

OCEAN DRIVEN ENERGY PLANT

TECHNICAL FIELD

[0001] This invention relates in general to power generation and, more particularly, to a power generation plant for deriving electricity from water motion.

BACKGROUND ART

[0002] Large portions of the world suffer from shortages in power generation. As a result, many of these countries remain underdeveloped from the rest of the world, and their citizens often must survive through harsh living conditions for much of the year, as neither heat nor cooling is available.

[0003] In the rest of the world, the vast amount of electricity is generated by oil, gas, coal or nuclear power plants. Burning oil, gas and coal results in polluted air, and all of those fuel resources are rapidly diminishing as the need for electricity has skyrocketed in developed countries. Nuclear energy requires the disposal of spent nuclear fuel, which remains dangerous for centuries.

[0004] Many clean alternatives have similar problems. Solar cells have an unlimited fuel source during daylight hours, but generate no electricity at night. Wind turbines also have a potentially unlimited power source, the wind, but will also not produce any power when the wind is light. With no practical way to store excess energy, these sources are generally supplemental to a fossil fuel powered energy system.

[0005] Therefore, a need has arisen for an energy plant that does not require fossil fuels and which produces generally uninterrupted energy.

DISCLOSURE OF INVENTION

[0006] In the present invention, a power generation device includes a water blanket comprising a plurality of pods arranged in a grid for floating on the surface of a body of water. Ball joints and hydraulic cylinders couple each of the pods to adjacent pods. A motor is coupled to the hydraulic cylinders, such that a flow of hydraulic fluid created by expansion and compression of the cylinders due to movement of the pods causes rotational motion in the motor. Generators are coupled to respective motors to generate electricity from the rotational motion of the motors.

[0007] In addition, the power from the ocean blanket can be supplemented with wind power from wind turbines on a platform containing the ocean blanket, power derived from ocean currents through water turbines, current at the surface of the water through paddle wheels, and solar power received by the pods of the ocean blanket.

[0008] The present invention provides significant advantages over the prior art. First, the power generation device generates no greenhouse gases and does not use fossil fuels, nuclear fuel, or other non-renewable fuels. The cost of energy should be greatly reduced, as all power sources come to the device naturally and continuously.

BRIEF DESCRIPTION OF DRAWINGS

[0009] For a more complete understanding of the present invention, and the advantages thereof, reference is now made to the following descriptions taken in conjunction with the accompanying drawings, in which:

[0010] Figure 1 is a perspective view of a power generation system with details of the subsystems;

[0011] Figure 2 is a perspective view of a portion of an ocean blanket subsystem;

[0012] Figure 3 is a top view of a pod used in the ocean blanket system;

[0013] Figure 4 is a front view of a paddle wheel used in a pod;

[0014] Figure 5 is a side view of a paddle wheel;

[0015] Figure 6 is a bottom perspective view of recesses used for rotation of the mechanisms within a pod;

[0016] Figure 7 is a perspective view of a water turbine assembly;

[0017] Figure 8 is a rear view of a a water turbine assembly;

[0018] Figure 9 is a side view of a water turbine assembly;

[0019] Figure 10 is a perspective view of a platform with a detailed view of a hole for mounting water turbine assemblies.

BEST MODE FOR CARRYING OUT THE INVENTION

[0020] The present invention is best understood in relation to Figures 1-10 of the drawings, like numerals being used for like elements of the various drawings.

[0021] Figure 1 illustrates the Continuous Energy Plant, which uses forces in the ocean, at the surface of the ocean, and above the ocean, to generate power continuously. Four forces are exploited – the tide, ocean currents, the waves, wind above the ocean, and sunlight.

[0022] Figure 1 illustrates the overall system 10 with detailed views of the main components. There are three main subsystems: (1) the Ocean Blanket Subsystem 12, (2) the Water Turbine Subsystem 14, and (3) the Windmill Subsystem 16. The system 10 can be built offshore using a platform that is anchored to the ground using piers, similar to technologies used by offshore rigs.

[0023] Each of the subsystems provides energy using different forces and in many cases there is only a small possibility that all the forces will be low at the same time. Power from the system 10 can be transferred to the end user using undersea power cables.

[0024] On the deck of the system 10, large wind turbines 16a, which can be of conventional design create electricity from the wind.

[0025] The Ocean Blanket Subsystem 12 comprises three separate assemblies for providing electricity. First, a grid is formed of pods 18 are connected together by mechanical ball joints 20 which give the pods 18 freedom of movement in all directions relative to adjacent pods 18. Pods are further linked by multiple hydraulic cylinders 22 coupling the pods that expand and contract responsive to movement of the floating pods as they move relative to one another due to waves. As the cylinders expand and contract, they create a flow of hydraulic fluid through hydraulic pump/motors associated with each of the pods, causing the motor to turn. As the motor turns, it powers a generator. Up to sixteen hydraulic cylinders may be

connected to each pod. Operation of the hydraulic cylinders, motor and generator is described in greater detail in connection with Figures 2- 6. Power from the generator is passed through a slip ring 23. The slip ring 23 stays in a fixed position the system spins, keeping all electrical connections together. All of the power generated by a pod 18 will continuously pass through its slip ring 23.

[0026] Second, paddle wheels 24 beneath the pod 18 (see Figure 2 for greater detail) on the bottom (i.e. submerged) side of each pod 18 provide a second source of electricity. As the ocean current flows, the paddle wheels 24 turn, driving another generator on the pod assembly. The paddle wheels rotate around horizontal axes to provide power; each paddle wheel 24 can also rotate around a vertical axis, responsive to a rudder, to keep its horizontal rotational axis perpendicular to the flow of the ocean current, to maximize the force of the current pushing the paddle wheel 24.

[0027] Third, the stationary domes 26 on the top of the pods 18 are covered with photovoltaic (solar) cells 28. The solar cells 28 convert sunlight into electricity.

[0028] Power is passed to the underwater cables through the slip ring 23 for each pod 18, which allows the pod to move freely without stressing the electrical connection. In the preferred embodiment, both hydraulics and electric energy pass through the slip ring 23.

[0029] The pods of the Ocean Blanket subsystem 12 are described in greater detail in connection with Figures 2 – 6. Energy generated by hydraulics is described in connection with Figures 2-3. Each side of a pod 18 is connected to a side of an adjacent pod (except for certain sides on the periphery of the grid) by a ball joint 20 having a male joint portion 20a and a female joint portion 20b. The ball joints are disposed in the center of all sides, with each pod having two male ball joint sections and two female ball joint sections. This allows all of the pods to be mechanically connected together, but allowing the pods 18 to have full movement. Each pod 18 can move independently up and down, and back and forth, and in and out.

[0030] The hydraulic cylinders 22 also connect the pods 18 together. Each side of a pod 18 has up to four cylinders 22 that are connected to the pod 18 with ball joints 42. Every hydraulic cylinder 22 completes a ball joint 46 (in the illustrated embodiment, the cylinders 22 have female ball joint portions at each end and the pods 18 have male ball joint portions) at each end. The pods 18 can have up to 16 hydraulic cylinders that will move simultaneously. The movements of the pods 18 create hydraulic forces in the cylinders 22, which power hydraulic motors 48. The hydraulic motors power respective generators 50, which create electricity.

[0031] Referring to Figures 4 and 5, the paddle wheel 24 on the bottom side of the pod has a shaft that has sealed roller bearing at each end. As the ocean current flows it turns the paddle wheel 24. There is a pulley 52 close to the end of the shaft 54. This pulley is connected to a pulley on the generator 56, as the paddle wheel 24 rotates it creates energy through the second generator 56.

[0032] The paddle wheel 24 rotates around a horizontal axis to generate electricity. If the ocean current changes direction, the paddle has to be able to also change direction; for this reason the paddle wheel has to be able to spin around the vertical axis. This is accomplished by creating a recess 58 (see Figure 6) in the pod that the shaft bearings can move freely around the vertical axis. Simultaneously the generator base (the base that supports both the motor, hydraulic pump, tank, and two generators) has to be able to spin around the vertical axis. This is accomplished by a series of sealed bearings, and or cam followers underneath the generator base. These bearings ride on another recess 60 in the pod 18 that allows the generator base to spin freely around the vertical axis. The paddle wheel can rotate 360 degrees around the vertical and horizontal axis simultaneously. A rudder (not shown) is used to keep each paddle assembly rotating about a horizontal axis perpendicular to the ocean current flow.

[0033] The ocean blanket 12 generates an amount of power which is based on:

1. Speed of the current.
2. Size of the waves.

3. Frequency of the waves.
4. Size and weight of the pod assemblies.
5. Sun availability.

[0034] Accordingly, the Ocean Blanket 12 provides electricity in almost any climate and during any time of day. The Ocean Blanket 12 can also be coupled to the platform using cylinders such that the rising and falling tide creates hydraulic flow.

[0035] This system will work continuously. As long as the ocean (or other body of water such as river or large lake) has movement this system will continuously generate electricity. The ocean alone has more than enough force to supply electricity for the entire earth.

[0036] The Water Turbine Subsystem 14 shown in greater detail in Figures 7-9. The Water Turbine Subsystem 14 includes a plurality of turbines 30 around the periphery of the ocean blanket 12. Each turbine assembly 30 has multiple turbines 32, each preferably having an individual vertical shaft 34 coupled to a respective generator 36 enclosed in a generator base 38. As water flows through the turbines, each turbine 32 spins its own shaft 34, which in turn causes the respective generator 36 to produce electricity. The shafts 34 extend between the associated turbine 32 and generator base 38.

[0037] Because of the size of the water turbines, a rotatable anchor point 40 is connected to telescoping piers 44 (see Figure 10), in order to stabilize the bottom of the turbine assemblies 30, allowing each water turbine 30 to spin freely around its vertical axis as the current changes direction. The orientation of the water turbine assembly 30 relative to its vertical axis is also controlled by a rudder (not shown) connected to each turbine assembly 30, such that the turbines 32 spin in a plane perpendicular to the ocean currents.

[0038] In the preferred embodiment shown in Figure 10, a pier system 41 with a platform 42 that supports a vertical shaft is used. This pier system 41 would have

sealed bearings in mounting holes 43 that would allow a support shaft 40a to spin. On the top of the platform, the water turbines assemblies 30 each have sealed roller bearings, and/or cam-followers that permit the whole assembly 30 to rotate. Telescoping piers 44 anchor the platform 42, but allow it to rise and fall with the tides.

[0039] In operation, the Water Turbine subsystem 14 uses the force of the ocean current, and/or the flow of water (such as in a river) to rotate the water turbines 32. The larger the diameter of the turbines 32, the greater the force that will be created to drive the generators 36. This subsystem is designed to allow for large diameter water turbines. As with wind turbines 17 and paddles 24 a rudder determines the direction of the water current, and or the flow of water (not shown on drawing), such that the force of the current against the turbines 32 is optimized.

[0040] Each water turbine 32 rotates around a horizontal axis. A shaft connected to either a right angle gearbox and/or to a right angle joint will rotate around a vertical axis as the water turbine 32 rotates around its horizontal axis. As the vertical shaft rotates, it will drive its associated generator to produce electricity.

[0041] In the preferred embodiment, each water turbine 32 has its own shaft 34, so that each water turbine assembly 30 will have multiple shafts, with each shaft extending from the water turbine 32 to the respective generator 36. The generators 36 then send power out through a slip ring 43. The slip rings 43 allow equipment to rotate while being able to maintain power connections, such as electricity (power, and controls), pneumatics, hydraulics, water etc... The purpose of this slip ring 43 is to allow the power (electricity) generated from the generators out to the end user, yet allowing the water turbines assemblies to spin freely.

[0042] The slip ring 43 stays in a fixed position while the generator base 38, and the water turbines 32 spin around the vertical axis. As the system spins, the slip ring 43 will keep all electrical connections together, all of the power generated by all of the generators 36 will continuously pass through the slip ring 43. From this point,

the electricity created by this system can be transferred to the end user utilizing underwater sea cables, and or overhead cables.

[0043] Preferably, guarding is provided to protect the water turbine assemblies from the creatures in the water, boats, sub-marines, and general debris flowing through the water.

[0044] The power generated by the overall system 10 will be determined by location, because there are many factors that can change even on a daily basis such as:

1. Speed of the current.
2. Size of the waves.
3. Frequency of the waves.
4. Size and weight of the pod assemblies.
5. Sun availability.
6. Wind speed
2. The diameter of the water turbines
3. The different types of water turbines
4. The type of blade assemblies
5. The number of blade assemblies
6. Surface area of blades
7. The number of water turbines on each assembly

[0045] This system 10 could be used to generate power for not only cities, but also countries around the world. Conventional power plants utilize gas, coal, or nuclear. This system would utilize our earth's largest and most plentiful natural resources, that have an unlimited supply of power. Just as importantly, the system 10 will work continuously. As long as the oceans have movement, the sun continues to shine, and the wind continues to blow this system will continuously generate electricity. The ocean alone has more than enough force to supply electricity for the entire earth.

[0046] The present invention provides significant advantages over the prior art:

1. No greenhouse gases
2. Does not require external fuel source such as:
 - a. Coal
 - b. Gas
 - c. Nuclear
 - d. other non-renewable fuels
3. Environmentally friendly
4. Reduces the cost of electricity
5. Will ultimately reduce the cost of fuel around the world. It is the basic rule of supply and demand. Since the demand will significantly drop down, then price will follow.
6. Saves our earth's resources that are not renewable.
7. Helps omit global warming.

[0047] Although the Detailed Description of the invention has been directed to certain exemplary embodiments, various modifications of these embodiments, as well as alternative embodiments, will be suggested to those skilled in the art. The invention encompasses any modifications or alternative embodiments that fall within the scope of the Claims.

Claims

1. A power generation device, comprising:
 - a plurality of pods arranged in a grid for floating on the surface of a body of water;
 - ball joints coupling each of the pods to adjacent pods;
 - a motor coupled to the hydraulic cylinders, such that a flow of hydraulic fluid created by expansion and compression of the cylinders due to movement of the pods causes rotational motion in the motor; a generator coupled to the motor to generate electricity from the rotational motion of the motor; a platform disposed on the pods; a water paddle attached to each pod; wind turbines disposed on the platform; water turbine assemblies disposed on an underside of the platform; and solar cells disposed on a top surface of the platform.
2. A power generation unit, comprising: an integrated first system and at least one second system, each of the first and at least one second systems are configured to convert a source of renewable energy to electricity, the first system comprising a plurality of movably interconnected buoyant pods forming a water blanket having a top side and a bottom side, wherein the water blanket generates electricity in response to wave action, and the at least one second system is chosen from a system for converting solar energy to electricity, a system for converting wind energy to electricity, and a system for converting water energy such as ocean current energy or river flow energy into electricity, wherein the at least one system for converting solar energy to electricity comprises one or more solar cells disposed on the top side of the water blanket, the at least one system for converting wind energy to electricity comprises one or more windmills disposed on the top side of the water blanket, and the at least one system for converting water energy to electricity is chosen from a system comprising a water paddle connected to the water blanket, a system comprising water turbines disposed on the bottom side of the water blanket, or both, and further wherein the power generation unit comprises each of the solar energy system, wind energy system, water paddle system, and water turbine system.
3. A power generation device for use on a body of water, comprising:

- a. a water blanket comprising a plurality of buoyant pods which are movably interconnected to generate electricity in response to wave action in the body of water, wherein each of the buoyant pods has a top side and a bottom side and the water blanket has a perimeter;
 - b. a system for converting solar energy to electricity;
 - c. a system for converting water energy such as ocean current energy or river flow energy into electricity; and,
 - d. optionally, a platform located along at least a portion of the perimeter of the water blanket;
- wherein the solar energy system is disposed on the top side of one or more buoyant pods, and further wherein the water energy system is one of a first water energy system, which when in use extends into the body of water from one or more buoyant pods, a second water energy system, which when in use extends into the body of water from the platform, if present, or both.
4. A power generation device according to claim 3, wherein the power generation device comprises a platform, the platform is movably coupled to the water blanket such that electricity may be generated in response to wave action in the body of water, and the water energy system comprises the first water energy system and the second water energy system.
 5. A power generation device according to claim 4, further comprising a system for converting wind energy to electricity, wherein the platform is adapted to support the wind energy system.
 6. A power generation device according to claim 4, wherein the solar energy system comprises solar cells disposed on the top side of one or more buoyant pods, the first wave energy system comprises at least one paddle wheel extending into the body of water from the buoyant pod, and the second wave energy system comprises one or more water turbine assemblies extending into the body of water from the platform.

7. A power generation device according to claim 6, wherein the power generation device comprises the platform and a system for converting wind energy to electricity, and wherein the wind energy system comprises one or more wind turbines disposed on the platform.
8. A power generation device according to claim 6, wherein the paddle wheel is attached to the water blanket such that it can both rotate around a first axis to generate electricity and around a second axis in response to changes in direction of an ocean current.
9. A power generation device according to claim 7, wherein each water turbine assembly comprises one or more water turbines configured to rotate around a first axis to generate electricity and around a second axis in response to changes in direction of an ocean current.
10. A power generation device according to claim 4, wherein the power generation device comprises a platform, the solar energy system comprises solar cells disposed on the top side of one or more buoyant pods, the wave energy system is the first wave energy system and the second wave energy system, and the first wave energy system comprises at least one paddle wheel extending into the body of water from the buoyant pod, and the second wave energy system comprises one or more water turbine assemblies extending into the body of water from the platform.
11. A method of generating electricity comprising deploying a power generation device according to claim 6 in a body of water.
12. A power generation device, comprising:
 - a water blanket having a perimeter and comprising a plurality of pods arranged in a grid for floating on the surface of a body of water; hydraulic cylinders coupling each of the pods to adjacent pods; a motor coupled to the hydraulic cylinders, such that a flow of hydraulic fluid created by expansion and compression of the cylinders due to movement of the pods causes rotational motion in the motor; and, a generator coupled to the motor to generate electricity

from the rotational motion of the motor;

a water paddle attached to each pod;

solar cells disposed on a top surface of one or more pods;

optionally, a platform disposed along at least a portion of the perimeter of the water blanket; and,

water turbine assemblies attached to and extending below the platform, if present.

13. A power generation device according to claim 12, further comprising one or more wind turbines supported by the platform.
14. A power generation device according to claim 12, wherein the power generation device comprises the platform and further comprises one or more wind turbines supported by the platform.