanism, by any suitable means. It may be that the mobile soliton generating apparatus can be towed by a powered vessel or may be self-powered. All such embodiments are within the ambit of the present invention.

It is envisaged that the ability to produce surf within a body of water, such as a lake,
15 river, estuary or ocean shoreline, may provide substantial cost savings compared with building a wave pool complex.

Unless the context requires otherwise or specifically stated to the contrary, integers, steps or elements of the invention recited herein as singular integers, steps or elements
20 clearly encompass both singular and plural forms of the recited integers, steps or elements.

Throughout this specification, unless the context requires otherwise, the word "comprise", or variations such as "comprises" or "comprising", will be understood to imply
25 the inclusion of a stated step or element or integer or group of steps or elements or integers, but not the exclusion of any other step or element or integer or group of steps, elements or integers. Thus, in the context of this specification, the term "comprising" is used in an inclusive sense and thus should be understood as meaning "including principally, but not necessarily solely".

30 It will be appreciated that the foregoing description has been given by way of illustrative example of the invention and that all such modifications and variations thereto as would be apparent to persons of skill in the art are deemed to fall within the broad scope and ambit of the invention as herein set forth.

CLAIMS

1. A mobile soliton generating apparatus comprising :
- 5 a water displacement body adapted to generate a soliton as said mobile soliton generating apparatus moves through a body of water;
- a channel formation associated with said water displacement body and extending beneath said water displacement body:
- wherein said water displacement body and said channel formation are adapted to maintain a fixed positional relationship to one another in use.
- 10
2. A mobile soliton generating apparatus according to claim 1, wherein said water displacement body and said channel formation are directly or indirectly connected to one another.
- 15
3. A mobile soliton generating apparatus according to claim 2, wherein said water displacement body is suspended from a transverse beam that spans said channel formation.
- 20
4. A mobile soliton generating apparatus according to any one of the preceding claims, wherein said water displacement body comprises a substantially cylindrical body whose longitudinal axis extends longitudinally within said channel formation.
- 25
5. A mobile soliton generating apparatus according to claim 4, wherein said substantially cylindrical body of said water displacement body comprises substantially convex end faces.
- 30
6. A mobile soliton generating apparatus according to any one of the preceding claims, wherein said channel formation comprises a floor and opposing side walls extending from said floor.
7. A mobile soliton generating apparatus according to any one of the preceding claims, additionally comprising one or more buoyancy conferring members.

β. A mobile soliton generating apparatus according to claim 7, wherein said buoyancy conferring members comprise a pair of buoyant hulls associated with said channel formation,

5

9. A mobile soliton generating apparatus according to claim 8, wherein said buoyant hulls are affixed to opposing outer sides of said channel formation.

10. A method for generating a soliton comprising :

10

moving a water displacement body through a body of water; and
moving a channel formation through said body of water beneath said water displacement body to form said soliton within said channel formation,
wherein said water displacement body and said channel formation are moved through said body of water at the same speed and at a fixed positional relationship to one another.

15

11. A method according to claim 10, wherein said water displacement body and said channel formation are moved towards an incline in a floor gradient of said body of water.

20

12. A method according to claim 11, wherein said water displacement body and said channel formation are moved diagonally towards said incline in said floor gradient of the body of water.

25

13. A method according to claim 11 or 12, wherein said soliton is released from said channel formation by slowing said water displacement body and said channel formation as they approach said incline in said floor gradient of the body of water.

30

14. A method according to any one of claims 10 to 13, wherein said water displacement body and said channel formation are moved through said body of water at a speed predicated by the depth of said channel formation.

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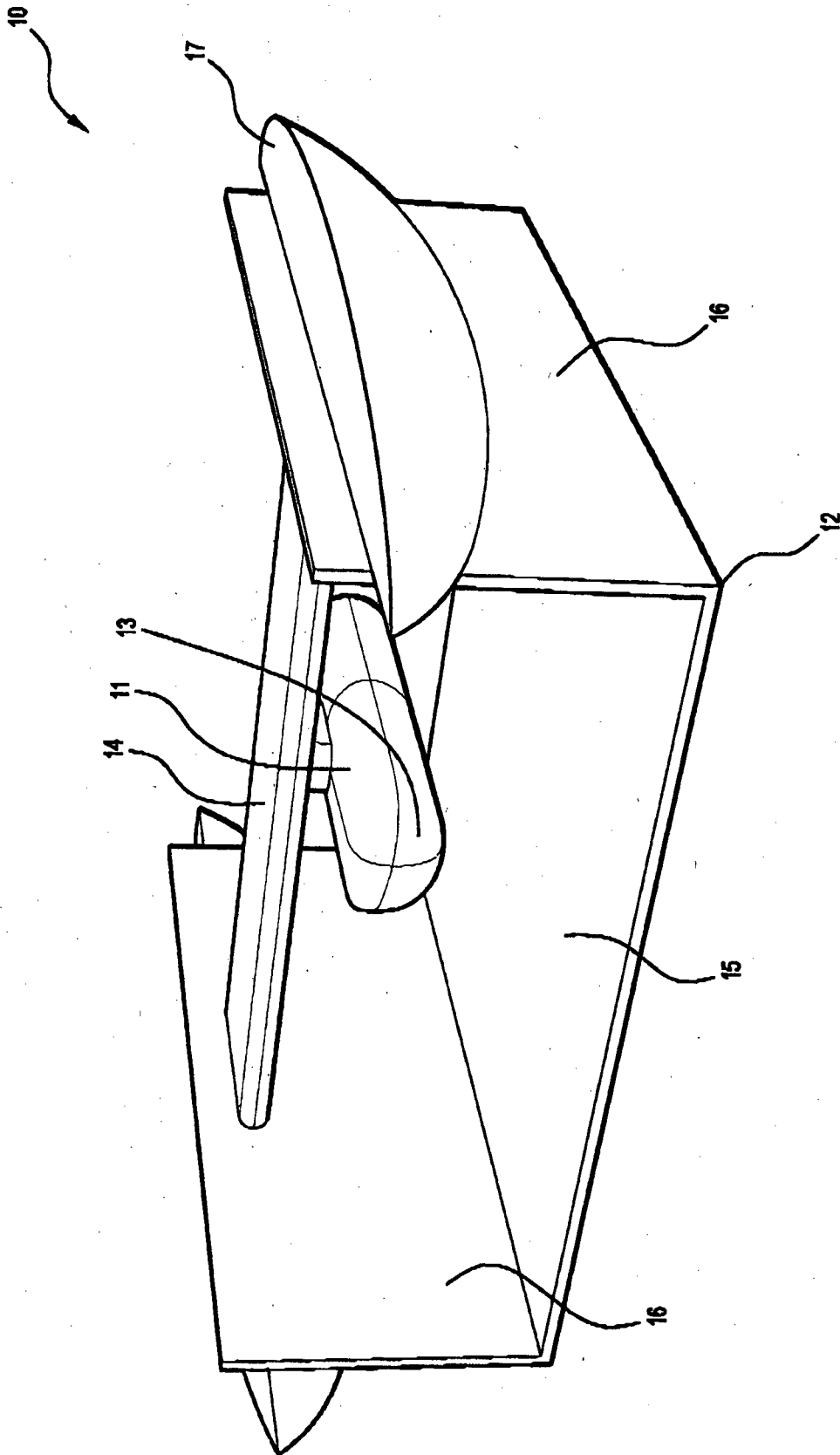


FIG. 1

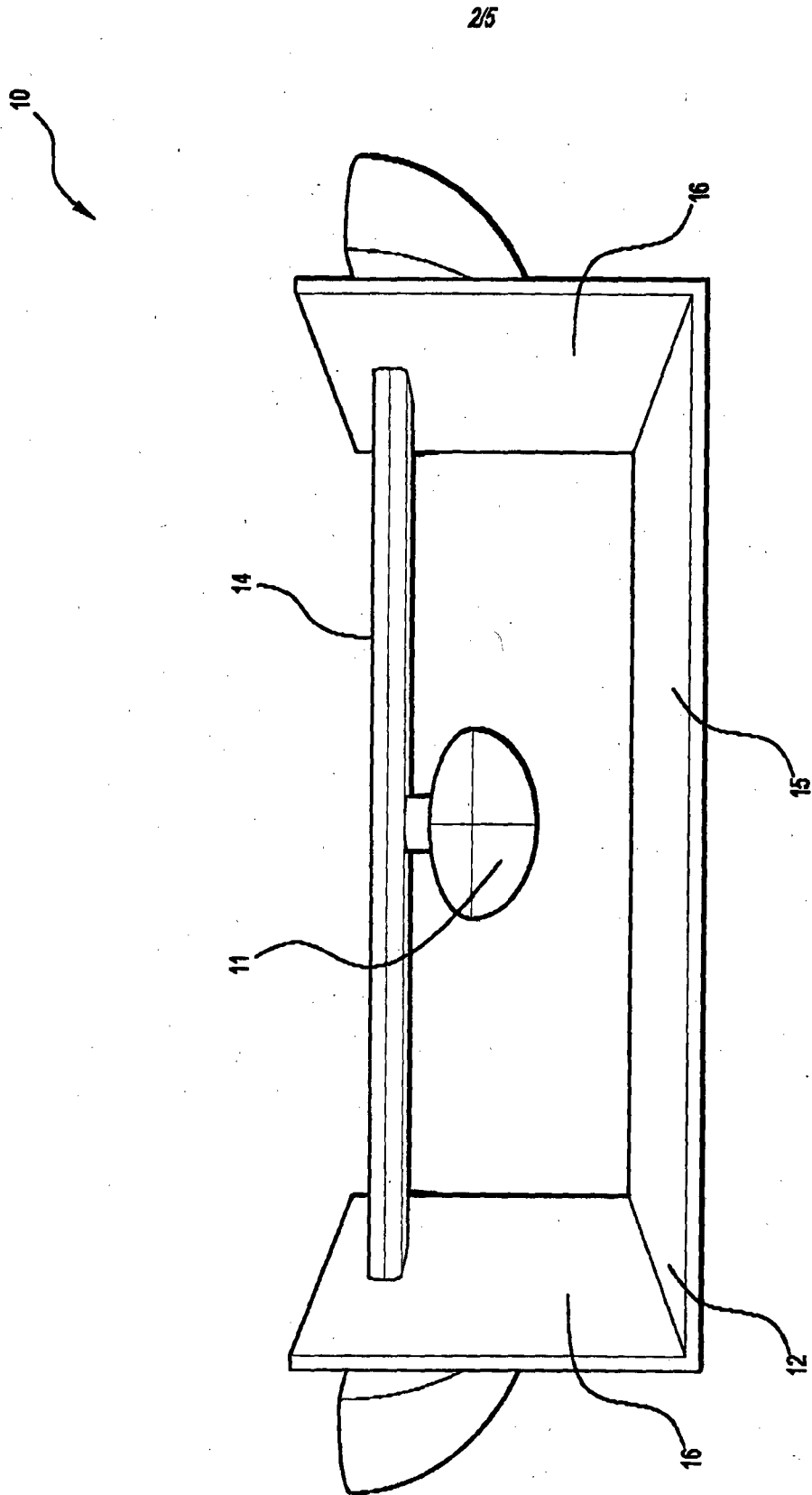


FIG. 2

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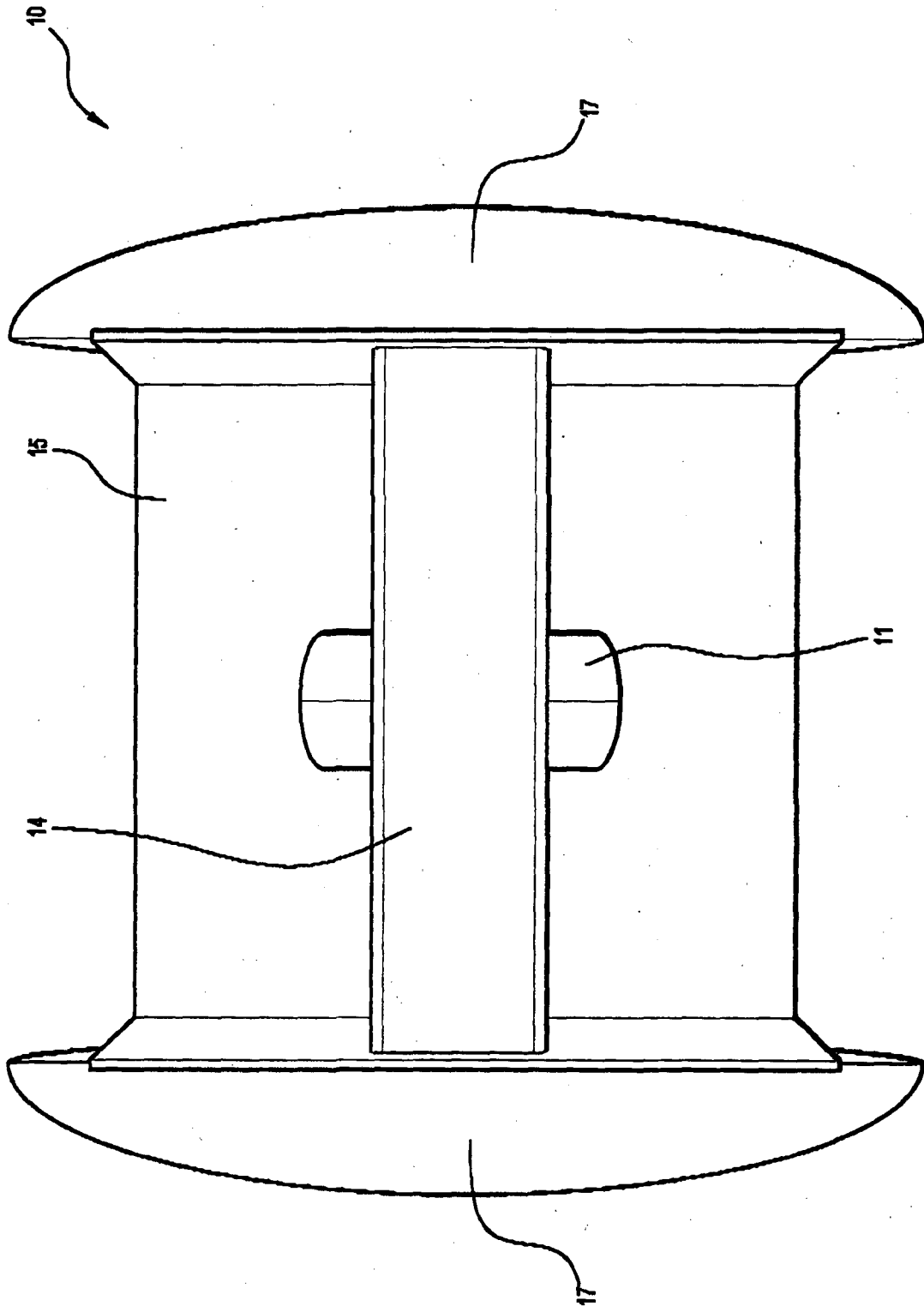


FIG. 3

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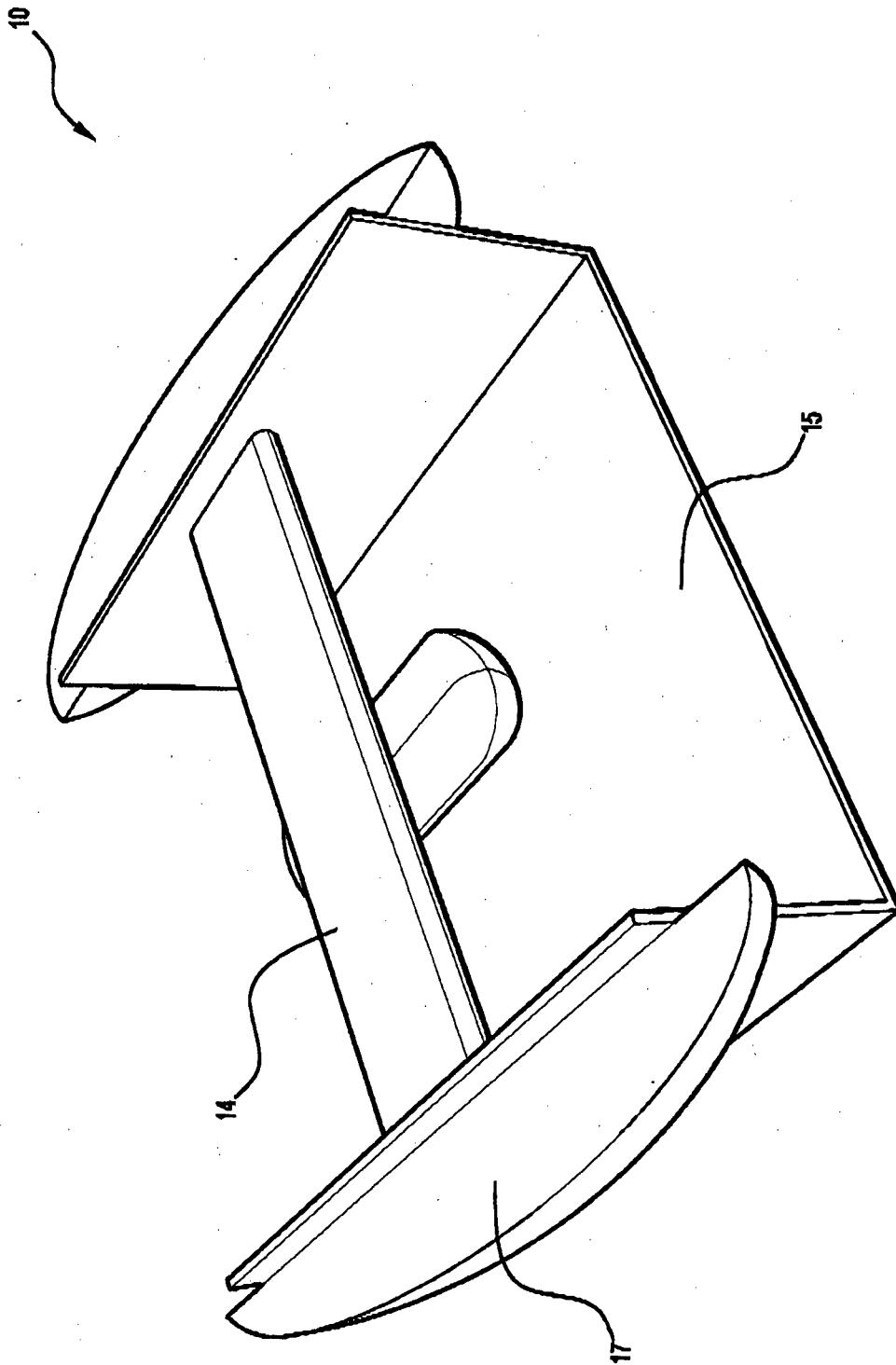


FIG. 4

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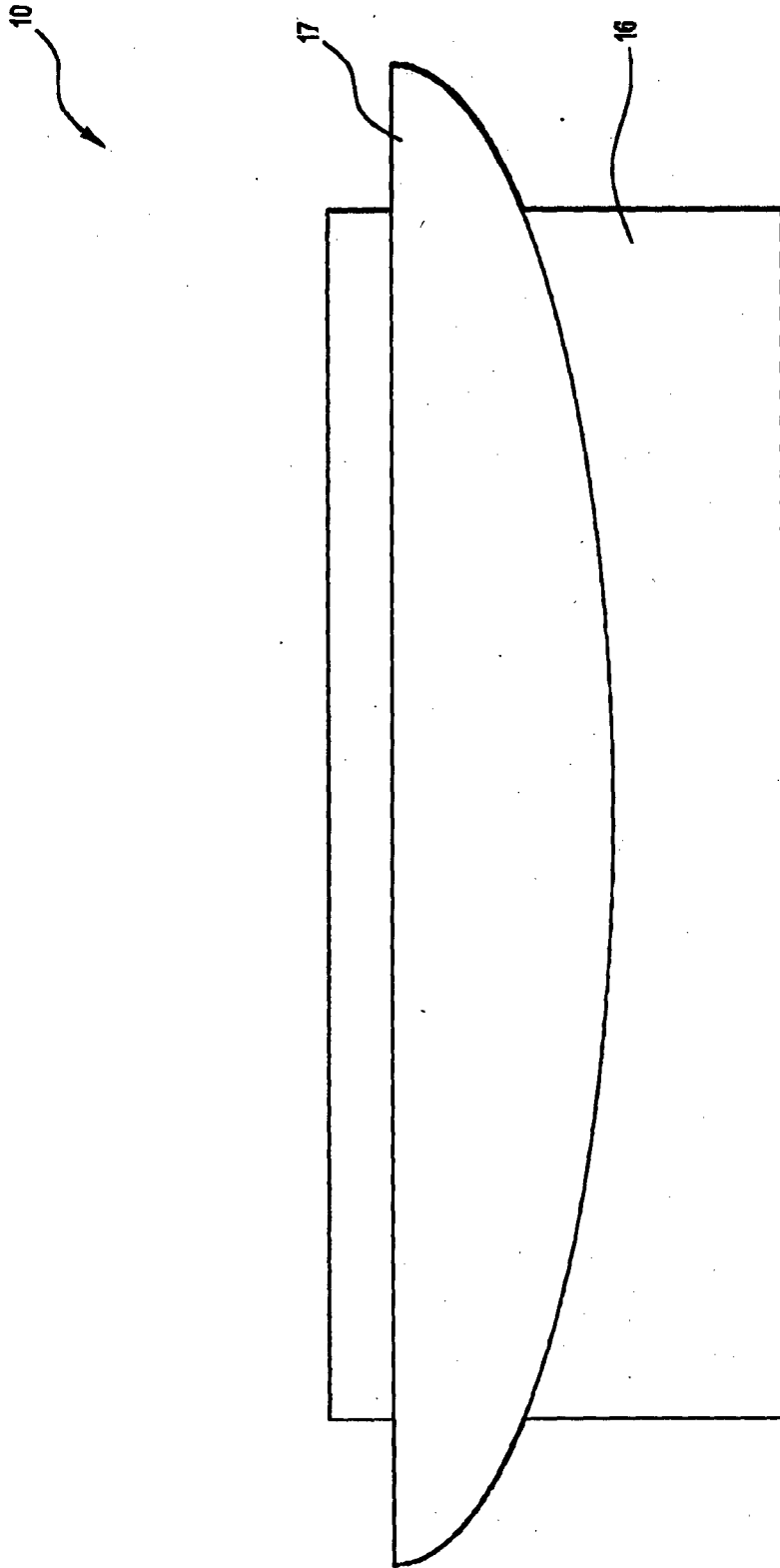


FIG. 5

INTERNATIONAL SEARCH REPORT

International application No.

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A. CLASSIFICATION OF SUBJECT MATTER

E04H 4/14 (2006.01) A63B 69/00 (2006.01) A63C 19/00 (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)

WPI, EPODOC: IPC, ECLA: E04H4/-, A63B69/00; ECLA: A63C19/00U ; Keywords: wave, surf, generate, produce, create, form, mobile, move, travel, underwater, submerge and like terms.

US Class mark 405/79 with the above keywords.

Total Patent - Authorities CN, JP, KR

IPC: A63C19/00, E04H4/-, A63B69/00/- ; Keywords: wave, surf, generate, create, produce, form, move, moving, travele, guide, mobile, underwater, submerg, submarine and like terms.

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:

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Date of the actual completion of the international search
18 December 2012Date of mailing of the international search report
18 December 2012

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INTERNATIONAL SEARCH REPORT

International application No.

C (Continuation).

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