

The Design and Simulation of the Charging Lighting Devices for the Fitness Equipment

Wang Chao

College of Robotics, Beijing Union University, Beijing, China

Email: kkb141@163.com

Abstract—In this paper, the design and simulation of the charging lighting devices for the fitness equipment in the capital community are studied. The charging lighting devices for the fitness equipment in the capital community are analyzed for the mode of energy saving and emission reduction for the residents in the capital community while providing fitness energy for regenerative energy. This paper is an important reference for energy saving and emission reduction policy decisions and the implementation of the capital and provides an operational support for achieving full coverage of sports life community.

Index Terms—design and simulation, charging lighting device, fitness equipment

I. INTRODUCTION

With the rapid development of modern industry, mankind's energy demand has obviously increased. According to experts' prediction, coal can be mined for 221 years, oil for 39 years and natural gas for only 60 years. The shortage of electricity caused by the shortage of electricity has become increasingly prominent. The continuous "power shortage" in 2003-2004 and the increase in the national electricity load by 15.2% over the previous year all pose a severe test of the sustainable economic and social development. The only way to solve the energy problem is to plan the regular energy use, save energy and develop new energy sources.

On the other hand, China's rapid economic development, the gradual improvement of the people's living standards, the enrichment of spiritual life and the healthy development of body and mind are valued by people. More and more people are keen on investing in health so as to enrich their leisure life. At the same time, people's awareness of sports is continuously enhanced and their fitness activities are universally popularized. The consumption of sports and fitness has become an important part of modern people's daily life consumption. The exercise of fitness has also gradually entered the life of ordinary people, thus various kinds of fitness places have emerged.

The use of energy generated by the human body in the exercise room generates electricity for the normal operation of other electrical equipment in the gym. This is the perfect combination of a healthy, slim and fit lifestyle with a theme of energy conservation and consumption reduction and the era of environmental protection. In the ever-changing exploration of new

energy sources, energy-saving products are emerging one after another today, fitness power generation is undoubtedly have the scale of development conditions and commercial development prospects of one of the power generation, but also ordinary people start from bit by bit, the secondary use of energy waste A model for treasure. Today, in order to build a conservation-oriented society throughout the country and make unremitting efforts today, fitness space generation to reduce operating costs as a fundamental guarantee for the development of new energy as the ultimate goal, has a broad market space and far-reaching promotion of significance.

In order to promote the nationwide fitness program, China has installed a large number of outdoor fitness equipment in various communities, which are well loved by the people for exercising and recreational activities. However, the motivation generated during exercise was wasted, and community fitness equipment charging lighting device is to convert these motive power into electrical energy for LED lighting. At present, the research results at home and abroad have been manual power generation devices, gear and chain drive power generation device, but manual power generation is too physical, and gear and chain drive power generation device structure is relatively complex, is not conducive to community outdoor environment maintenance. Community fitness device charging lighting device to reciprocate both feet as a power source to generate electricity, the more power of both feet, the more power of electricity generation. The community fitness machines seen everywhere can assure the masses of good foundation for energy-saving emission reduction benefits.

II. CALCULATION

Equipped with the capital community fitness equipment charging lighting device by standing on the community fitness equipment rocker pedal back and forth, drive the connecting rod connected to the shaft circular motion, rotation of the shaft generator to generate electricity, the generator connected to the battery charge and provide LED lighting or phone charging.

Problem Proposal ----> Document Retrieval ----> Community Fitness Field Investigation ----> Functional Design ----> Structural Design ----> Pro / Engineer Wildfire Modeling ----> Pro / Engineer Wildfire

Assembly ----> Structural Optimization ----> Pro / Engineer Mechanica Motion Simulation Prototype.

Parallelogram mechanism is a particularly useful mechanism, has a wide range of applications in the evolution of institutions, innovative design. Community fitness device charging lighting device mechanism principle for the crank rocker mechanism, the design of the existence of the conditions for the entire rotation, Figure 1 shows the rocker in the two extreme positions of the situation^[1,2].

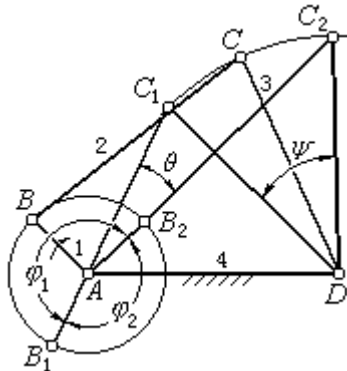


Figure 1. Community fitness equipment charging lighting device schematics

Analytical method for the length of each rod is shown in Figure 2.

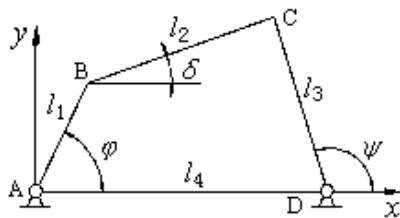


Figure 2. the length of each rod

$$\left. \begin{aligned} \cos \varphi + l_2 \cos \delta &= l_4 + l_3 \cos \psi \\ \sin \varphi + l_2 \sin \delta &= l_3 \sin \psi \end{aligned} \right\}$$

$$\cos \varphi = \frac{l_4^2 + l_3^2 + 1 - l_2^2}{2l_4} + l_3 \cos \psi - \frac{l_3}{l_4} \cos(\psi - \varphi)$$

$$\left. \begin{aligned} P_0 &= l_3 \\ P_1 &= -l_3 / l_4 \quad P_2 = \frac{l_4^2 + l_3^2 + 1 - l_2^2}{2l_4} \end{aligned} \right\}$$

$$\cos \varphi = P_0 \cos \psi + P_1 \cos(\psi - \varphi) + P_2$$

$$\cos \varphi_1 = P_0 \cos \psi_1 + P_1 \cos(\psi_1 - \varphi_1) + P_2$$

$$\cos \varphi_2 = P_0 \cos \psi_2 + P_1 \cos(\psi_2 - \varphi_2) + P_2$$

$$\cos \varphi_3 = P_0 \cos \psi_3 + P_1 \cos(\psi_3 - \varphi_3) + P_2$$

III. PERFORMANCE ANALYSIS

At present, a large number of outdoor fitness equipment installed in the community, one of the fitness as shown in Figure 3.



Figure 3. outdoor fitness equipment

Community Fitness Rechargeable Lighting Device As shown in Figure 4, including exercise bike rocker pedal, connecting rod, shaft, generator, battery, can be connected to LED lights. People standing on the exercise machine rocker pedals with the reciprocating motion, connecting rod connected to the circular motion of the shaft, shaft rotation generator to generate electricity, the generator connected to the battery charge and provides LED lighting. The device will provide lighting for community people while exercising and relaxing. In Pro / Engineer Mechanica prototype motion simulation, the effect is good.



Figure 4. motion simulation

There are two creations listed below in this application:

1) simple structure, set fitness and charging in one.

2) The human's feet as a power source, low-carbon, environmental protection, safety.

Community fitness device charging lighting device has the advantages of simple structure and wide range of application. It can regenerate electric energy while having a good mass foundation and facilities, and the benefits of energy-saving and emission-reduction promoted in the whole country will be very obvious. At present, there are 4868 community-only community fitness equipment in Beijing and 1 fitness equipment charging lighting device in one community to provide energy for 2 LED lights. Each time there are 10 people using this exercise machine, each person can be LED Light lighting provides 5 minutes of energy, taking into account 30% of the energy loss, the community 1 fitness rechargeable lighting devices for LED lighting each year to provide 25550 minutes of energy, a total of 2072956 hours for Beijing to produce LED lighting energy . If a 5# or 7# batteries can provide 10 hours for LED lighting, the equivalent of annual reduction of 210,000 batteries in Beijing abandoned, saving energy, reducing carbon emissions and protecting the environment.

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Wang Chao male, master degree, assistant research fellow, College of Robotics, Beijing Union University, Beijing, China
postal code: 100020
Email: kkb141@163.com