

Vibration power generation based mobile power

Meiqi Kang

School of Control and Computer Engineering, NCEPU, Baoding 071000, China.

13313351072@163.com

Abstract: In recent years, with the popularity of mobile digital electronic products such as smart phones and tablet computers, mobile power has become one of the essential products for consumers. Therefore, it is imperative to develop a mobile power source that can be charged anytime and anywhere to ensure the basic power supply of mobile digital electronic products such as smart wears and smart phones. The vibration self-charging mobile power source described in this paper is a new type of vibration power generation battery module added inside the traditional mobile power supply. Using the principle of electromagnetic induction, using a fixed coil and a movable magnet, the conductor cuts the magnetic induction wire to generate current when the vibration is induced. Complete energy collection. The storage output part through the design of the circuit, followed by rectification, filtering, energy storage, voltage regulator, to achieve a stable output DC voltage. After the module is added to a conventional mobile power supply, the mobile power supply can not only charge through an ordinary power supply, but also collect vibration energy generated by human motion to charge the mobile power supply, and can freely switch between the two charging modes and solve the problem in the outdoors. , Public transport, work, go out, etc. Difficult to obtain a fixed power supply or inconvenience to charge the mobile digital electronic devices to run out of power problems. And this product is a new energy development and utilization of vibration, in line with the current popular energy-saving emission reduction concept.

Keywords: vibration power generation, electromagnetic induction, mobile power.

1. INTRODUCTION

The main functions of the mobile power supply include charging through a common power source and moving through the human body, such as walking and arm swinging. The vibration generated by various daily actions generates electricity to charge the mobile power and can freely switch between the two charging modes. Ensure that users can still get extra power after running out of electricity through regular charging to maintain the working of digital devices such as smart wearables and smartphones. It solves the problem of running out of power when it is difficult to obtain a fixed power source or inconvenient charging in outdoor, public transportation, work, and outing. As long as the power is in an under-filled state, it

supports the vibration charging energy storage. Through practical use, the device can achieve more efficient conversion of energy and can effectively solve the problem of running out of mobile power.

In order to solve this practical demand, we have developed a new vibratory self-charging mobile power source with a universal output port 5V, 1A/2A output, digital display residual power, led high-brightness lighting, vibration charging and traditional charging modes. Long press for more than 3 seconds to complete the switch, short press to activate the battery indicator, and press the key twice to turn on led lighting. The multi-port output ensures the universality of the mobile power supply; the remaining power is displayed to ensure that the user clearly perceives the power supply status of the mobile power supply and whether it needs to be charged. Led high brightness lighting allows users to use or directly use the lighting function at night; vibration power generation function to help users continue to get energy when inconvenient charging, in the sports, shopping, travel and other non-fixed charging power supply occasions, can be carried by the mobile power. Placed in a backpack, the vibrations generated by human motion trigger the power generation device in the device, and the energy obtained is stored along with the energy obtained in the traditional form of charging, and the power supply is completed when needed.

2. BACKGROUND

In recent years, with the popularization and rapid growth of digital products, the rise of smart wears, smart phones and other industries, the status of battery technology as its power source has become more and more important, and as one of its extremely important supplementary power sources, mobile power sources. It is at the climax of development. However, the current mobile power supply on the market has a long charging time and has a relatively large volume and weight. After the power is exhausted, it loses its application value. This affects the user experience to a large extent: Communication tools such as smart phones penetrate into the public life. Today, the daily behaviors of GPS, payment, communication, and online purchase cannot be used due to exhaustion of electricity, and the inconvenience caused is obvious. Therefore, it is imperative to develop a mobile power source that can be charged anytime and anywhere to ensure the basic power supply of smart wears, smart phones, etc., and ensure basic functions such as communication under emergency conditions. Only by taking advantage of the omnipresent energy in the public life, energy can be collected anytime and anywhere to complete the power supply, so as to solve the power limitation in mobile power applications and enhance the user experience.

3. WORKING PRINCIPLE

The vibration self-charging mobile power introduced in this paper can be divided into three main modules: main energy storage module, vibration power generation charging module, power display and lighting module. While each module is operating independently, there are

also linkages and synergy between the modules. Through the operation of the three modules, the basic work such as charging and power generation of the device is completed.

3.1 Main energy storage module

After the technical requirements, costs, finished product effects and other aspects, multi-level comparisons and experiments, the main energy storage module uses 18650 lithium batteries[1]. The 18650 lithium battery core is 18 mm in diameter and 65 mm long. With features of large capacity, long life, high safety performance, no memory effect, small internal resistance, serial and parallel applications, etc., its safety performance is extremely high, no explosion, no burning; non-toxic, non-pollution; The safety performance is achieved at one go, the number of cycles is more than 500 times; the high temperature resistance is good, and the discharge efficiency reaches 100% under the condition of 65 degrees. We installed a protective plate for the main energy storage module to avoid overcharging and overcharging the battery, extending the service life of the mobile power supply, and it does not have a memory effect. It is not necessary to empty the remaining charge before charging, and it is suitable for use in a mobile power supply. The internal resistance of the polymer cell is smaller than that of the general liquid cell. The internal resistance of the domestic polymer cell can even be less than 35mΩ, which greatly reduces the self-consumption of the mobile power supply and prolongs the standby time of the mobile power supply.

3.2 Vibration power generation charging module

The vibration-type power generation charging module adopts an electromagnetic power generation system and is divided into two parts: energy collection and storage output. Using the principle of electromagnetic induction, using a fixed coil and a movable magnet, when a vibration is induced, the conductor cuts a magnetic induction wire to generate a current to complete the energy collection. The generator uses a rectangular parallelepiped magnet of 8mm*15mm*35mm. The ultra-fine copper wire is wound to form a 35mm coil, which is wound in the middle of a fixed-size plastic tube. Place a magnetic plate with a diameter of 10mm on the upper and lower sides of the cylinder. Due to the repulsion of the same stage, the phases attract each other, the magnet is suspended in the middle of the plastic cylinder, and the coil is wound just outside the cylinder so that the magnet can maximally cut when vibrated. Magnetic lines, get as much energy as possible. Through the design of the circuit, through the rectification, filtering, energy storage, voltage regulation, to achieve a stable output voltage of 5.0V DC to complete the storage output. Part of the product circuit shown in Figure 1.

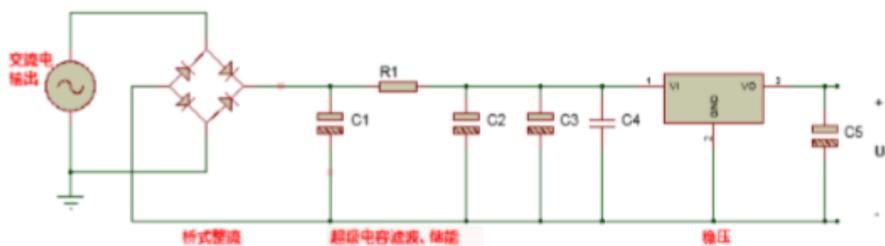


Fig.1 Part of the product circuit

ADC that accurately measures battery voltage and current, and accesses ADC data through I2C. Built-in power path management supports punching. Built-in power calculation method can accurately obtain battery power information. The battery power curve can be customized to accurately display the battery power and support 3/4/5 LED display and lighting functions. With ESOP16L package, it can automatically detect device insertion, pull out, and automatically standby. In addition, with over-voltage, overcharge, over-current, over-discharge and over-temperature protection. Part of the product circuit shown in Figure 2.

4. ADVANTAGE

The new type of vibration power generation mobile power introduced in this paper adopts the parallel method of vibration power generation and traditional charging. It can not only meet the user's daily charging requirements, but also complete the energy storage after the power is exhausted, helping the user to escape from the embarrassing situation of exhausted power. The vibration power generation does not affect the normal working life of the user, and it does not require tedious settings to automatically trigger charging. Second, low-carbon environmental protection, green energy, to meet the social needs for sustainable development. In addition, the port is suitable for all kinds of data lines, various current levels, and is universally applicable. In addition, this device has a power display function that clearly shows the mobile power status.

5. CONCLUSION

This article describes the vibration self-charging mobile power supply is a new type of vibration power generation battery module inside the traditional mobile power supply, can only be charged through the ordinary power supply, but also to collect the body movements, such as: walking, arm swing and other daily actions generated by the vibration The energy charges the mobile power and can freely switch between the two charging modes. Solved the problem of running out of power of mobile digital electronic devices in the outdoors, public transportation, work, going out and other difficult to obtain a fixed power supply or inconvenient charging. Moreover, this product is a new energy development and utilization of vibration, in line with the current popular energy-saving emission reduction concept, has broad application prospects.

REFERENCES

- [1] Xuping Jia. Panasonic 4 Ah 18650 lithium ion battery [J]. Power Technology, 2010, 34 (09): 865-867.
- [2] Zeli Niu, Wei Mao, Yongjie Zhou. Research and Production of Multifunctional Portable Charging Pods [J]. Information Recording Materials, 2017, 18(05): 26-27.