

Design and Application for Innovative Marine Renewable Energy Devices

新型海洋能发电装置设计与应用

林伟豪 张天明 | Wei-Haur Lam Tianming Zhang 著



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Preface

The international community has paid more and more attention to the protection of energy security, the protection of the ecological environment and the reaction of the climate change. Ocean energy as a clean and renewable energy is not only rich in resources, but also has little effects to the environment. The development and utilization of ocean energy becomes a common consensus and concerted action of the coastal countries and regions all over the world. China is a rich energy country. The governments are increasingly concerned about the clean renewable energy such as ocean energy. The Chinese government has made great efforts to promote the development of ocean energy and realized the transformation of marine energy equipment from "generating electricity" to "stabilizing power generation" in order to implement the spirit of the 18th CPC National Congress and adhere to the concept of "innovation, coordination, green, opening and sharing", which accelerates the development process of ocean energy in China.

Intellectual property is the exclusive right of creative spiritual wealth created by individuals or collectives in the fields of science, technology, literature and art according to law. Intellectual property is an intangible property right. The invention as a kind of intellectual property is defined by the article 2 (section 2) of the patent law of China as follows: "the invention means the new technological scheme put forward for the product, method or improvement thereof." The invention refers to a new technical proposal proposed for the product, method or its improvement. "Invention refers to a new technical scheme for product, method or improvement, which mainly embodies novelty, creativity and practicability. The writing and application of the invention patent is beneficial to protect the intellectual property of the patent holder. It can prevent the rival malicious competition and protect the rights and interests of the patent holder. We can understand the latest technology progress in related fields and industries through analysis and retrieval of patents, which can promote the development of technology. It can be said that the invention patent is an important index to measure the scientific and technological innovation ability of a country or region.

The first part of this book aims at the problem of the high transportation and installation cost

in the process of the industrialization for the traditional tidal-current turbines and introduces 9 new folding tidal-current-power generating devices. The characteristic of these devices is that a set of folding system has been innovatively put forward on the basis of the traditional tidal-current-turbine and the folding tidal-current-power generating devices such as horizontal-axis, vertical-axis, oscillation and drag-driven have been designed. These new generating devices are convenient to transportation, avoid assembly between different parts, reduce the transportation and installation cost, shortens construction time under water and improve the installation quality by the effective folding to reduce the whole volume of the device, which takes advantages to the industrialization process of power generation.

There are many types of marine energy such as wind energy, wave energy, solar energy and tidal-current energy, which can simultaneously exist and are rich in sources. The second part of this book based on the folding tidal-current-power generating device specifically introduces some new integrated devices of ocean renewable energy such as wind-power generation, solar power generation, integrated generation of tidal-current-power and wind-power and Vortex-Induced-Vibration (VIV) generation. The utilization rate of marine resources is greatly improved by combining ocean energy with wind and solar power. Further, a multi-form power generation system is formed. We should develop efficient, stable and reliable marine power generating equipment and broaden the application forms of marine energy, which will gradually build a new pattern of marine energy development suited to China's marine situation.

Finally, the book is oriented to the needs of manufacturing, utilization and layout around the development of ocean equipment. The ocean energy is used in ocean, which accelerates the research and development of marine power supply technology. The third part of the book introduces some related patents that promote the industrialization of power generation, which mainly includes a patent of additive method to fabricate propeller or tidal-current-turbine, a patent of recirculating flume for tidal-current-turbine and a patent of Laser Doppler Anemometry (LDA) device for tidal-turbine-wake measurement.

This book has the following characteristics. 1, systematicness. The book introduces four design techniques of folding tidal-current-power generating device such as horizontal-axis, vertical-axis, oscillation and drag-driven. Some new integrated devices of ocean renewable energy such as wind-power generation, solar power generation based on the above basis are designed, which promotes the industrialization of related patents. 2, scientificness. The contents of the book are presented in the patents, which mainly includes abstract, claims, description and attached drawing. 3, innovativeness. The folding power generating devices in the book are firstly invented by the author. There are no other books that have the same content as this book to date in the world.

This book in the form of patent shows the technology and equipment of marine power generation to readers and particularly shows the folding tidal-current-power generating device and integrated devices of ocean renewable energy, which are suitable for the engineers in the related field of marine energy, university teacher, student and general readers interested in the

development of marine renewable energy technology. The engineers in the field could learn the latest folding tidal-current-power generating device, integrated devices of ocean renewable energy and supplementary devices for tidal power from this book. University teachers and students can know the latest developments in the field, study the design methods of related power generating equipment, know the development direction of marine renewable energy and then improve the knowledge reserve by reading this book. General reader could know about marine renewable energy and increase research interests by reading this book. At the same time, each part of the book is an authorized or applied invention patent, which can help the readers learn the writing skills of the invention patent.

The inventors involved in this book include: Wei-Haur Lam, Yongchen Song, Hailin Mu, Weiguo Liu, Dayong Wang, Ming Jia, Hushan Xu, Yangchun Zhan, Cong Chen, Xiuyun Wang, Jiafei Song, Weizhong Li, Yu Liu, Yi Zhang, Shugeng Yang, Yan Huang, Ying Li, Shilun Feng, Xiaomei Wang, Benrui Zhu, Peihua Gong, Yufeng Tian, Yonggang Cui, Shuguang Wang, Jinxin Jiang, Yanbo Ma, Jianhua Guo, Tianming Zhang, Chong Sun, Liangge Shan, Fumin Wang, Daochen Lv, Huixian Song, Chuchu Sun, Chongxiao Yang, Shangyu Yu, Jianquan Wang, Bolong Yun, Shun Yao, Wenhao Xu, Yongqing Hai, Yang Gao, Yansong Wang, Shangru Jia, Xingyu Liu.

There might be any inappropriateness and flaws in this book due to the knowledge of the author and the lack of patent data. Please do not hesitate to contact us.

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1st December, 2017

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