

A Proposal of Multi-Floats Type Wave Energy Conversion System

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ABSTRACT

In this paper, a new system of wave energy conversion is proposed and results of model experiment are presented. This system extracts wave energy from the vertical motion of a float and counterweight connected at both ends of a tension member hanged from a pulley. An alternate rotational motion of a pulley thus obtained is transferred into a pair of opposite directional rotational motions by a pair of one-way clutches. The system works irrespectively to traveling direction of waves, and greatly reduces the structural problems usual to movable body type which employ rotation of movable body itself.

KEY WORDS: wave power, energy conversion, movable body, float, counterweight, one-way clutch, multiple conversion elements

INTRODUCTION

As the living standards of human beings go up, the use of natural resources and energy continue to grow. This is causing many serious problems in global environment, e. g., depletion of fossil fuels and the adverse effects of exhaust gases from thermal power plants. In such circumstances, much is expected of clean energy. Though wave power has not achieved the widespread popularity of water and wind power, it has many superior properties to those of wind power or the direct use of sunlight. Sea waves are caused by wind and are propagated to other water areas, where by transport energy. Since winds blow always at some places, wave power is fairly stable. Tapping this energy only requires the

placement of an energy converter linearly on/near the surface of water along the coast.

According to Dawson(1979), wave power converters which seems promising are divided roughly into two types. One is oscillating water column(OWC) type and other is movable body type. OWC type utilizes the water surface oscillation in air- and water- tight chambers caused by the sea wave motion, and movable body type utilizes the motion of bodies caused by sea wave. The OWC type consists of a container placed upside down on a sea surface. Sea waves create a pressure difference between the in- and outside of the container, and the resulting air currents turns a turbine. Since this system does not involve many moving parts, there are very few strength problems as a structure.

Movable body type extracts wave energy as a motion of the body which is located near the water surface and is forced to move by water wave. This motion is converted into rotational motion. Since this system requires no air- or water tight chamber to endure the force due to pressure difference, use of a large quantity of materials required for the chamber and extensive processing can be avoided. Furthermore, energy gain can be estimated by dynamic computation from wave period and wave height, which make it easy to design an efficient system(Evans(1976), Mynett et. al. (1979)). However, the system using the rotational motion of the body itself as power intake poses serious problem that the damaging torsional force inevitably applies to the moving body and its rotary shaft. For instance, if the axis of the rotational motion of the body for power intake is not oriented at the right