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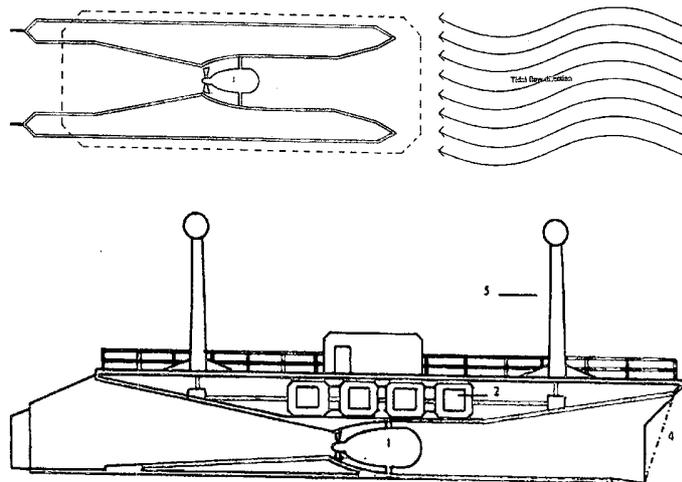
(51) INT CL:
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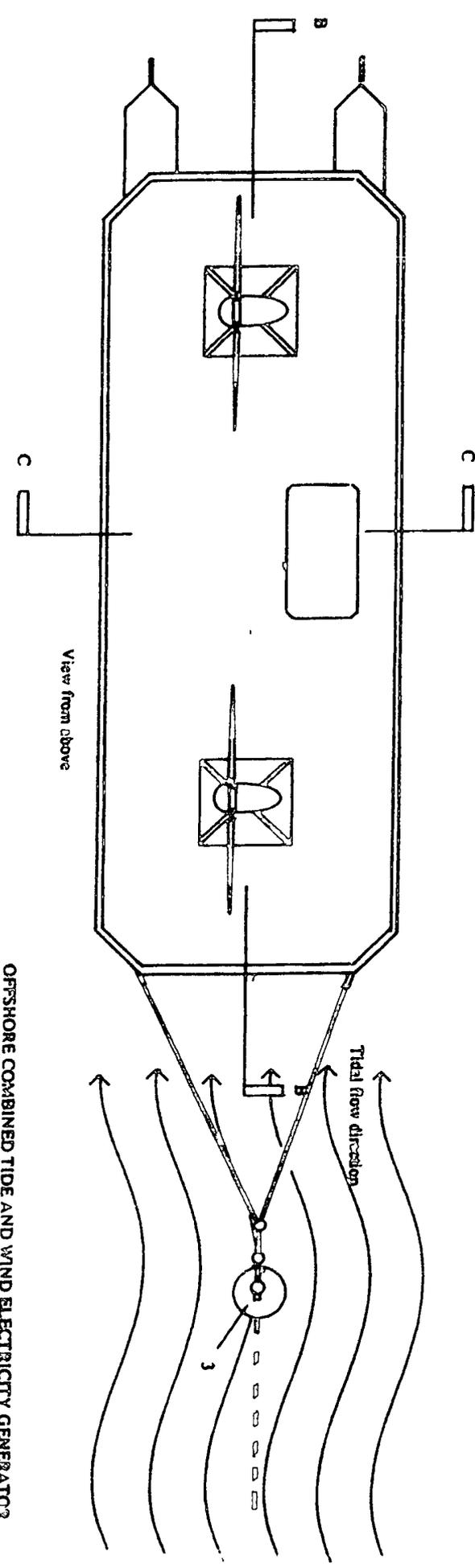
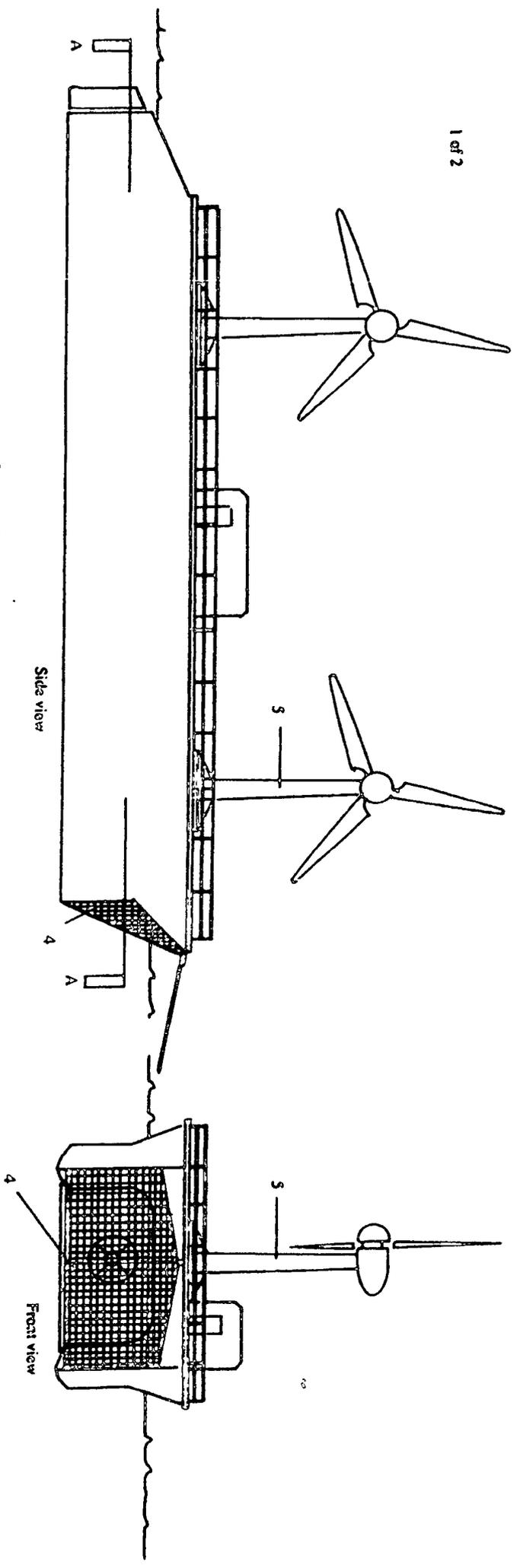
(56) Documents Cited:
GB 2348249 A EP 1849999 A2
EP 1731757 A1 WO 2008/050149 A1
WO 2007/148120 A1 US 4446378 A

(58) Field of Search:
INT CL **F03B**
Other: **Online: WPI, EPODOC**

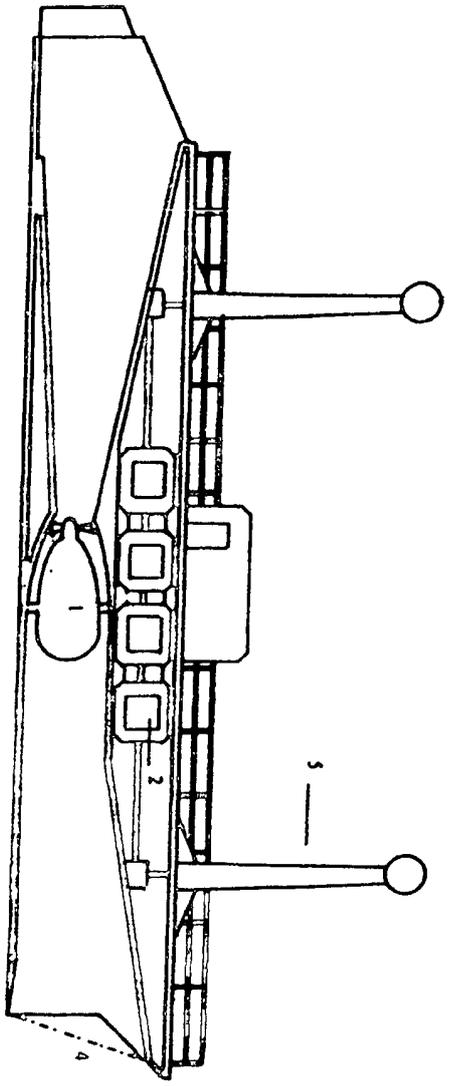
(54) Abstract Title: **Floating tidal turbine with profiled channel to accelerate flow**

(57) A tidal flow turbine comprises a large vessel with twin hulls shaped internally to produce a strong flow of water over turbines 1 when moored in a tidal stream. The vessel is attached to a mooring 3 so it can rise and fall with the ebb and flow of the tide. It has an onboard autohelm system to determine the direction of swing as the tide turns. Wind turbines 5 may be mounted on the deck, and the vessel may house transformers 2. The water turbine may be protected from waterborne debris by means of a grille 4 at the bow.

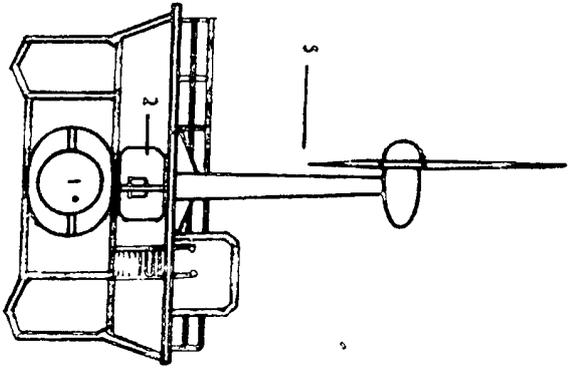




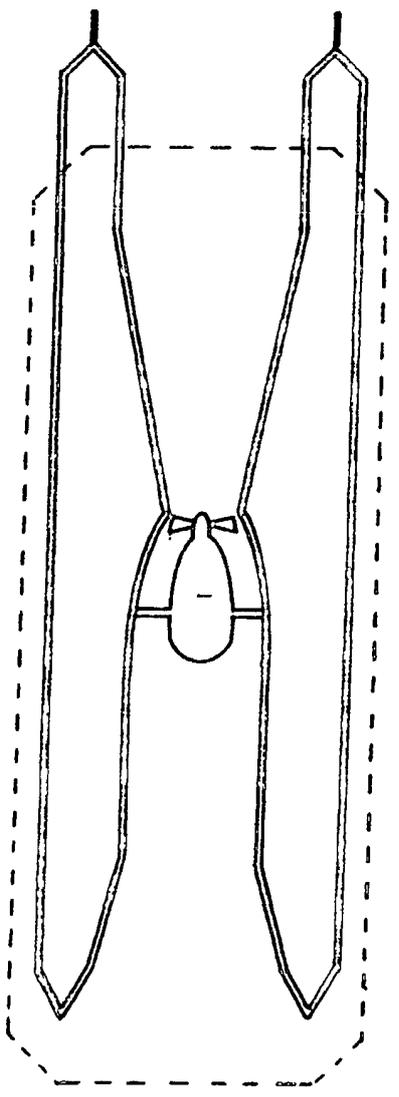
OFFSHORE COMBINED TIDE AND WIND ELECTRICITY GENERATOR



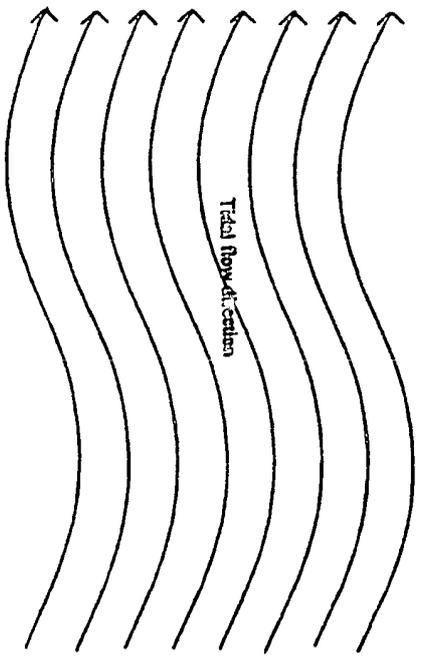
SECTION B - B



SECTION C - C



SECTION A - A



OFFSHORE COMBINED TIDE AND WIND ELECTRICITY GENERATOR

OFFSHORE COMBINED TIDE AND WIND ELECTRICITY GENERATOR

This relates to generating electricity harnessing the energy of tidal flow with the energy of wind power.

When trying to capture the energy from tides the problems arise from the rise and fall of the water level and the reversing of the direction of flow of the water, making it difficult for an unmanned fixed device to capture the energy at all states of the tide.

To overcome these issues a very large dual hulled ship (catamaran) is moored on a permanent swinging mooring allowing the vessel to rise and fall with the tide and being anchored to the sea-bed it will cut through the tide as it ebbs and flows. The twin hulls are joined by a deck above and a continuous plate joining the keels below the waterline. The hulls deck and base are shaped in a way to force the water flowing between the hulls into an ever smaller tube at the end of which are situated the appropriate turbines or single turbine. As the volume containing the water decreases the pressure and speed will increase maximising the energy transferred to the turbine. The internal shaping of the vessels is critical and depends on the type of turbine used. A form of the 'Kaplan' turbine which has been developed for waters at lower pressures would be considered.

The vessel aft of the turbine would also have to be shaped in such a way as to allow the water to flow over the turbine without any cavitation or and exit the vessel in a smooth flow.

The power generated would be transferred to the appropriate transformers housed in a weather tight hold immediately above the turbine, along with any other necessary equipment, which could be accessed via a deckhouse to allow maintenance.

As the tide turns the vessel swings on the mooring, keeping the flow of water through the turbines in the same direction. An onboard auto-helm system would determine the direction of swing as the tide turns.

In an offshore location wind turbines do not have to be as tall as those situated on land as there is far less interference to the air flow and the wind is generally more strong and consistent over the sea. The wind turbines would give an energy output the same as is expected from land based ones but would have a greatly increased output when combined with the energy extracted from the tide. The tidal element would still produce electricity if there was no wind and the wind turbines would be working as the vessel swung as the tide turned. The generators would only be inactive only in the infrequent situation of a dead calm over the period of slack water.

The strongest tides are found around headlands and in channels where tidal flow is restricted so a number of these vessels would be moored in these sites clear of any shipping lanes and marked on navigation charts. They would be lit in the same way as navigational buoys by solar powered lights.

The power generated would be introduced to the national grid via cables to the mooring buoy, and thence along the seabed to a shore based substation.

The ship would have a low profile with no bridge or superstructure to reduce wind resistance, only the necessary means of accessing the onboard machinery and the windmills mounted to the deck.

A large part of the cost of building land based wind generators is getting the cranes and equipment as well as the generator itself to the site on which it is to be erected, but these vessels would be constructed in a factory shipyard, launched, and towed into position.

The ships, once towed to and moored in the appropriate sites would not need to be manned, but could be boarded from time to time for inspection and maintenance.

The vessels would have to be large enough to house turbines and generators similar to those used in hydroelectric dams, and stable enough to allow the wind turbines to operate in strong winds. They would also have to be seaworthy enough to withstand gales and storms but would not be considered for use in waters where hurricanes or typhoons occur.

One of the main problems with building wind turbines on land are the planning process that takes time and sometimes prohibits them being built. These vessels could be sited far enough off shore to avoid such regulation.

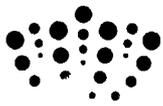
The power generator is described in the accompanying drawings.

Page 1 of the drawings shows the vessel in side and front (bow) elevations showing the wind turbines (5) fixed to the deck and the shaped grille at the bow where the water enters (4) to prevent flotsam from damaging the turbine blades. The ship is shown in plan secured to a mooring buoy (3) which in turn is secured to the sea bed. The power generated would be transferred to shore via this route. The plan also shows the direction of the tidal stream. The section lines A-A, B-B, and C-C are marked on this drawing and refer to the sections shown on page 2.

Page 2 shows the interior of the generator. Sections A-A and B-B show how the interiors might be shaped to increase water pressure; this shaping would be determined by the type of turbine (1) used. The hulls also have to have enough displacement to support the machinery (2) housed on board and allow the vessel to sit at the correct level in the water.

Claims

- 1) A large vessel attached to a swinging mooring, firmly anchored to the sea bed, in a tidal stream causing a continuous flow of water over a turbine or turbines, to generate electricity as the tide ebbs and flows.
- 2) A twin hulled ship according to claim 1 in which the hulls deck and keels are shaped to increase the water flow through the turbine or turbines, to maximise their efficiency.
- 3) A vessel according to claim 2 which has wind turbines mounted on its deck to supplement the energy input and continue power generation as the tide turns.
- 4) A vessel according to claim 3 on which the water turbine will keep generating electricity when the wind drops and the wind turbines will generate electricity as the tide turns.



Application No: GB0801636 2

Examiner: Mr Peter Middleton

Claims searched: 1-4

Date of search: 6 May 2009

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1-4	EP1849999 A2 (KELVIN) see abstract and figures: tidal turbine may have twin hulls and profiled channel
X	1-4	WO2008/050149 A1 (NEPTUNE) see abstract and figures: floating tidal turbine with shaped channel
X	1-4	WO2007/148120 A1 (GOODREDGE) floating tidal turbine may provide base for wind and solar power generators
X	1-4	US4446378 A (MARTINEZ) see abstract and figures: tidal turbine with profiled channel
X	1-4	EP1731757 A1 (PRODUTORA DE EN ELECTRICA) see abstract and figures: floating tidal turbine with protective grille
A	1	GB2348249 A (ARMSTRONG) see figures and abstract: tidal flow turbine with controllable rudder to determine rotation direction during tide change

Categories:

X Document indicating lack of novelty or inventive step	A Document indicating technological background and/or state of the art
Y Document indicating lack of inventive step if combined with one or more other documents of same category	P Document published on or after the declared priority date but before the filing date of this invention
& Member of the same patent family	E Patent document published on or after, but with priority date earlier than, the filing date of this application

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^X:

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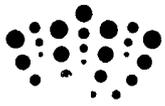
Worldwide search of patent documents classified in the following areas of the IPC

F03B

The following online and other databases have been used in the preparation of this search report

Online: WPI, EPODOC

International Classification:



Subclass	Subgroup	Valid From
F03B	0013/26	01/01/2006