IMPLEMENTATION OF WEARABLE MOBILE CHARGING DEVICE

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Abstract

As the need for energy grows ever increasing, so is the need to produce energy in the most efficient and eco-friendly way possible. Sophisticated electronic devices are being produced every day. Such portable devices require energy in the form of batteries to function properly.

However, recharging such batteries require electricity produced through conventional methods.

Conventional electricity may not be available every time and at every place. This requires the need for innovative methods of energy production.

With wearable technology, learning more about yourself has not only become high-tech but also real-time. From devices and apps that help you track heart rate and food consumption details to gadgets that monitor your mood and even surrounding air, the "quantified self" is a reality for the everyday person.

Following the same trend, our project aims at producing energy with the help of wearable technology. This paper discusses wearable device which could be a pen or a wrist watch or a knee cap. Such an innovation would not only reduce our dependence on conventional electricity but also provide us the opportunity to recharge our devices anytime and anywhere. This idea would also propel towards a cleaner and greener future by reducing our dependence on conventional and inefficient methods.

INTRODUCTION

Mobile phones nowadays have become extremely powerful in terms of processing speed and versatility. Smart phones are equipped with sophisticated Intel processors, Wi-Fi and Bluetooth technology etc. These functions of mobile phones drain the battery more rapidly. Therefore, to tackle this problem portable mobile charging devices have emerged.

Many a times we are unable to charge our phones due to several problems. Firstly, not everyone can afford to have a portable charger in addition to having a smart phone. Secondly, these portable chargers itself have a limited power which they can supply. Furthermore, these portable chargers itself need to be charged with electricity and if this energy is not utilized, the energy stored gets drained with time.

This calls for the need of a solution which can:

- Provide free energy without the use of conventional electricity.
- Can be accessed anytime and anywhere.
- Uses energy generated with the help of human power.

Our paper puts forth the idea of generating power with the help of human energy and using it to charge devices like mobile phones etc. This device generating power could be anything from a wrist watch to a daily-use pen or it could be a knee cap.

We would be focusing on the wrist-watch concept as it is reliable and can be constructed using readily available electronic devices.

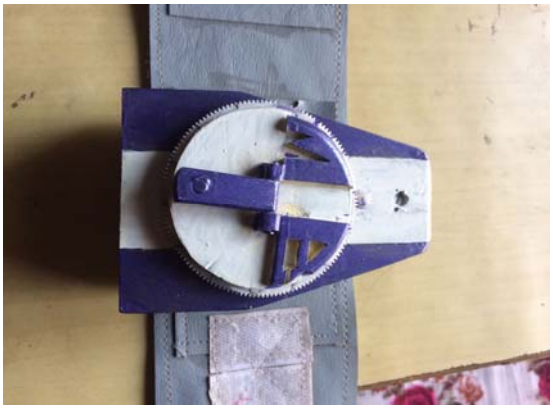
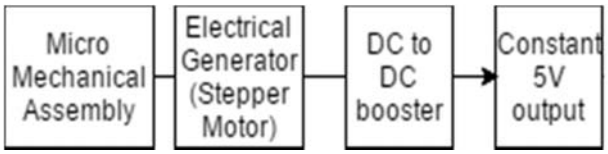


Fig-1: Charging device made to attach in the wrist.

METHODOLOGY

The device will operate on the principles of Faraday's Law. The proposed product to implement this would be a wrist watch. A stepper motor of rating 16 ohms would be used to generate power for the prototype.



Block dig. 1:

- Since the assembly inside the device would be of micro level, the charging device involves concepts of MEMS. In the above block diagram, the first block is of Micro Mechanical Assembly. This comprises the stepper motor and gears mounted in the device. It also consists of the integrated circuits which will control the current generated by the stepper motor.
- The third block is that of a DC to DC converter. The integrated circuit would consist of a boost/buck transformer. The function of this transformer is to control the output generated by the magnetic core assembly. The transformer would be selected such that the output would be of 5V DC. Even if the output by the windings is less than 5V, the transformer would boost it to 5V. Similarly if the output by windings is greater than 5V, the transformer would buck it to 5V. The integrated circuit would also consist of voltage regulation IC. This would ensure constant voltage level at the output.
- The output of the device will be supplied with the help of a USB connector. This connector could be connected to any mobile phone to charge the device.

WORKING

The device consists of a stepper motor of rating 12 Ohms. The stepper motor is attached to a gear. This gear is the driven gear. It has 12 teethes.

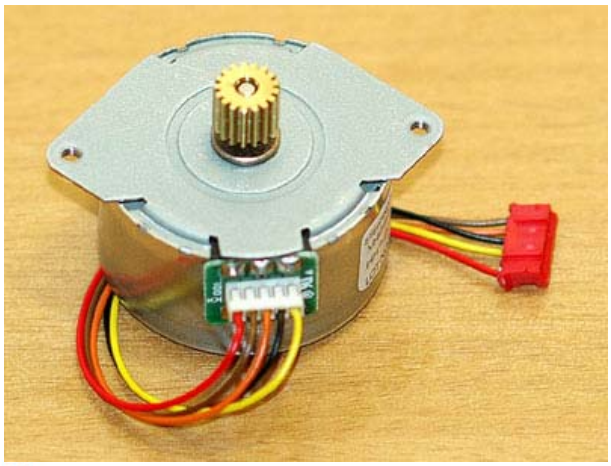


Fig2: Stepper motor (12 Ohm).

The driven gear is attached to another driver gear. The driver gear has 156 teethes.

$$\text{Gear ratio} = \frac{\boldsymbol{Driven}}{\boldsymbol{Driver}} = \frac{12}{156} = 0.0769$$

Therefore, we see that the ratio is less than one which means that we will be getting increased speed instead of torque due to the gear assembly.

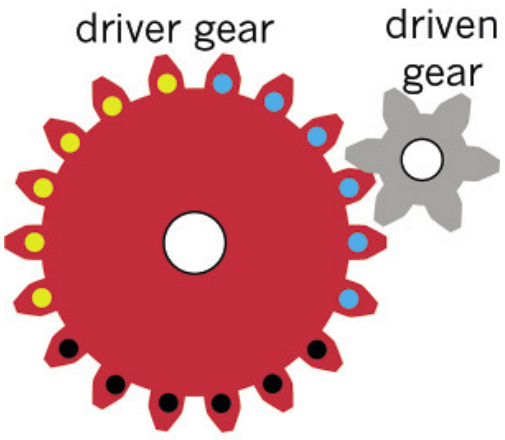


Fig3: Gear Ratio.

Therefore, for every one rotation of the driver gear, the driven gear would rotate 12 times. This gives the stepper motor enough power to generate for charging device.

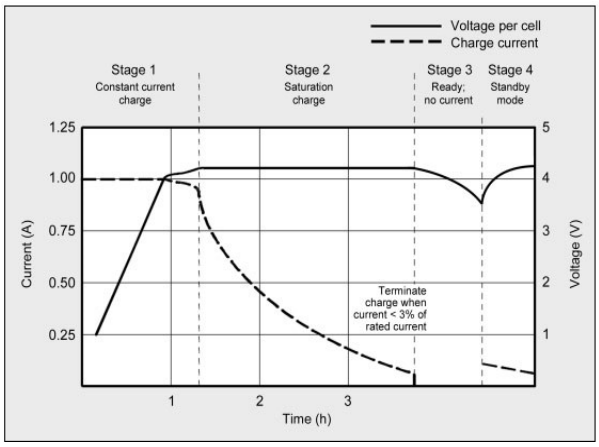


Fig4: Charging Graph Of Phone(2200mAh).

We used a 2200mAh phone for the test. As the rotor is rotated in any direction continiously with some contant6speed. The motor due to back EMF starts generating the a a potential difference and which drives the current. The current generated is not constant as the speed of rotor is variable. So the varying voltage is bost by the booster circuit. The graph above shows the charging patten of a battery. We are likely to get the above results as shown in the graph.

FUTURE SCOPE

- This project has the capability to replace the currently available power banks.
- In future updates, it can be upgraded to provide output voltages in options of 3V, 5V and 12V as well.
- This device currently provides energy in real time. But it can be upgraded to store energy as well which can be used later.
- It can be used to generate light by attaching a small LED at the front of the watch.

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