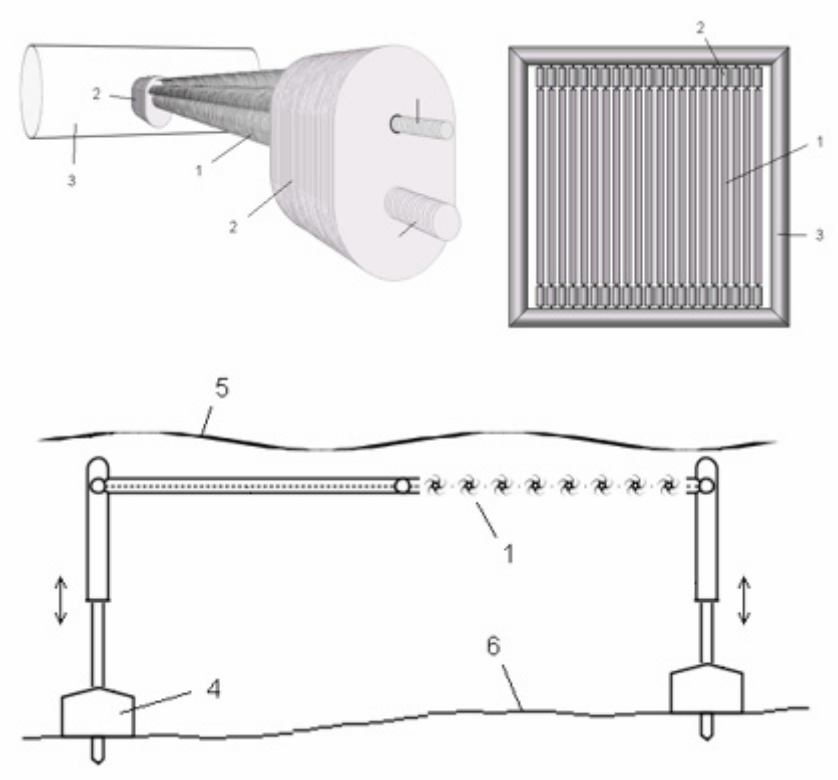
Gangolf Jobb

An Ocean Wave Energy Converter

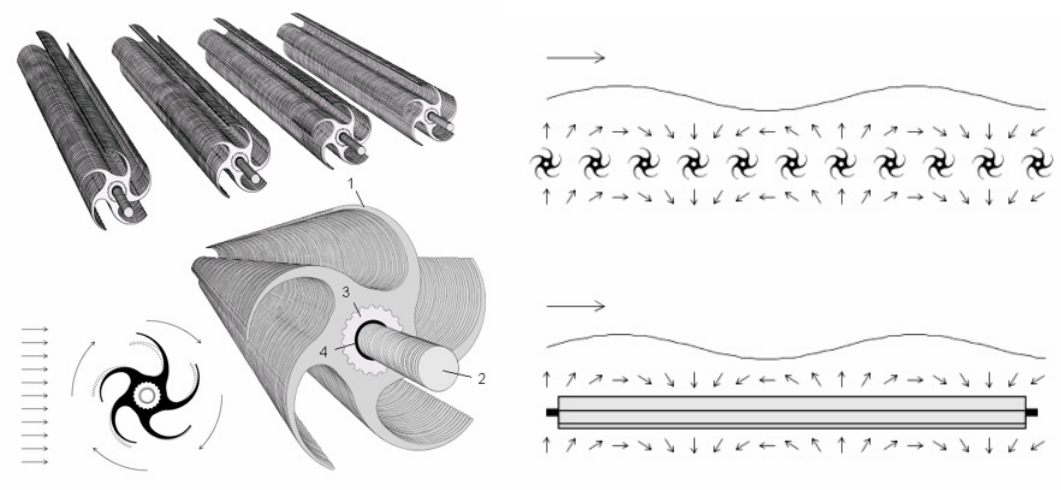
A variety of technologies have already been proposed to capture energy from ocean waves, but this one requires a minimum of material, is cheap and robust. Rather than looking at the up and down movements of waves, the proposed method lets the circular water currents beneath the waves directly drive rotors.

The novel ocean wave energy converter consists of an array of parallel Savonius rotors with elastic blades, which are arranged to form a plane and are mounted on tensioned axes in a rectangular frame. The diameter of the rotors is small compared to their length, and compared to the height of the waves. The rotors are made of rubber or plastic on a core of aluminium and rotate around tensioned axes of carbon fibres or coated steel. At the ends of each rotor sit small dynamos which transform the rotational movement of the rotors into electricity. In order to capture energy from waves the proposed converter must be positioned right beneath the water surface and oriented parallel to it.



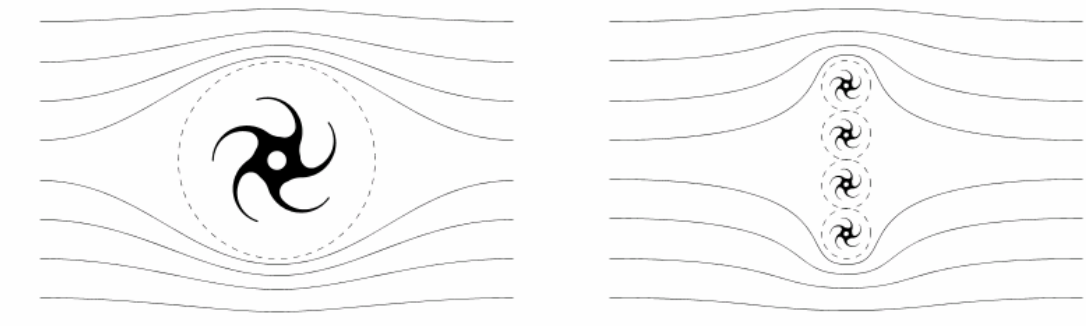
(1) Savonius rotor, (2) dynamo, (3) frame, (4) anchor and length-variable pole, (5) ocean wave, (6) sea ground.

The basis of the wave converter is the omni-directional Savonius rotor with elastic blades shown below. Savonius rotors are driven by any local water flow that has a directional component perpendicular to their axis, no matter from which direction the water comes. Under the ocean waves there is an oscillating flow field that locally changes its direction all the time. There is nearly everywhere a driving flow component striking a horizontal rotor, if the rotor is long and its diameter is small enough. The figures on the right illustrate the flow field under a sea wave coming from the left and how it hits the rotor.

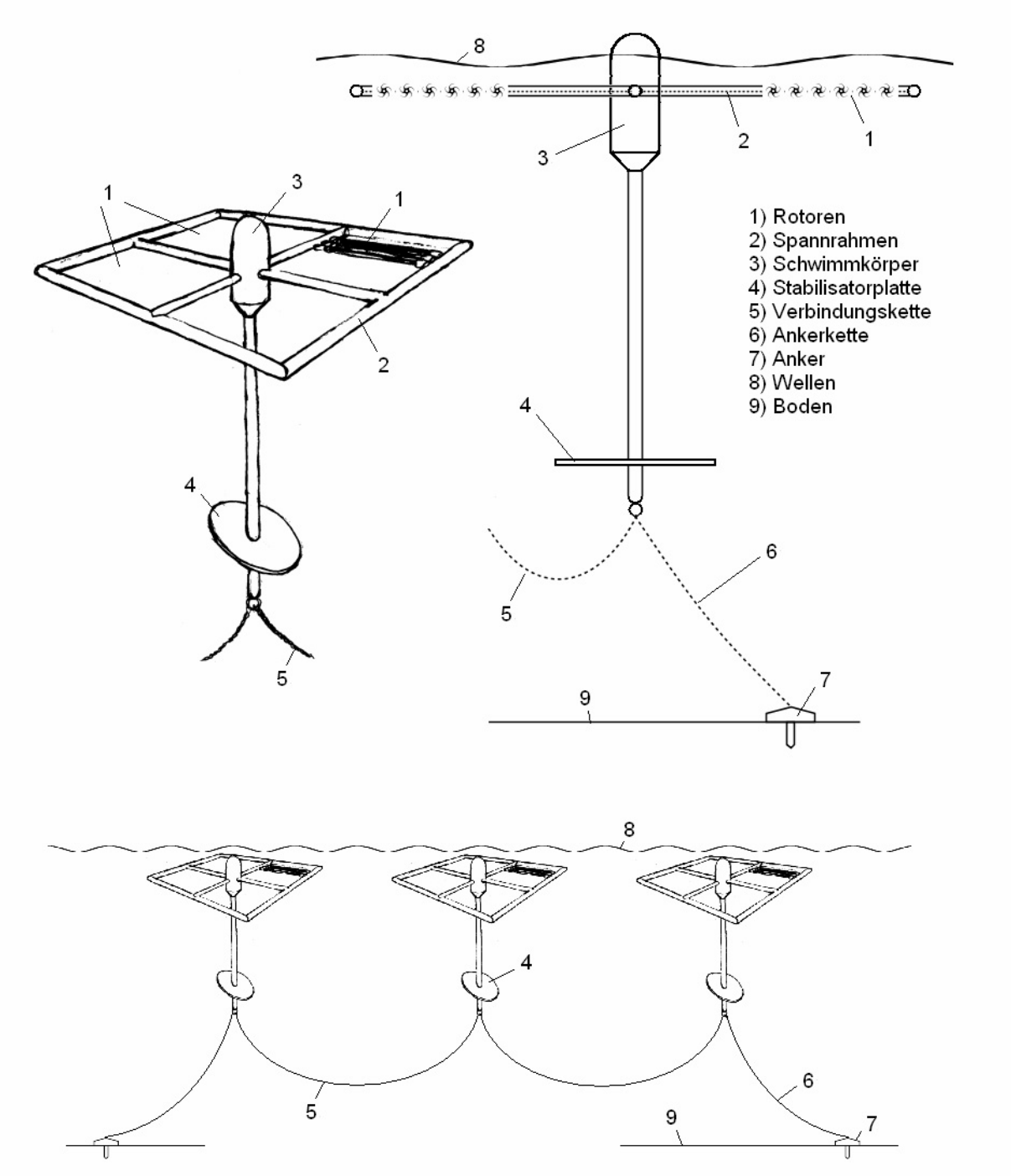


Elastic rotor blades do significantly improve the efficiency of the Savonius rotors. Water flow striking the concave side of a rotor blade will elongate the blade and increase its torque. Flow striking the convex side of a blade will curl the blade more tightly and reduce the drag. The mechanical work put into bending the elastic blades will be retrieved as soon as the blades snap back. The narrow parallel arrangement of the rotors accelerates the water flow between them, increases their torque and speed. Tensioning the rotor axes in a frame allows to construct very thin and long rotors which can still resist the water force. All rotor parts can be produced cheaply by simple extrusion.

Using a multitude of small rotors instead of a big one has several advantages. Small rotors can be placed much closer to the water surface, where most of the wave energy is. An array of small rotors covering the same water flux as a big rotor requires much less material to harvest the same flow power. Moreover, the small rotors rotate faster and therefore also require smaller dynamos. The over-all flow field drives more water through the grid of small rotors, which results in a better efficiency. Finally, the small rotors are much easier to produce.



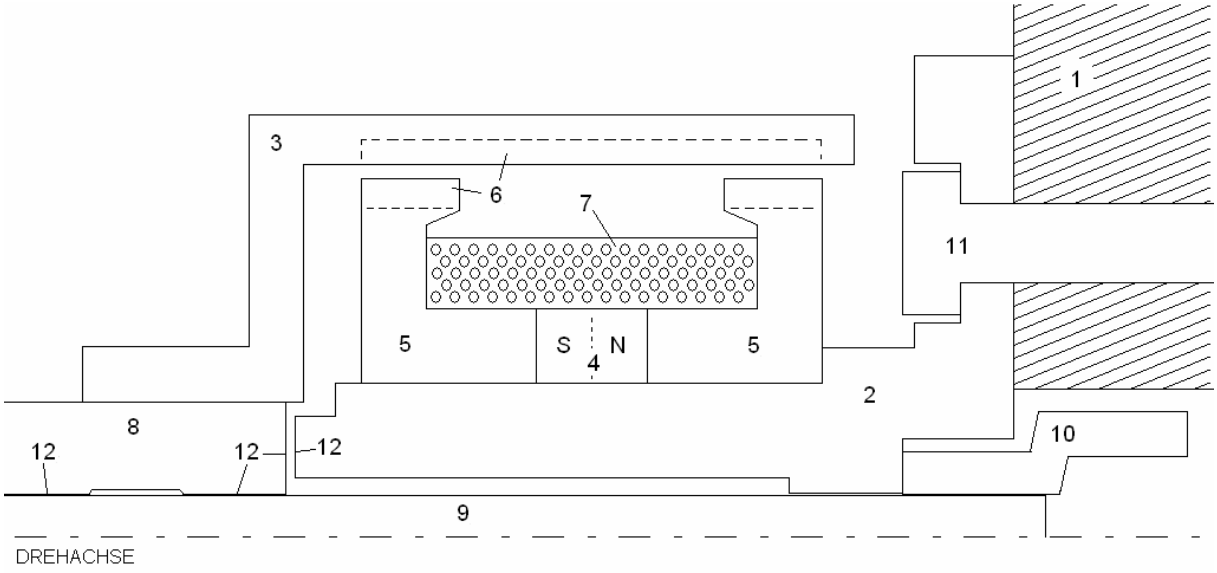
The ocean wave energy converter can be installed floating offshore as well as be fixed to poles near the coast - invisibly submerged under the water surface. The figure below shows a floating converter and how it is anchored to the ground.



(1) rotors, (2) frame, (3) floating body, (4) stabilizer plate, (5) connecting chain, (6) anchor chain, (7) anchor, (8) ocean waves, (9) sea ground.

Unlike other systems, most of which can only catch the up and down movements of the water surface, the proposed method converts currents from almost any direction. Only currents parallel to the rotors cannot be absorbed. Due to their small diameter, the Savonius rotors are able to harness much higher spectral components of the water waves and, thus, more energy than e.g. large buoys or plates, or the inlet of a OWC. The direct absorbtion of wave energy using rotors does not involve expensive and inefficient conversion steps like compressing air, converting linear motion into rotation motion, or using hydraulic pumps. No material is needed to build strong walls of chambers or basins. The new converter exposes a minimum surface area to the impact force of waves, its structure is strong and light, the rotors are elastic – which makes it likely to better withstand heavy weather than other systems.

The electromechanical aspect of the proposed wave converter is easy, too. The figure below shows a possibility to mount the rotors into the frame, with a transversal flow dynamo sitting on the same tensioned axis. The dynamo has only one permanent magnet, only one coil, but many teeth. There is no gear, no shaft sealing. Depending on the number of teeth, the dynamo produces alternating current with a frequency, which is a multiple of that of the wave rotor.



(1) converter frame, (2) dynamo stator, (3) dynamo rotor, (4) magnet, (5) iron core, (6) dynamo teeth, (8) wave rotor shaft (rotates), (9) tensioned rotor axis (fixed), (10) tensioning nut, (12) sliding surface.

I am looking for an institution or company who likes to try this out. Ideally, with my own participation. I am also looking for sponsors. In particular, I would appreciate contributions of free prototype parts, or specialist expertise. This technology might create additional markets for rubber, plastic, aluminium, metal frames, cables, subsea connectors, electromagnetic equipment, power inverters.

Let's stop global warming!

Patent is pending. Application number is DE102004060275A1 or PCT/EP2005/013507. The presented material is NOT confidential and may be distributed.

Contact: Gangolf Jobb, Fritz-Kortner-Bogen 36, 81739 München, Germany.

Email: gangolf.jobb@treefinder.de

Website: http://www.treefinder.de/ideas.html