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NON-CONVENTIONAL ENERGY GENERATION THROUGH KNEE

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ABSTRACT: The main aim of the project is to develop Knee power generator. The power producing device is attached to the Knee the movement of the Knee generates power. This project is designed to ensure that our cell phones never run out of juice by letting us charge it while we are on our daily walk and getting some exercise and thereby getting two jobs done at the same time. The basic idea is about converting a part of the bio-mechanical energy spent in our day-to-day lives (while walking) into a usable form and storing it to charge low-power battery-operated devices.

Keywords: [Dynamo, Charging circuit, Battery.]

1. INTRODUCTION

Mobile phones are used widely in our everyday lives giving us the freedom to communicate anywhere and at anytime. Equipped with various facilities, it is available to people of all classes. The affordable price range and the easy application make it a pleasure to use. Besides communication, they also have various other services programmed in them. The latest mobile phones are incorporated with features like MP3 players, high resolution camera, high sound quality, 4G technology and the list goes on. The mobile phones have become a hit among all classes of people from kids to teenagers to adults allowing them to enjoy a tech-savvy lifestyle. These phones are considered as style statement and give a sophisticated touch to your profile. The utility of this device is no longer unknown. The rate of sales growth in India shows that nearly six million people buy cells every month in India. In fact this is the largest growing market in the world. Although the extensive use of mobile phones have placed us in a completely new arena but the core of all the mobile phones have remained constant and that's the battery and the charging of this battery. The majority of cell phones use built-in batteries that can be recharged with a charger and an electrical outlet. But if the charger is improperly used, it may stop operating and even cause dangerous situations. Werely heavily on our cell phones for various applications, so we need to realize how important it is to have enough battery power to make accomplish our needs.

2. BLOCK DIAGRAM OF PROPOSED SYSTEM

The block diagram of the proposed system consists of the following blocks

1. Dynamo
2. Charging circuit
3. Battery

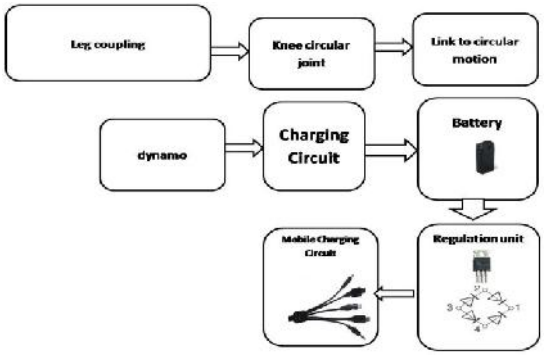

Figure.1.Block diagram of proposed system

A. **Charging circuit**: In this project we are using charging circuit to avoid reverse charge protection because the energy from solar panel is stored into battery. The current from the battery may go to solar panel in reverse direction to avoid this we are using charging circuit

B. **Dynamo:** In this power generation project we are using dynamo for the power generation which converts kinetic energy into mechanical energy. The shaft spins and is connected to a generator which creates electricity. knee power converts the kinetic energy in to generate electricity or mechanical power.

C. **Battery:** A rechargeable battery, storage battery, or accumulator is a type of electrical battery. It comprises one or more electrochemical cells, and is a type of energy accumulator. It is known as a secondary cell because its electrochemical reactions are electrically reversible. Rechargeable batteries come in many different shapes and sizes, ranging from button cells to megawatt systems connected to stabilize an electrical distribution network. Several different combinations of chemicals are commonly used, including: lead–acid, nickel cadmium (NiCd), nickel metal hydride (NiMH), lithium ion (Li-ion), and lithium ion polymer (Li-ion polymer).

The Dynamo consists of 3 major components: the stator, the armature, and the commutator.

The stator is a fixed structure that makes magnetic field, you can do this in a small dynamo using a permanent magnet. Large dynamos require an electromagnet.

The armature is made of coiled copper windings which rotate inside the magnetic field made by the stator. When the windings move, they cut through the lines of magnetic field. This creates pulses of electric power.

The commutator is needed to produce direct current. In direct current power flows in only one direction through a wire, the problem is that the rotating armature in a dynamo reverses current each half turn, so the commutator is a rotary switch that disconnects the power during the reversed current part of the cycle

3. METHODOLOGY

A. Knee Generator

A knee-mounted brace that generates electricity from a person's stepping action, and requires little extra effort, brings new meaning to the phrase "power walk". The generator could be used to power cellphones, prosthetic limbs, or medical implants, researchers argue. The new device harnesses the energy of a person's leg as it swings forward during a step. The knee straightens towards the end of the leg-swing before the foot hits the ground. That spins gears inside the device, which drive an electric generator. The device is designed so it only generates electricity during the "braking" phase of each step. This is when the leg is being unbent and is decelerating, just before the foot touches the ground. The device works similarly to hybrid and electric cars-They boost efficiency by generating electricity from energy expended during braking – known as regenerative braking.

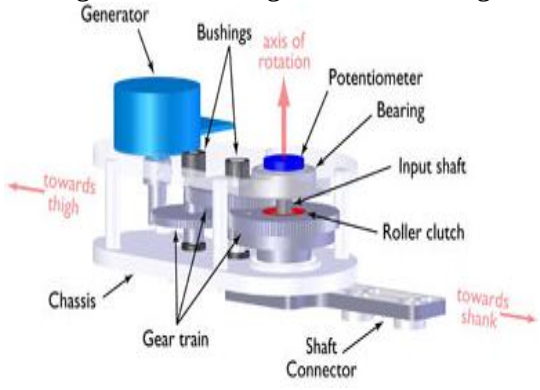

Figure.2. Internal parts of proposed system

B. Rotary motion

The brace has a flexible joint that allows the wearer to walk and the rotary motion at the joint drives a set of gears, which are connected to an electrical generator. The clutch can be adjusted so that energy is only harvested towards the end of a stride, when the body does negative work to stop the leg swinging forward just before it touches the ground. The brace can also work in a second mode in which energy is harvested throughout the stride.

4. WORKING PRINCIPLE

This device has to be worn below the knee cap on one leg and a light string is attached to the other leg. The strides taken help in pulling and retracting the string, which is further attached to a dynamo that generates about 3.5 Watts, enough to charge low-powered devices such as our mobile phones. This device captures the energy by connecting an electrical generator to leg movements.

When the person extends the gap between the legs, power is generated by a gear that turns and spins the generator. The flexion of the leg turns off the gear so as not to discomfort the person. Walking involves a change in relative displacement of around 35 cm between legs. This repeated linear motion could be converted to rotary motion with the help of a pulley and string. Thus, the bio-mechanical work is converted into mechanical form and eventually stored as chemical energy in batteries to store electric energy. The device is clamped on one leg and a hole lets out a string that is attached to the other leg that helps in the conversion of the displacement into rotary motion.

Even a slight displacement pulls the string out, thereby rotating the pulley, which turns the central shaft. The shaft is common to the gearbox, the dynamo and the recoil mechanism. So, when the displacement reduces, there is a slack in the string, which is removed by the tension produced by the recoil system. Since the electricity produced is bi-directional and contains spikes, an electronic circuit encompassing a rectifier and a filter converts it into a unidirectional, spike-free wave and stores the energy produced in rechargeable batteries. This stored energy is used as an input supply to mobiles with the help of different adapters. This new device is motion sensitive, being auto-activated by leg movements and it does not increase the energy spent with walking.

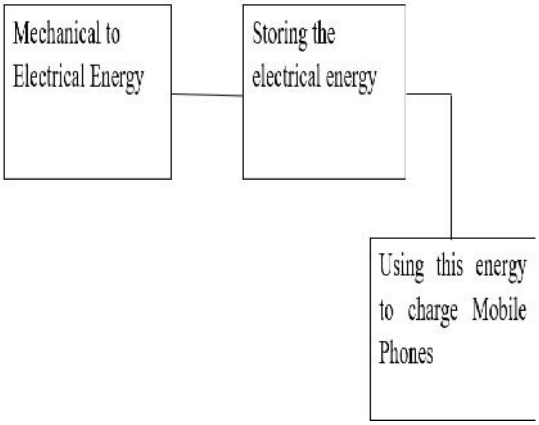

Figure.3.Operation of proposed system

5. APPLICATIONS

1. Knee power generation can be used in street lighting
2. Mobile Charging
3. Public places

6. ADVANTAGES

1. Increasing the effectiveness of mobiles in rural India by providing a portable means of charging of mobiles, torches, radios.
2. Helping military personnel charge their GPS devices and other low-power electronic gadgets while on the move.
3. Providing an alternate means to wall-based charging for MP3 players, mobiles, etc in cities, thereby, helping today's fast generation to move faster without mobile battery problems.
4. India has signed the Kyoto Protocol – an acknowledgement that we share the concern of global warming, which also expresses our commitment to slow down climate change. Walk-N-Charge would just add to the efforts put in by India in various innovative ways.
5. Charging your cell phone might soon be as simple as taking a walk around the block.

CONCLUSION

We have developed a biomechanical energy harvester for generating electricity from walking:

5V output is obtained while walking which can be used to charge the mobile phone requiring 3.7V in real time. The device was efficient and the control system was effective at selectively engaging power generation. Consequently, subjects were able to generate substantial amounts of electrical power with little additional effort over that required to support the device mass. The amount of available energy at moderate walking speeds is only slightly less than that at the end of swing and it increases strongly with speed. Thus, in all we conclude that with this process, we can extract the energy from the human feet, convert it into electric energy and use it in real time application of charging the devices.

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