"A SYSTEM OF UNDERWATER POWER GENERATION"

FIELD OF THE INVENTION

The invention relates to a system of underwater power generation. In particular, although not exclusively, the invention relates to a system of converting the kinetic energy of moving water to electrical energy.

BACKGROUND TO THE INVENTION

Clean power generation has become a major concern due to the effects of global warming. Renewable clean power generation has been developed using solar cells, wind turbines and wave turbines. However, an effective renewable power generation system has yet to be developed using ocean currents.

US Patent No. 4,383,182 discloses an apparatus for generating power from ocean currents. The apparatus is winged and is anchored to the ocean floor. A number of propellers are attached to the wing and are rotated by the ocean current. The rotation of the propellers causes rotation of a generator to generate electricity. The problem with this apparatus is that the apparatus is not easily moved to cater for changes in the direction of ocean currents. Further, the generation of energy is dependant upon the size and number of propellers to catch a specific area of current flow.

US Patent No. 4,163,904 discloses an underwater turbine plant for generating electrical power using ocean currents. The turbine is driven by the flow of the water current across the blades of the turbine. Again, the level of electricity generated is proportional to the area of water that the turbine plant is able to capture.

US Patent No. 4,335,319 discloses a hydroelectric power apparatus that includes a powerhouse containing a power generator above the powerhouse located above the surface of the water. A hydraulic turbine is lowered from the powerhouse when the ocean currents are sufficient to drive the turbine. The disadvantage with this apparatus is that power is required to extend and retract the turbine. Further, the ocean current area that is utilised is equivalent to the inlet area of the turbine.

US Patent No. 5,440,176 discloses a hydroelectric power plant similar to that of US Patent No. 4,335,319 in that a series of turbines are extended and retracted dependant upon the velocity of the ocean currents. Similar disadvantages exist with the power plant disclosed in US Patent No. 5,440,176 as with the apparatus disclosed in US Patent No. 4,335,319.

US Patent No. 6,109,863 discloses a fully submersible apparatus for generating electricity. The apparatus includes a buoyant structure having a motor mounted thereto. A series of vanes are connected to the motor. The vanes are rotated by the ocean current to cause electricity to be generated. A disadvantage with this apparatus is that the generation of electricity is dependant upon the area of current that the vanes are able to capture.

US Patent No. 4,313,059 discloses a system for generating electricity from ocean currents. The system uses two drags that are connected to opposite ends of a cable. The middle of the cable is wrapped around a generator. The drags are lowered into the ocean and moved from a drag position to a non-drag position to reciprocate movement of the cable. The disadvantage with this system is that the generator must be able to generate energy when rotated in both directions. Further, the energy supply is not constant as the generator is constantly changing directions.

GB Patent Application 2,214,239A discloses an apparatus for harnessing power from natural fluid flows. The apparatus includes a continuous belt having a number of vanes. The continuous belt encircles a pair of cylinders that are operatively connected to drive a generator. The continuous belt is orientated so that water flow across the vanes to drive the belt and hence rotate the cylinders. The problem with this apparatus is that water flows through a front set of vanes and then through a rear set of vanes on the continuous belt. This creates water turbulence in water that passes through the rear set of vanes and hence efficiency of the apparatus is reduced.

OBJECT OF THE INVENTION

It is an object of the invention to overcome or alleviate at least one or more of the above disadvantages or provide the consumer with a useful or commercial choice.

DISCLOSURE OF THE INVENTION

In one form, although it need not be the only or indeed the broadest form, the invention resides in an underwater power generation system comprising:

at least one continuous pathway;

at least one carriage that is movable around said pathway;

at least one foil attached to the at least one carriage, the at least one foil able to be driven by a water current; and

at least one power take-off having a rotatable member;

wherein the driven foil cause the at least one carriage be moved about the pathway and contact said rotatable member to cause rotation of the rotatable member.

Preferably, the pathway is a track.

Preferably, there are at least 5 carriages. More preferably there are at least 20 carriages. The carriages may be joined together via a pivotal link. Normally the carriages are joined together by wire rope or cable.

The at least one foil rotates substantially within a plane that is substantially perpendicular to flow of water current. In this manner, the foil can drive the carriage around the entire length of the pathway.

The power take-off may be operatively connected to a pump or generator or the like device. The rotatable member is typically a wheel.

Further features of the present invention will become apparent from the following detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

To assist in understanding the invention and to enable a person skilled in the art to put the invention into practical, an embodiment of the invention will be described by way of example only with reference to the accompanying drawings, wherein:

FIG. 1 shows a perspective of an underwater power generation system according to a first embodiment of the present invention;

FIG. 2 shows front view of the underwater power generation system of FIG. 1;

FIG. 3 shows a top perspective view of the underwater power generation system of FIG. 1;

FIG. 4 shows a top perspective view of a foil carriage;

FIG. 5 shows a bottom perspective view of a foil carriage; and

FIG. 6 shows a detailed view of a carriage engaging with a power take off wheel.

DETAILED DESCRIPTION OF THE INVENTION

FIGS. 1 to 6 show an underwater power generation system 10 that uses water currents to produce electricity. The underwater power generation system 10 includes a frame 20, a track 30, twenty-two foils 40, two power take-offs 50 and twenty-two foil carriages 60.

The frame 20 is formed from a main cylindrical body 21 with two arcuate attachment arms 22. The main cylindrical body 21 is hollow and has a centre fin 23 that extends rearwardly and forwardly from the main cylindrical body 21.

The arcuate arms 22 are used to hold the underwater power generation system 10. Placement cables (not shown) are attached to ends of each of the arcuate arms 22 and are anchored to an ocean or river floor to hold the underwater power generation system 10 in position. Alternatively, the cables are mounted to a bridge, boat, or the like structure.

Track support members 25 are attached and extend outwardly from the main cylindrical body 21. The track support members 25 are used to mount the track 30. Each track support member 25 is formed from a track arm 26 and a track cradle 27. The track 30 is flat and oval in shape. The track 30 has outwardly extending lips 31 that are located on the sides of the track 30.

Each of the foils 40 is formed from two wings 41 and a connection arm 42. The two wings 41 are rearwardly splayed with respect to each other and are inclined downwardly with respect to the connection arm 42. The wings 41 are formed from fibre-glass and are of a tear-drop shape when viewed in transverse cross-section. A series of holes (not shown) are located through the connection arm to connect respect foils to respective carriages 60.

Each of the two power take-offs 50 include a power take-off shaft 51 and a power take-off wheel 52. The power take-off shaft 51 extends through

and is mounted for rotation by the main body 21. Bearings (not shown) are used to mount the power take-off shaft 51. A series of apertures 53 is located along the circumference of each power take-off wheel 51. A peg mounting plate 54 is located within each aperture 53 and fastened to the power take-off wheel 51. A peg 55 extends outwardly from each peg mounting plate 54. Circumferential grooves 56 extend the circumference of the power take-off wheels 52.

A gear box 57, a gear box shaft (not shown) and an alternator 58 are located adjacent an end of the power take-off shaft 51. The gear box 57 is connected to the power take-off shaft 51 and also connected to the gear box shaft. The gear box is geared so that the gear box shaft is rotated at a substantially greater speed that the power take-off shaft 51. The gear box shaft is connected to the alternator 58 to drive the alternator and produce electricity.

Each of the foil carriages 60, shown in detail in FIGS 4 and 5, is formed from a foil carriage body 70 and two wheel assemblies 80. The foil carriage body 70 is formed from a flat body plate 71 with two upwardly extending wheel assembly attachment plates 72 attached to adjacent ends of the flat body plate 71. Two spaced apart splice plates 73 are located adjacent one end of the foil carriage body 70. Holes 74 are located through the splice plates to connect a foil 40 to the foil carriage 60. A brace 75 is attached to the foil carriage body 70 to attach the splice plates to the foil carriage body 70.

When assembled, the connection arm 42 of the foil 40 is located between the splice plates 73 and fastened to the splice plates 73 to attach the foil 40 to the foil carriage 60. The angle of the foil 40 is able to be adjusted using the series of holes located in the foil connection arm 42. The angle of the foils 40 is determined by numerous elements such as the velocity of the water and the direction of the water current.

Each of the wheel assemblies 80 is formed from a U-shaped wheel bracket 81 and two wheels 82 mounted for rotation adjacent opposite ends of the U-shaped bracket 81 via wheel shafts 83. Each of the wheels 82 has a wheel channel 84 located within the wheel. The U-shaped brackets 81 are pivotally mounted to the wheel assembly attachment plates 72 via two bolts 85. When assembled, the wheels 82 are located on side of the track 30 to allow the foil carriage 60 to run along the track 30. The outwardly extending lips 31 are

located within the wheel channel 84 so that the wheels are unable to disengage the track 30. As the foil carriage 60 moves around the track 30, the U-shaped brackets 81 are allowed above to pivot so that the wheels 82 are able to move around the curved portions of the track 30.

Cable attachment portions 90 are attached to an underside of the flat body plate 71. Carriage cables 91 are pivotally mounted to the cable attachment portions 90 via cable attachment pins 92. Each carriage cable 91 is mounted to two foil carriages 60. A pusher 100 extends downwardly from an underside of the flat body plate 71. The pusher 100 is located between the channel attachment portions 90.

In use, the underwater power generation system 10 is located within a water current so that the track 30 is substantially perpendicular to the water current. The water current acts on the foils 40 and causes the foil carriages 60 to be driven around the track 30. As the carriages are driven around the track 30, the pusher 100 contacts the peg 55 as shown FIG 6. The cables 90 are located within the groove 56. Both the pusher contacting the peg 55 and the cable 90 being located within the groove causes the power take-off wheels 52 to be rotated which causes rotation of the power take-off shafts 51. The power take-off shafts 51 drive the gear boxes 57 which in turn drives the gear box shafts at a substantially greater rotation speed. The gear box shafts drive the alternators 58 to produce electricity which can be utilised as desired.

It should be appreciated that various changes and modification may be made to the embodiment described without departing from the spirit or scope of the invention.

CLAIMS:

1. An underwater power generation system comprising:

at least one continuous pathway;

at least one carriage that is movable around said pathway;

at least one foil attached to the at least one carriage, the at least one foil able to be driven by a water current; and

at least one power take-off having a rotatable member;

wherein the driven foil cause the at least one carriage be moved about the pathway and contact said rotatable member to cause rotation of the rotatable member.

2. The underwater power generation system of claim 1 wherein the pathway is in the form of a track.

3. The underwater power generation system of claim 1 wherein the at least one foil is formed from a connection arm and two wings.

4. The underwater power generation system of claim 1 wherein there are at least 5 carriages.

5. The underwater power generation system of claim 1 wherein there are at least 20 carriages.

6. The underwater power generation system of claim 5 wherein the carriages are joined to each other via a pivotal link.

7. The underwater power generation system of claim 1 wherein the at least one foil rotates substantially within a plane that is substantially perpendicular to flow of water current.

8. The underwater power generation system of claim 1 wherein the power take-off is operatively connected to a pump or generator or alternator.

9. The underwater power generation system of claim 1 wherein The rotatable member is a wheel.

10. The underwater power generation system of claim 1 wherein the at least one carriage moves around the pathway via wheels.

11. The underwater power generation system of claim 1 wherein the power take-off is operatively connected to a gear box.