Development of the New Wave Power Generation System

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ABSTRACT

Authors have been developing unique pure mechanical wave power generation system having high efficiency and compact float type system. The principle of the system is application of gyroscopic moment of fly wheel on swing float by wave.

This paper presents the principle of the gyro wave power generation system and their test results. The results showed the reliable design of the system, the possibility of sufficient high efficiency and the importance of the future improvement of synchronized phase control system.

KEY WORDS: wave power generator; renewable energy; gyroscopic moment.

NOMENCLATURE

\(C_f\): Damping coefficient of float by wave generation
\(C_g\): Damping coefficient of gimbal
\(C_z\): Damping coefficient of float around z axis
\(G\): Lateral moment of inertia of gimbal
\(G_p\): Poler moment of inertia of gimbal
\(I\): Lateral moment of inertia of the float
\(I_f\): Poler moment of inertia of the float
\(I_a\): Additional lateral moment of inertia by water
\(J\): Lateral moment of inertia of flywheel
\(J_f\): Poler moment of inertia of flywheel
\(K_f\): Spring constant of float
\(M_{\phi}\): Input torque around x axis from wave
\(M_{\theta}\): Input torque around y axis from wave
\(\phi\), \(\theta\), \(\psi\): Float angular coordinate
\(\zeta\): Gimbal angular coordinate
\(\omega\): Angular velocity of flywheel

INTRODUCTION

The importance of renewable energy has been recognized and many kinds of generation systems have been developed and applied.

Wave power generation system is one of the developing system of this purpose. The many kinds of wave power generation systems were invented and tested. Every system has own characteristics and merit and demerit. Practical applications are still under way due to high cost / performance and many social restrictions.

Pelamis and Power boye are recent progressed system.

Authors have been developing unique pure mechanical wave power generation system having high efficiency and compact float type system. The principle of the system is application of gyroscopic moment of flywheel on swing float excited by wave.

This paper presents the principle and history of this gyro wave power generation system and field test of prototype system.

GYRO WAVE POWER GENERATION SYSTEM

Principle of the system

The function of this system presented by following flow as shown in Fig.1 and Fig.2.