

Foot Step Power Generation System with Wireless Power Transmission

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Abstract- Man has needed and used energy at an increasing rate for his sustenance and wellbeing ever since he came on the earth a few million years ago. Due to this a lot of energy resources have been exhausted and wasted. Proposal for the utilization of waste energy of foot power with human locomotion is very much relevant and important for highly populated countries like India and China where the roads, railway stations, bus stands, temples, etc. are all over crowded and millions of people move around the clock. This whole human/ bio-energy being wasted if can be made possible for utilization it will be great invention and crowd energy farms will be very useful energy sources in crowded countries. In this project we are generating electrical power as non-conventional method by simply walking or running on the foot step. Non-conventional energy system is very essential at this time to our nation. Non-conventional energy using foot step is converting mechanical energy into the electrical energy.

foot step. Non-conventional energy system is very essential at this time to our nation. Non-conventional energy using foot step needs no fuel input power to generate the output of the electrical power. This project using simple drive mechanism such as rock and pinion assemble and chain drive mechanism.

For this project the conversion of the force energy in to electrical energy. The control mechanism carries the rack & pinion, D.C generator, battery and inverter control. We have discussed the various applications and further extension also. So this project is implemented to all foot step, the power generation is very high. The initial cost of this arrangement is high.

Gear wheel and fly wheel are techniques to generate electrical power. This method also work on this principle and in it mechanical part are used because it is placed on where the number of peoples are more and energy produced by their movement on the floor.

I. INTRODUCTION

In this project we are generating electrical power as non-conventional method by simply walking or running on the foot step. Non-conventional energy system is very essential at this time to our nation. Non-conventional energy using foot step is converting mechanical energy into the electrical energy. In this project the conversion of the force energy in to electrical energy. A.C ripples neutralizer, unidirectional current controller and 12V, 1.3Amp lead acid dc rechargeable battery and an inverter is used to drive AC/DC loads. The battery is connected to the inverter. This inverter is used to convert the 12 Volt D.C to the 230 Volt A.C. This 230 Volt A.C voltage is used to activate the loads. We are using conventional battery charging unit also for giving supply to the circuitry. This project uses regulated 5V, 500mA power supply. 7805 three terminal voltage regulator is used for voltage regulation. Bridge type full wave rectifier is used to rectify the ac out put of secondary of 230/12V step down transformer.

Power would generated by footsteps of crowd on the floor. Foot step scheme is located beneath the floor then the then there will be sheet covering the foot step arrangement plate and also spring will be there for vibration force on plate. The foot step plate will be in chunks in the floor. This plate will generate power in the type of electric current. The power produced by pedestrians can also be used as additional features such as to lightning up street light or the light that used at that place for pedestrians. So the pedestrians should give credit the energy which produced by their movement.

II. PRINCIPLE

In this project we are generating electrical power as non-conventional method by simply running on the train in the

Proposal for the utilization of waste energy of foot power with human locomotion is very much relevant and important for highly populated countries like India and China where the roads, railway stations, bus stands, temples, etc. are all over crowded and millions of people move around the clock. This whole human/bio-energy being wasted if can be made possible for utilization it will be great invention and crowd energy farms will be very useful energy sources in crowded countries. Walking across a "Crowd Farm," floor, then, will be a fun for idle people who can improve their health by exercising in such farms with earning. The electrical energy generated at such farms will be useful for nearby applications.

The voltage that produced through steps is rectified and after battery charger circuit this D.C voltage is stored in the lead acid battery of 12 volt. This lead acid battery is further attached to the inverter.

III. BLOCK DIAGRAM

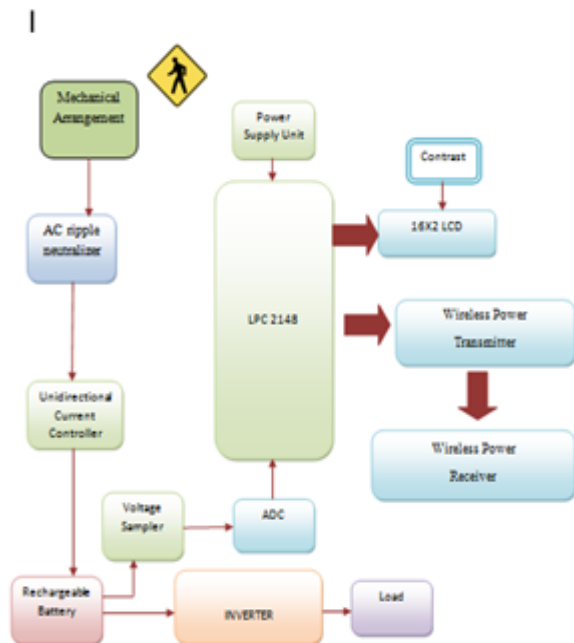


Figure1:block diagram

3.1 mechanical arrangement:

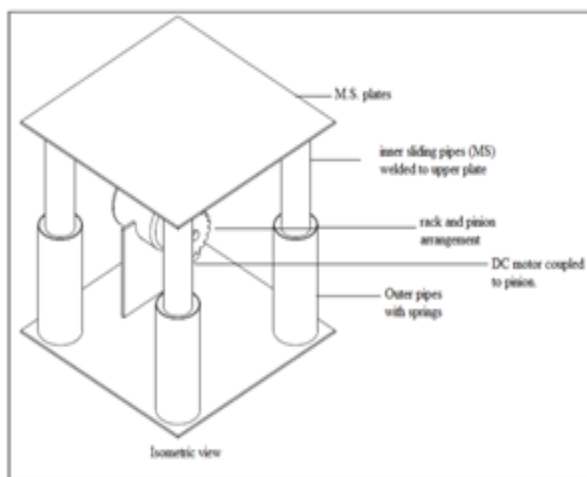


Figure2: mechanical arrangement

The complete diagram of the power generation using FOOT STEP is given above. L-shapes window is inclined in certain small angle which is used to generate the power. The pushing power is converted into electrical energy by proper driving arrangement.

The rack & pinion, spring arrangement is fixed at the FOOT STEP which is mounded below the L-shapes window.

The spring is used to return the inclined L-shapes window in same position by releasing the load. The pinion shaft is connected to the supporter by end bearings as shown in fig. The larger sprocket also coupled with the pinion shaft, so that it is running the same speed of pinion. The larger sprocket is coupled to the small cycle sprocket with the help of chain (cycle).

The gear wheel is coupled to the smaller motor shaft. The generator is used here, is permanent magnet D.C generator. The generated voltage is 12Volt D.C. This D.C voltage is stored to the Lead-acid 12 Volt battery. The battery is connected to the inverter. This inverter is used to convert the 12 Volt D.C to the 230 Volt A.C.

3.2 OPERATIONAL DESCRIPTION:

In this project a gear system is attached with flywheel which causes to rotate the dynamo as the tile on the deck is pressed. The power that is created is saved in the batteries. In addition we will be able to monitor and control the amount of electricity generated as shown in the figure 2. When an individual passes it push the tile on the ground surface which turn the shaft beneath the tile, turn is limited by clutch bearing which is underpinned by holders. Primary shaft is rotate approx. twice by a single tile push. The movement of the prevailing shaft turn the gear which builds it 15 times (1:15) then its movement which is temporary store the movement, which is convey to the DC generator (it generates 12V 40 amp at 1000 rpm). Energy generated is stored in the batteries , an inverter circuitry is implemented to convert the DC to AC ,so that we can sprint the home electrical load , Further a microcontroller based home mechanization framework is implemented which control rooms prudently. Entire framework is put on the iron bars called channels. Our entire project physical system diagram is shown in above diagram.

3.3 wireless power transmission:

Short distance induction:

These methods can reach at most a few centimeters. The action of an electrical transformer is the simplest instance of wireless energy transfer. The primary and secondary circuits of a transformer are electrically isolated from each other. The transfer of energy takes place by electromagnetic coupling through a process known as mutual induction. Wireless power transfer is a new technology to transfer electrical power without any physical contact between the source and the load. The aim of this paper is to propose the use of a simple, cheap and easy technique for charging any mobile.

The various technologies available so far for wireless transmission of electricity and the need for a wireless system of energy transmission are discussed here. The main problem is how power is transferred wirelessly without any bad effect on environment and human. The core of the used technology is making use of the magnetic resonance concept for transmitting the power wirelessly for charging any mobile. Electric power is transferred at a frequency of about 100 kHz in a short distance range to charge a mobile making use of resonance. An impedance compensating network is used to achieve maximum power transfer. The practical results are very close to these obtained using the mathematical model and the theoretical calculations.

The transfer of electric energy from a power source to an electric load without a direct physical connection between them, usually via an electromagnetic field, is defined as Wireless Power Transfer Technology (WPTT). Nowadays, electronic devices such as cell phones and laptops need WPTT for wireless charging with also the advantage of the protection from any faults at the power source. In the 1890's, a wireless power transfer (WPT) system was demonstrated by Nikola Tesla using his demonstration on resonant transformers called Tesla coils.

In July 2007, a group of researchers at MIT presented a method of transmitting power wirelessly. The researchers used an electromagnetically coupled resonance system to power a 60W light bulb wirelessly from a distance over two meters away. The magnetic resonance coupling technology has been found to be viable for midrange energy transfer. It is used for charging the electric vehicles with energy efficiency up to 90% in a relatively short time. It is also used for low power wireless charging of mobile phones with a power up to five watts and energy efficiency up to 70%.

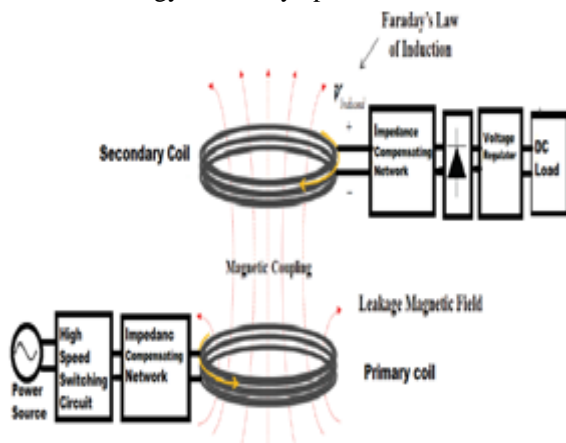


Figure3:wireless power transmission

IV. CIRCUIT DIAGRAM

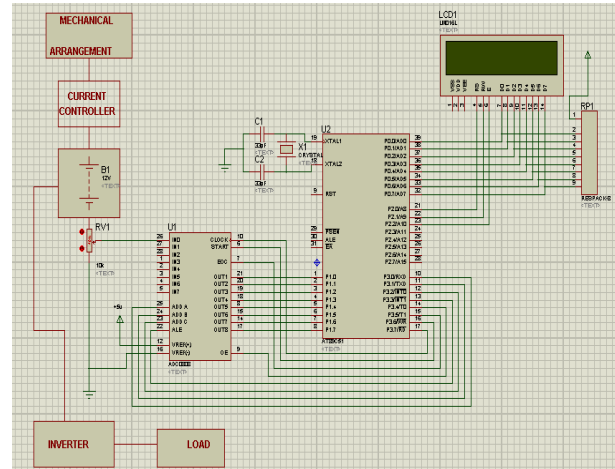


Figure4:circuit diagram

4.1 a.c. ripple neutralizer:

It removes the ripples from the output of rectifier and smoothens the D.C. Output received from this filter is constant until the mains voltage and load is maintained constant.

4.2 adc:

An analog-to-digital converter (abbreviated ADC, A/D or A to D) is a device that converts a continuous quantity to a discrete time digital representation. Typically, an ADC is an electronic device that converts an input analog voltage or current to a digital number proportional to the magnitude of the voltage or current.

4.3 inverter:

An inverter is an electrical device that converts direct current (DC) to alternating current (AC); the converted AC can be at any required voltage and frequency with the use of appropriate transformers, switching, and control circuits. Solid-state inverters have no moving parts and are used in a wide range of applications, from small switching power supplies in computers, to large electric utility high-voltage direct current applications that transport bulk power.

4.4 voltage sampler (sample &hold circuit):

Sample-and-hold (S/H) is an important analog building block with many applications, including analog-to-digital converters (ADCs) and switched-capacitor filters. The function of the S/H circuit is to sample an analog input signal and hold this value over ascertain length of time for subsequent processing.

V. RESULTS

Our proposed model of rack and pinion operated foot step power generation was able to produce electricity by pressing the upper plate by foot. The rack and pinion rotates the DC motor and thus DC motor generate electrical current which is shown by LED. This current produced can be also measure by multi-meter (electronic current, voltage measuring device). The results obtained by our fabricated model are,

1. Minimum voltage required to glow LED= 3.3 volts
2. Maximum voltage produced by DC motor = 10.8 volts
3. Number of small LED running in this system = $64 \times 2 = 128$
4. Number of small 3 volt can run by this system = 250
5. Maximum current produced by DC motor= 200 milli-ampere
6. Downward displacement required for 1 rotation of pinion = 64 mm.
7. Total cost of the project = 8550 rupees (well within our estimated budget of 10000 rupees)

5.1 for power calculation

Centrifugal force, $f_c = m \omega^2 r$ (5)

$$M = 7\text{kg}$$

$$W = m \times g$$

$$w = 2\pi n/60$$

$$R = 1\text{m}$$

Substituting the values of m , ω , r in equation [4]

$$f_c = 7.56\text{ N.}$$

Downward force, $f_d = m \times g$

$$= 7 \times 9.81$$

$$= 68.6\text{N.}$$

Centrifugal force, $f = f_c + f_d$

$$= 68.6 + 7.56$$

$$= 76.17\text{N}$$

Torque = $f \times r$

$$= 76.17 \times 1$$

$$= 76.2\text{Nm.}$$

Power = Torque x angular velocity.

$$= 76.2 \times 1.05$$

$$= 79.7$$

Substituting the value of k_w and n in equation in [3],

$$M_t = 776.7$$

$$[M_t] = 1.4 \times M_t$$

$$= 1.4 \times 776.7$$

$$= 1087.1\text{ N-m}$$

Substituting the values of σ_{max} , $[M_t]$, E_1, E_2 in equation [1],

The minimum diameter of the pinion is calculated to be 78.7mm.

We have taken the standard diameter of pinion as 75mm.

5.2 output power calculation:

Let us consider,

The mass of a body = 60 Kg (Approximately)

Height of speed brake = 10 cm

\therefore Work done = Force x Distance

Here,

Force = Weight of the Body

$$= 60\text{ Kg} \times 9.81$$

$$= 588.6\text{ N}$$

Distance traveled by the body = Height of the speed brake

$$= 10\text{ cm}$$

VI. APPLICATIONS

Applications of the foot step power generation are,

- This can be implemented on railway station to generate electric power.
- In bus station.
- In car parking system.
- In Airports.
- In Lift system.
- In car lifting system.
- In street lights
- Electric escalators

VII. ADVANTAGES

- To store the electricity in battery.
- It can be use at any time when it necessary.
- Easy construction.
- Less number of parts required.
- Electricity can used for many purposes

VIII. CONCLUSION

In concluding the words of our project, since the power generation using foot step get its energy requirements from the Non-renewable source of energy. There is no need of power from the mains and there is less pollution in this source of energy. It is very useful to the places all roads and as well as all kind of foot step which is used to generate the non-conventional energy like electricity.

It is able to extend this project by using same arrangement and construct in the footsteps so that increase the power production rate by fixing school and colleges, highways etc.

The total cost of project was well within our estimated budget of 10000 rupees. By increasing size and specifications of motor and assembly we can increase the output of system if required in future.

ACKNOWLEDGEMENT

we would like to thank Prof. Prajkta Deshmane, for guiding and motivating us to write this paper, supporting us and we would also like to thank G.S.M.C.O.E. and E&TC Engineering Department for their support.

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