

Marine beacon having independent power generation

TECHNICAL FIELD

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[001] The present invention relates to a marine beacon which may be independently powered through the generation of power, including electrical power by the movement of water in particular such electricity generated by the movement of water to be used for the purposes of powering navigational aids
10 such as lighthouses, buoys, fog signals, light beacons, radar reflectors, radio beacons, sonic or visual signals and the likes.

BACKGROUND ART

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[002] Today commercial transportation of cargoes, goods and passengers from one location to another location is still primarily carried out by waterway transportation. Waterways are also being increasing used for recreational and research purposes, as such it is extremely critical for these nautical voyages to
20 be properly and safely guided through water to ensure safe passage. For this reason, most maritime authorities have adopted a uniform system of buoyage to guide ship vessels in their nautical travel through these heavily crowded or treacherous waters.

[003] During nautical travel, to guide ship vessels when they navigate in the open sea, it is often that navigational aids such as lighthouses, off-shore platforms, buoys, fog signals, light beacons, radar reflectors, radio beacons, sonic or visual signals and the likes are being used to prevent the ship vessels
5 from accidental collisions at sea or to prevent ship vessels from losing their navigational course in their nautical travel. In this specification, these devices are referred to collectively as “**navigational aid**” or “**marine beacon**”.

[004] In order for these navigational aids to continuously function under
10 all weather conditions in the sea, they require steady and continuous power supply to enable them properly and effectively function at all times. At present, one of the methods of ensuring that these navigational aids is functioning properly and effectively is by way of conducting regular physical maintenance of these aids. This physical maintenance is typically conducted by the
15 respective maritime authorities or bodies overseeing such areas of responsibility; and the most important step of maintenance involves the servicing, charging, changing or replacement of the power supplies or generators to such navigational aids. Many of these navigational aids are being powered by lead acid accumulators, solar cells and solar panels, acoustic and
20 microwave power supplies and generators. During maintenance, these power supplies or generators are being serviced, charged, changed or replaced depending on their respective conditions and effective functionalities. One of the main disadvantages of this form of power supplies or generators is the need for such regular maintenance in order that they could continue functioning

properly and effectively or such power supplies or generators rely on the conditions of the weather in order to deliver continuous and uninterrupted power supplies to these navigational aids.

5 [005] While U.S. Patent No. 3,662,180 (Jorgensen et al.) discloses an invention that relates to an angle coding navigational beacon that comprises of radiant energy projector in combination with a coded mask whereby an angle dependent code is projected into space. Such angular disposition of a remote observer or receiver may be determined relative to the axis of the beacon by
10 the type, number and sequence of energy pulses received during a predetermined time interval. It is described in the invention that the navigational beacon is amenable with a variety of energy sources including optical, acoustic and microwave energy. These varieties of energy sources suggested in the invention require expensive and regular maintenance.

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[006] In U.S. Patent No. 5,016,227 (John H. Turner, Jr.), the invention disclosed is directed to a top mounted buoy signaling device which is suitable for private applications. The buoy signaling device is inexpensive, suitable for prolonged use in marine environments and has a configuration facilitating
20 emplacement and/or removal. The configuration of the buoy signaling device also facilitates in situ servicing and/or component replacement. However, the device is designed to utilize off-the-shelf batteries as power sources and thereby requiring the periodic replacement of the power sources each time the off-the-shelf batteries deplete.

[007] In fresh waterways such as rivers where the direction of water flow is unchanging, it may be possible to deploy hydraulic mill-type of generator such as that disclosed in U.S. Patent No. **7,033,111** (Lee). However, in estuarial, littoral or marine environments, it may be more practical to harness energy from the constantly moving and directionless waves and underwater currents to power the marine beacon. For example, in U.S. Patents No. **4,286,347** (Modisette) and No. **4,383,413** (Wells) and the rising and falling motion of the waves are harness by way of translating them into vertical movements of trapped air to turn turbines. Sometimes, the translated air movement by assisted by piston and one-way valve means such as in U.S. Patent No. **5,701,740** (Tveter). In U.S. Patent No. **4,492,875** (Rowe) the rocking motion of the waves are translated into solenoid action by a magnetized ball rolling about the insides of a hollow spherical buoy which is lined with wire windings, thus directly translating the waves motion into electricity.

[008] The present invention relates to another form of regenerative energy, that is, energy from the movement of ocean waves. This form of generator powered by the movement of ocean waves allows electrical energy to be made available on a continually basis without the need for re-charging or replacement. Further, it does not depend on the condition of the climate in order to ensure that it can continually function. The invention can continue to generate power as long as there is movement of water waves. In this manner, the supply of power to the navigational aids is consistent and continual,

generally, this invention allows the navigational aids to be more effective and require less maintenance effort.

[009] Any discussion of documents, devices, acts or knowledge in this
5 specification is included to explain the context of the invention. It should not be
taken as an admission that any of the material forms a part of the prior art base
or the common general knowledge in the relevant art in Singapore or
elsewhere on or before the priority date of the disclosure and claims herein. All
statements as to the date or representation as to the contents of these
10 documents is based on the information available to the applicant and does not
constitute any admission as to the correctness of the dates or contents of these
documents

15 SUMMARY OF THE INVENTION

[0010] We therefore endeavour to provide in the present invention a marine
beacon useful as a navigational aid which may harness underwater current to
drive a turbine to generate electricity independently and for a self sustained
20 operation.

[0011] In a general embodiment of our invention, a marine beacon is
provided for providing navigational aid comprising at least a float; a signalling
means mounted relative to said float, above water surface; and a propellor-
driven turbine mounted relative to said float, below water surface, wherein the

turbine generates at least requisite energy to operate the signaling means. The signalling means may include any one or combination of a lighting, radio transmitter, fog horn or sonar emitter, and is preferably controlled by an electronic module which may be hermetically sealed in a housing.

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[0012] In one aspect of our invention, the marine beacon is provided with a base support for mounting thereon other components, such as for mounting the signalling means atop said base support; mounting the turbine to the bottom of the base support; and mounting the float to the base support in relative
10 buoyancy so as to place said turbine under water level and the signalling means above water level. Preferably, the electronic module housing is integral with the base support.

[0013] In another aspect, a plurality of floats may be provided in a
15 distributed arrangement to provide relative buoyancy.

[0014] In yet another aspect, the power generated from our marine beacon's turbine may be collected by an accumulator from which the signaling means and/or electronic module may draw their respective operating power.
20 The accumulator is preferably any one or combination of rechargeable battery, capacitor or compulsator.

[0015] Other aspects and preferred aspects are disclosed in the specification and / or defined in the appended claims, forming a part of the

description of the invention.

[0016] Further scope of applicability of the present invention will become apparent from the detailed description given hereinafter. However, it should be understood that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

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BRIEF DESCRIPTION OF DRAWINGS

[0017] Our invention may be better understood with reference to the following drawings for a specific application of our invention, that is, by way of an example of applying the power supply generator to power navigational aids, such as a light beacon, and should not, therefore, be interpreted as being limited to the particular application shown. The figures are collectively referred to in the Detailed Description that follows.

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[0018] FIGURE 1 shows one embodiment of the invention being deployed in the sea serving its function as a navigational aids in guiding ship or vessels in their nautical travel through heavily sailed, crowded or treacherous waters;

[0019] FIGURE 2 shows a detailed perspective view of a component of the navigational aids;

[0020] FIGURE 3 shows a perspective view of the generator used in our
5 marine beacon or navigational aid in using the driving energy of water to convert into electrical power;

[0021] FIGURE 4 shows a perspective view of the navigational aids being deployed with the generator immersed in water; and

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[0022] FIGURE 5 shows a schematic representation of another embodiment of our invention wherein a propeller-driven underwater turbine is employed.

15 DETAILED DESCRIPTION OF SPECIFIC EMBODIMENT

[0023] FIGURE 1 shows an embodiment of the invention in the form of a light beacon afloat in the sea as depicted by numeral 20. When a ship or vessel 12 navigates in the open sea, it is often that navigational aids such as
20 lighthouses, buoys, fog signals, light beacons, radar reflectors, radio beacons, sonic or visual signals and the likes are being used to warn the ship or vessel 12 of hazards at sea or to prevent ship or vessel 12 from losing its navigational course in its nautical travel.

[0024] It is important to note that for safety operation of the ship vessel 12 as it navigates through treacherous waters, the navigational aids that are positioned along the passage of the vessels to guide and provide direction to these ship vessels must not fail and must function properly and expeditiously at all time regardless of the weather condition and the time of the day.

[0025] In view of the importance of the navigational aids functioning properly and expeditiously at all time, the embodiment of the invention 20 must be able to continue function properly and expeditiously at all times, this is achieved through its power supplies or generators that could deliver continuous and uninterrupted power supplies to these navigational aids regardless of the weather condition and the time of the day.

[0026] Our invention embodied as a marine beacon (20) in FIG. 1 may be powered by power supply or generator that converts the movement of ocean wave motion energy into electrical energy for powering the invention. Alternatively, it may recharges a rechargeable battery so that electrical energy is made available on a continuous basis without disruptive power supply. Further, it does not depend on the weather in order to ensure that it can continuously function. The marine beacon (20) can continue to supply power. In this manner, the supply of power to the navigational aids is consistent and continuous. Generally, this invention allows the navigational aids to be more effective and require less maintenance effort.

[0027] FIGURE 2 shows the detailed features of a central component of the apparatus (20) comprising the marine beacon. The apparatus 20 comprises of a base support 30 which is securely fastened to floating buoys or structures 32, and erecting upon the base support includes a housing 26, with a connecting
5 means 24 between the housing 26 and the signal source 22 which can be a light or audio source, an electronic module 28 disposed within the housing 26. An extension 34 from the bottom of the base support 30 provides means to mount a power generator 50 submerged in water as illustrated in FIGURE 3.

10 [0028] The base support 30 is securely fastened to one or more floats 32 or an arrangement of floats to provide sufficient buoyancy to the marine beacon 20 and keeps it afloat on water. In this embodiment, four buoys 32 are used to keep it afloat but it should be noted that the number of floats may be varied according to the weight of the marine beacon (20).

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[0029] The base support 30 can be constructed with light materials such as wood, plastic, PVC or light metal, it is important that the base support 30 is constructed with material that is light in weight yet able to hold and support the structures erected upon it. Equally important is that the base support 30 must
20 not be corroded easily when in contact with sea water.

[0030] Although the housing 26 as shown in FIGURE 2 as being tubular in configuration, it is to be understood that the housing 26 can be configured in other shapes such as rectangular or conical mounted onto the base support 30

so long that it could accommodate and house the electronic modules disposed therein. It is to be further understood that the housing 26 can be configured for mounting to other structures (not shown) so long as the structure that it is being mounted upon could remain afloat including floating wooden plank and floatation gear.

[0031] The signal emitting source 22 which can be a light or audio emitting source is attached to the housing 26 by a connecting means. The electronic module 28 concealed in the housing 26 serves to control the signal emitting source. Power source is required to operate the electronic module 28 in controlling the signal emitting source, as well as to operate the signal emitting source itself.

[0032] In FIGURE 4, the marine beacon 20 is shown with a propeller driven turbine 50 under water surface whereby the bottom of the turbine 50 is attached to a cable 42 at one end while the other end of the cable 42 is attached to an anchor 44 lying on the sea floor. In this configuration, the marine beacon 20 is shown tethered to the anchor 44 and thus allows the beacon 20 some limited freedom of movement according to the underwater current. With a rudder- or fin-like formation 46 provided at the end of the turbine body 50, the turbine may thus be turned to face the direction of under water current to optimally harness the flow of water with the propeller.

[0033] FIGURE 5 illustrates a schematic representation of another

embodiment of a marine beacon (51) wherein a propeller driven turbine (52) is used to harness underwater current for generating electrical power. As discussed in the preceding embodiment, the power generated may be used to charge a rechargeable battery (54) or other forms of electrical energy storage bank. Drawing electricity from this battery (54) to operate the radio emitter (56), electronic control module and the signaling means (58) may provide a stable and continuous power source.

[0034] It may be said that, with the exception of hovercrafts, all watercraft including submarines use propellers for drive, it thus occur to us that this must be the more efficient translation of drive. Conversely, using propeller to harness underwater current and translate it to drive a turbine may be more efficient than the above-discussed wave-driven prior art. As underwater currents may have constantly changing direction of flow, it may be necessary to provide a fin means (not shown) (as the rudder in converse of propeller-driven) to guide the turbine's propeller to optimally and automatically turn to the ever changing direction of flow of the underwater currents.

[0035] As the present invention may be embodied in several forms without departing from the spirit of the essential characteristics of the invention, it should be understood that the above described embodiments are not to limit the present invention unless otherwise specified, but rather should be construed broadly within the spirit and scope of the invention as defined in the appended claims. Various modifications and equivalent arrangements are intended to be included

within the spirit and scope of the invention and appended claims. Therefore, the specific embodiments are to be understood to be illustrative of the many ways in which the principles of the present invention may be practiced. In the following claims, means-plus-function clauses are intended to cover structures as
5 performing the defined function and not only structural equivalents, but also equivalent structures. For example, although a nail and a screw may not be structural equivalents in that a nail employs a cylindrical surface to secure wooden parts together, whereas a screw employs a helical surface to secure wooden parts together, in the environment of fastening wooden parts, a nail and
10 a screw are equivalent structures.

[0036] “Comprises/comprising” when used in this specification is taken to specify the presence of stated features, integers, steps or components but does not preclude the presence or addition of one or more other features,
15 integers, steps, components or groups thereof.”

CLAIMS

We claim:

- 5 1. A marine beacon for providing navigational aid comprising
 - at least a float (32);
 - a signalling means (22) mounted relative to said float (32), above water surface; and
 - a propeller-driven turbine (52) mounted relative to said float (32), below
- 10 water surface, wherein said turbine harnesses underwater currents to generate at least requisite energy useful to operate said signaling means (22).
2. A marine beacon according to Claim 1 wherein the signaling means (22) includes any one or combination of a lighting, radio transmitter, fog horn or
- 15 sonar emitter.
3. A marine beacon according to Claim 1 wherein the signaling means (22) is subject to control by an electronic module (28).
- 20 4. A marine beacon according to Claim 3 wherein the electronic module is hermetically sealed in a housing (28).
5. A marine beacon according to Claim 1 wherein a base support (30) is provided for mounting thereon other components, including

- mounting said signaling means atop said base support (30);
 - mounting said turbine to bottom of said base support (30); and
 - mounting said float to said base support (30) in relative buoyancy so as to place said turbine under water level and said signaling means above water
- 5 level.

6. A marine beacon according to Claim 5 wherein the housing of Claim 4 is integral with said base support.

10 7. A marine beacon according to Claim 5 wherein a plurality of floats is provided in a distributed arrangement to provide relative buoyancy stability.

8. A marine beacon according to Claim 1 wherein power generated from

15 the turbine (52) is collected by an accumulator (54) from which the signalling means (22) and/or electronic module (28) draw their respective operating power.

9. A marine beacon according to Claim 1 wherein the accumulator is any

20 one or combination of rechargeable battery, capacitor or compulsator.