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Design of Human Powered Power-Bank using AC Motor

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ABSTRACT: We take our modern electric grid for granted assuming we'll always have easy access to power whenever we need it. In the aftermath of powerful storms, it can take days or even weeks for utility companies to reconnect downed powerlines. The batteries for our gadgets are only going to last so long. But there's one way to generate electricity that never runs out of power and is easy to carry, a human powered power-bank. This paper presents the design methodology of electrical power generation using leg movement. It's the travel gadget that recharges itself without any external electrical grid, using leg movement. Mechanical movement of leg is converted into electricity and stored in batteries for later use. It can be used to recharge cell phone, emergency flashlights, mp3playes etc.

KEYWORDS: Induction, mechanical energy, alternate energy source, AC to DC conversion.

I. INTRODUCTION

Mobile phone is our means to remain connected. While the phones have progressively got more powerful processors and large touchscreen interface, their power requirement has increased correspondingly. Unfortunately, battery technology has not been growing at a comparable pace. Hence there is a need of frequently charging a battery.

Our solution for these drawbacks/problem is a 'Human Powered Power-Bank'. It is a device that utilizes mechanical energy converts it into electrical energy that can be used to charge a cell phone. It does not require any external electrical source. Also by going for this alternative source of energy we can reduce the human foot prints in earth as we are using human efforts instead of conventional electricity. The device uses a gear trail and intermediate gear for transformation of
angular movement of leg into rotational movement of rotar which will then generate AC voltage with the help of coil placed around the magnetic rotar.

II. LITERATURE SURVEY

In recent years, a lot of alternate means have been proposed to provide electrical energy. The means with renewable and sustainable features has attracted as increasing interest in last few years. Many human powered generator as well as human powered harvesting systems have been proposed in last few years, amongst them large amount uses piezoelectric disc to generate electricity, which results in very low voltage and current and is unable to charge a cellphone. Another method proposed uses a trail of gear mounted in a shoe to generate electricity, drawback of this method is it is unable to produce desired amount of voltage required to charge a device.

III. WORKING PRINCIPLE AND DESIGN

The device works on basis of induction of motor. An induction generator or asynchronous generator is a type of alternating current electrical generator that uses the principle of induction motors to produce power. Induction generator operates by mechanically turning their rotor faster in synchronous speed. A regulator induction motor usually can be used as a generator without any internal modification.

In the device angular movement of knee joint is converted to a rotational movement using crank and a trail of gears, which rotates the magnetic rotar placed in between copper coil which in return produces electricity. Gear trail helps to convert the slow movement of crank into a speedy rotation of rotar which helps in producing electricity. According to 'FARADAYS' law of 'ELECTRO MAGNETIC INDUCTION' for the cutting flux by coil there will be some current flow measured from the copper wires which is AC by nature. This AC current is then converted to DC using a rectifier

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circuit, after this conversion it is supplied to Darlington pair of transistors to increase the current, after current amplification the voltage is then regulated to 5 volts using LM7805 IC & then fed to battery for storage purpose. This electricity can be later used to charge a cellphone, mp3 player, or power a flash light.

For a single step leg movement device generates about 30 volts AC, this AC voltage is rectified through a rectification circuit using four diodes assembly which results in fluctuating 1-10volts DC, because of the back and forth movement of a single leg. To overcome this problem, another rectified 10 volte from other leg device is combined this results to a total of 6-8 volts continuous DC voltage. Further this voltage is supplied to Darlington amplification circuit followed by voltage regulator LM7805 IC to limit the output voltage to 5 volts DC, further this voltage is used to charge batteries.

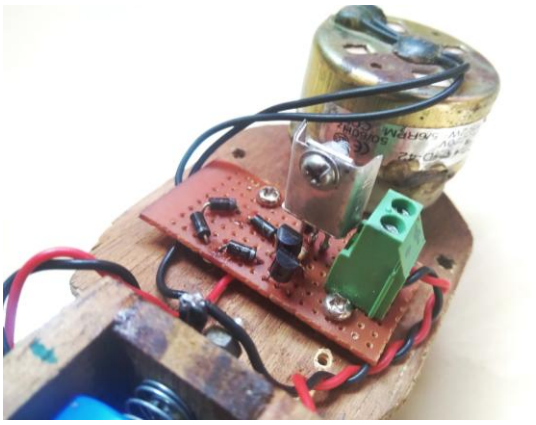

Figure 1 Rectifier , current amplifier & regulator circuit.

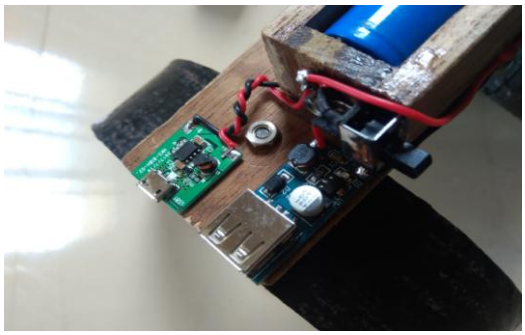

Figure 2 Step up converter DC-DC & TP4056 charging circuit.

Figure 3 AC motor fused with geared box to work as generator.

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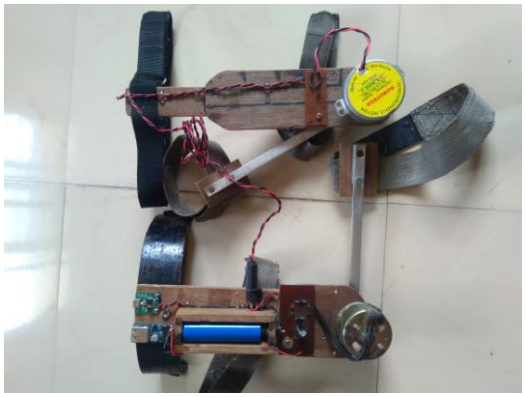

Figure 4 Device itself with harness.

IV. RESULTS

Table 1 Battery charging time for walking condition.

Battery charged (in volts V)	Time taken (in minutes)
0.06	5
0.12	10
0.18	15
0.24	20

Table 2 Battery charging time for hand crank condition.

Battery charged (in volts V)	Time taken (in minutes)
0.12	5
0.24	10
0.35	15
0.47	20
0.59	25

Table 3 Charging time of a cellphone.

Percentage charged (%)	Time taken (in minutes)
5	4
10	8
15	13
20	18

V. CONCLUSION

In this paper, a device working on electro magnetic induction is developed and studied. The gadget developed is based on walking as well as hand cranking is able to produce sufficient amount of electricity to charge a Li-ion battery. This Li-ion battery can be used for various purpose such as charging a cellphone, mp3 player, radio or powering up an emergency flash light. It was seen that handcranking serves to be a better option to produce electricity to charge the battery faster. The device proes to be an asset for human health by encouraging a fitness activity such as walking. The gadget is most useful in rural areas where one faces loadshading on daily basis, it serves a better help for people where there is no electricity and therefore no means to communicate. This gadget can be the most beneficial as it promotes

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fitness which leads to a healthy life, hence one can easily charge their devices just by walking or hand cranking it at whatever place they are present.

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