

Dos. 20713

Patent Claims

5 **1. The device for conversion of wave energy into electrical energy wherein** the device comprises a supporting construction (50), consisting of buoyancy elements (52), star-shaped, cylindrical or any other suitable shape, with a supporting tube (51) fixed to the top of the supporting construction (50), wherein it comprises a joint gear (30) having a gliding connection on the inner circumference with the outside surface of the supporting tube (51),
10 while a sphere (32) is hinged or tightly fixed at its outside circumference to the floating body (20) whereby the device has two gears, the first, flexible gear (1) used for connecting the floating body (20) to the second gear wherein the flexible gear (1) comprises a flexible element in the form of a rope, a cable or the like, and at least two pulleys (6b, 6c), whereby two pulleys (6b, 6c) are fixed to the supporting tube (51) by means of their supports above
15 the end point of the working stroke of the floating body (20) so that they can rotate and the middle pulley (6a) is by means of its support fixed to the second gear that connects the flexible gear (1) to the electric generator having additional mass (12) connected with the lower tube (53) of the supporting construction (50) in the sliding manner while the flexible element of the flexible gear (1), e.g. a cable, is coupled to the floating body (20) at one end,
20 then passed over the pulley (6b) and over the pulley (6a) inside the tube (51) and the pulley (6c) and by the other end again connected to the floating body (20) or the flexible gear (1) is composed of two identical flexible elements having one end attached to the floating body (20) and one flexible element of the gear (1) goes over pulley (6b) while the other flexible element of the gear (1) goes over pulley (6c) and by the other end they are mutually
25 connected by a lever pivotally attached to one end of the second rigid gear and the connecting points of the flexible gear (1) and the floating body (20) as well as two upper pulleys (6b, 6c) are mutually opposite and wherein at the end of the buoyancy element (52), at the upper tube side (51) casing (80) is placed and the flexible ropes (71) are at one end attached to the buoyancy element (52) and to the floating body (20) at the other end, whereby the supporting
30 construction (50) is by ropes (63) coupled to the anchor weight (67) that can be positioned in the bearing in the anchor base (61).

2. **The device** of claim 1, **wherein** the additional mass (12) for balancing with the mass of the floating body (20) and adjusting the movement of the floating body (20) on the waves is
35 at the lower side attached to the second gear.

3. **The device** of one or more preceding claims, **wherein** it comprises a device for braking the floating body (20) consisting of a flexible element (71), made up as monolithic or composite from synthetic materials, one end attached to the bottom of the floating body (20), and the other end fixed to the buoyancy element (52).

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4. **The device** of one or more preceding claims, **wherein** the anchor weight (67) is made of concrete and placed in the anchor base (61) produced in the form of a hollow construction filled with water when the anchor base (61) is at the anchorage location, ie. the location of the device exploitation.

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5. **The device** of one or more preceding claims, **wherein** the floating body (20) basically consisting of a steel frame (21) and having a closed chamber (22) is coated with foam coating (23).

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6. **The device** of claim 6, **wherein** the foam coating (23) is composed of an external layer (24) made of material with high resistance to tensile stress and an inner layer (25) made of material that is good at absorbing shocks.

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7. **The device** of claims 1 and 2, **wherein** the floating body (20) is constructed as self-submerging floating body so its mass is bigger than its volume that provides its buoyancy.

8. **The device** of claims 1, 2 and 7, **wherein** the added mass (12) keeps the floating body (20) on the water surface and regulates its draught depth.

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9. **The device** of one or more preceding claims, **wherein** the second gear (2, 3, 8, 9), connected with a flexible gear (1) at one end, at the other end with a generator of electrical energy, constructed of elements as a gear (4) and the rack (2) type, or a jackscrew (9) and a nut (7) or sprocket wheel (5) and a chain (3) situated in the lower supporting tube (53) attached to the supporting structure (50).

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10. **The device** of one or more claims from 1 to 9, **wherein** the second gear (8) that is at one side connected to the flexible gear (1), and at the other side to the electrical generator, consists of rigid elements as linear generator type gear, ie basically it consists of a movable

magnet (8) and a fixed, immovable coil (10) and located in the lower bearing tube (53) attached to the supporting construction (50).

11. **The device** of one or more claims from 1 to 9, **wherein** the second gear being connected to the flexible gear (1) at one side, and at the other side to the electrical generator, consists of rigid elements as the type of a gear comprising a jackscrew (9) and a nut (7) with recalculating balls and located in the lower supporting tube (53) and attached to the supporting construction (50).

12. **The device** of claim 11, **wherein** the nut (7) directly rotates the generator rotor.

13. **The device** of one or more claims from 1 to 9, **wherein** the second gear being connected to the flexible gear (1) at one side, and at the other side to the electrical generator, consists of a flexible element consisting of as a chain (3) and a sprocket wheel (5) placed in the buoyancy element (52) of the supporting construction (50).

14. **The device** of claim 13, **wherein** the second gear is coupled with the additional mass (12) through the tackle system where the flexible element passes the pulleys of the tackle for connecting to the additional mass (12) made up in the form of a rope, a sprocket wheel or any other suitable form.

15. **The device** of one of claims 1 to 14, **wherein** the device includes an automatic system for activating safety measures of the device.

16. **The device** of claim 15, **wherein** the automatic system operates the generator that converts to motor mode when the security measures are activated and increases the added mass (12) to the upper end position securing it and thus leading to self- submerging of the floating body (20) that enters the casing (80) and remains there until the deactivation of the security measures.

17. **The device** of one or more claims from 1 to 15, **wherein** the flexible elements (71) ensure that the floating body (20) does not hit the upper part of the supporting tube (51).

18. **The device** of one or more claims from 1 to 15, **wherein** the floating body (80) overlaps the casing (80) and slows the floating body (20) down and by hydrodynamic resistance prevents it from hitting the supporting structure (50).

- 5 19. **The process for deployment on the exploitation location** of the device for conversion of wave energy into electrical energy constructed according to one of the preceding claims, **wherein** the process comprises the following phases:
- assembling buoyancy elements (52) into the supporting construction (50) and placing the additional mass (12) as well as assembling certain parts of the device, lowering the
 - 10 superposed part of the supporting construction (50) into the water by use of a crane and attaching it to a shipyard dock;
 - coupling the remaining elements to the supporting construction (50) to the final formation of the device,
 - transport by water of the device to the deployment location where the stability of the
 - 15 transport is achieved by the multiplied additional mass (12);
 - water transport of the anchor weight (67) with the anchor base (61) so that the anchor base (61) floats acting as a pontoon for the transport of the anchor weight (67) to the deployment location of the device;
 - fixing the poles (62) or construction of concrete base for the anchor base (61);
 - 20 - lowering the anchor base (61) by opening the valves (64a, 64b, 64c, 64d) and filling it with water;
 - connecting the anchor base (67) with the supporting construction (50), using ropes (63)
 - depth adjustment of the device, ie. adjustment its distance from the bottom of the sea.
20. **The process for deployment on the exploitation location** of claim 19 of the device for
- 25 conversion of wave energy into electrical energy carried out according to claim 12 or 13, **wherein**, the transport phase is performed as transport with a low draught.