PROPOSED SYSTEMS FOR WAVE ENERGY CONVERSION

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Keywords: Wind waves, Energy conversion, Wave power device (WPD), Wave power plant (WPP), Working tool, Float, Wave energy concentration

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Summary

There are hundreds of patents describing design of wave power devices. But only less than two dozens of them are mostly perspective and well studied. WPD of all kind consist of three main parts: a working tool, a power converter and a mounting or stabilization system.

The article is mainly focused on the types and design of tools because power converters and stabilization systems are well known.

The most typical and well-known technical proposals are presented in accordance with the types of the working tool and waves interaction.

With the adjustment of design for any construction type it is possible to reach about 90 % of energy extraction efficiency. Adjustment means that the working tools are tuned to interact with the main wave frequency or shall be able to work efficiently with the whole wave spectrum.

1. General Considerations

There are hundreds of patents describing wave power devices (WPD) design, but only less than two dozens are mostly practically feasible and well studied. Some of them are tested as large scale models in open sea conditions and realized in industrial WPD.

Among experts various types of WPD are known. M. MacKormick and V. I. Sichkarev give a short description of those devices, enumerating their main design features and emphasizing the most well known projects.

WPD of all kind in general consist of three main parts - a working tool, a power converter and a stabilizing system.

The tool works in direct contact with water, performs various movements caused by waves or somehow changes waves movement conditions. It can be designed as floats, systems of floats, water wheels or turbines, breakwaters, moles etc. In most cases (except some water wheels and turbines) a working tool converts wave energy into another type of energy that is more suitable for further conversion.

The power converter is designed to accept the energy accumulated by the working tool (mechanical energy of the tool movement, water level head, air or oil pressure) and convert it into energy, that is suitable for transmission or for immediate use. Converters can be designed as hydraulic piston pumps, gearing, chain or cable gears, air wheels and other well-known devices.

Stabilizing systems hold the WPD in a given position. If a device is located on shore, then this system is presented by the device itself. Wave power devices, located offshore, are stabilized by solid columns or frames, chains or cables, anchored to the sea bottom using rigid constructions or anchors. A device can also be connected by flexible joints with a transporting vessel.

Since power converters and stabilizing systems are all well known constructions, the WPD, listed bellow, are classified by a working tool design and type. Nevertheless there are lots of proposals classifying WPD according to types of power converters and stabilizing systems.

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Biographical Sketch

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Born 14 November 1939, Moscow

1962 Graduated from the Moscow State University of Civil Engineering

1972 Ph.D.

1997 Full professor

1962 up to now collaborator of the Moscow State University of Civil Engineering, starting from 1997 Professor at the Chair «Usage of hydraulic energy»

Author of 150 scientific papers (in particular 17 concerned with wave energy) and 20 patents

Main field of activity - hydraulic engineering including wave energy installations

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