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ELECTRICITY GENERATION WITH HUMAN FOOTSTEPS

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ABSTRACT:
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.
This project using simple drive mechanism such as rack 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. The D.C generator used in this project is Permanente Magnet D.C generator. The Generator is coupled to thePly wheel Shaft with the help of Spur Gear Mechanism. The Output of the generator is 12 Volts. This 12 Volt is stored in a 7 Amp-Hour Battery. The battery type is Lead-Acid battery. The battery is connected to the inverter which is used to convert the D.C 12 Volt to the 230 Volt A.C. By increasing the capacity of battery and inverter circuit, the power rating is increased.

INTRODUCTION

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. Primitive man requiredenergy primarily in the form of food. He derived this by eating plants or animals, whichhe hunted. Subsequently he discovered fire and his energy needs increased as he startedto make use of wood and other bio mass to supply the energy needs for cooking as wellas for keeping himself warm

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 sources have been exhausted and wasted. So, non-conventional energy is very essential at this time to our nation. Walking is the most common activity in day to day life. When a person walks, he lose energy to the road surface in the form of impact, vibration, sound etc, due to the transfer of his weight to the road surface, through foot falls on the ground during every step. This energy can be tapped and converted in the usable form such as in electrical form.

WORKING:

When people walk on the floor, the floor press on the mechanical setup. The setup depresses due to the spring action and pulls the lever assembly which rotates one of the freewheel bearing fitted to the shaft. The shaft then rotates the large pulley which is connected to the smaller pulley through a V-belt. This smaller pulley acts as a reducer which provides more rotations corresponding to one rotation of the large pulley. This smaller pulley coupled with the dynamo (or sanyo coil), a device that converts the energy of motion into electric current and power is obtained.

This process depends on two factors, primary spring tension and type of generator used. The primary spring tension is determined by calculating the average weight over a locomotive area. To get more power output, type of generator is considered as the main factor. When the pressure is applied through a foot step, ninety-five percent of the pressure applied is converted into energy in this method.

BLOCK DIAGRAM:

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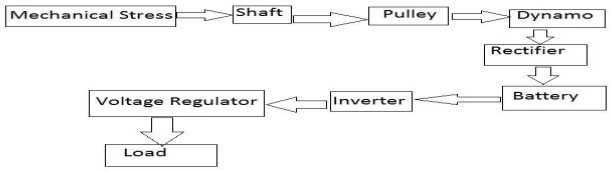

CONSTRUCTION: A responsive flooring system made up of blocks that depress slightly under the force of human steps would be installed. The flooring system depresses to a little extent as people walk over them which in turn depresses the mechanical setup installed immediately beneath it. This simple mechanical setup consists of a compressible top platform and a immovable bottom platform. Other components of this system are, four primary springs, a lever assembly, a shaft fitted with two free wheel bearings, a large pulley, a smaller pulley, power generator(dynamo or sanyo coil), and a break arrangement. The compression of the top layer is provided by the springs installed in four corners. Then it consists of a lever assembly, two freewheel bearings fitted to a shaft, a large pulley attached to the shaft and a smaller pulley connected with the large pulley. The small pulley is coupled with the dynamo which rotates when the small pulley is rotated. There is a secondary spring arrangement and a break system to provide additional rotations to the small pulley.

AVERAGE WEIGHT OF LOCOMOTIVE AREA: This parameter is used to determining the primary spring tension of the setup. For example, if the project is installed in a higher secondary school, the spring tension must be able to withstand the loads of different students almost in same age group, staffs etc. This gives the average weight of 65 to 70 kg. So the spring tension must withstand 5 kg less and more to average weight. The whole weight will not be acting on the spring tension alone but on the hinges of the flooring system also. This parameter also has an influence over the hinge arrangement of flooring system.

But this varies in case of a railway platform where people of different age group moves. The average weight may vary up to 75kg to 85 kg. This would give required compression to weight group of 70kg to 90kg and considerable compression to weight group below 70kg and would able to withstand the weight group of above 90kg. This average weight varies from place to place.

POWER GENERATOR: We have used two 6V AC dynamo as the power generator for this project. The main advantage this provided was the small rated speed required to produce power of 6 watts and a current of 1A in each of the dynamo.

The total current accounted for the two dynamo was 2A and this was rectified and stored in a 6W dry battery. This battery will get charged fully within 3 hours when charged using power producing platform. This time will be considerably reduced when we use number of dynamos to charge a single 6W dry battery. A single power producing platform can accommodate 4 dynamos and when the battery is charged using all the current from these 4 dynamos, time taken to charge completely reduces below 2 hours. The battery can be used to supply the requirement as from then and there or it can be ported to place of requirement. For example if this project is used in railway platform, all the batteries powered by several setups in the daytime can be used to supply the way lights across the platform during the night time.

Instead of dynamo sanyo coils are used to produce power. Sanyo coil is also similar to dynamo. The dynamo accommodates thick copper coils whereas sanyo coil uses very thin aluminium coils. Single sanyo coil produces 24 volts whereas a dynamo can produce only 6V or 12V.

This increases the efficiency of the project to greater extent hence we prefer sanyo coil to dynamo. More than one battery can be charged using one setup when sanyo coils are installed in it. Apart from this, we can also use generators having less rated speed to increase the efficiency of the project.

SECONDARY SPRING: There is a secondary spring arrangement which consists of a spring and a break system. This arrangement is used to produce additional rotation time to the generator. When the setup is compressed continuously, this spring gets wound on the shaft slowly. The reverse rotation of the shaft under the tension of the spring is prevented by the break system and second freewheel bearing that is fitted to the shaft until the spring attains its maximum tension. By the time the spring attains its maximum tension, the break releases and the free wheel bearing rotates the shaft on

the opposite side. This rotates the large pulley which in turn rotates the small pulley and the dynamo. This increases the time period of the rotations of the generator.

Power producing platform is not intended for home use as a single human step can only power for one flickering second. But get a crowd in motion, multiply that single step by 28,527 steps, for example, and the result is enough energy to power a moving train for one second. Hence it is obvious that from large number of such projects, we can easily satisfy our power requirement to solve power crisis.

APPLICATIONS:

- Railway, subway stations
- Roads
- Temples
- Bus stands, air ports
- Music halls, auditoriums
- Markets
- And in all places where movement of people is abundant.

ADVANTAGES:

- Highly efficient in more crowded places.
- Depending upon the power generator and number of them, power output is very high
- This process depends on human resources which is available in plenty in our country which makes our country a favorable place for this project.
- Promising technology for solving power crisis to an affordable extent.
- Low cost level.
- Simple in construction.
- Pollution free.
- Reduces transmission losses.
- Wide areas of application.

EXTERNAL IRON FRAME WORK

The external frame work is having length of 4 foot and breadth of 1.5foot.there are three pairs of cylindrical hollow pipes are welded as pillars, which will give the support for the surface of the platform

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Platform with lever arrangement

At the bottom of the platform we have attached a lever .Hence when a pressure is applied on the surface of the platform the platform compresses softly with the help of springs which is attached between the platform and the hollow cylindrical iron pipes and the suspension for the platform will be given by the spring .the spring will compress for the average weight of 55 to 70 kg. The spring's compression is tested for average weight using the spring balance.

DC MOTORS:

A DC motor is a mechanically commutated electric motor powered from direct current(DC). The stator is stationary in space by definition and therefore so is its current. The current in the rotor is switched by the commutator to also be stationary in space. This is how the relative angle between the stator and rotor magnetic flux is maintained near 90 degrees, which generates the maximum torque.

DC motors have a rotating armature winding (winding in which a voltage is induced) but non-rotating armature magnetic field and a static field winding (winding that produce the main magnetic flux) or permanent magnet. Different connections of the field and armature winding provide different inherent speed/torque regulation characteristics. The speed of a DC motor can be controlled by changing the voltage applied to the armature or by changing the field current. The introduction of variable resistance in the armature circuit or field circuit allowed speed control. Modern DC motors are often controlled by power electronics systems called DC drives.

The introduction of DC motors to run machinery eliminated the need for local steam or internal combustion engines, and line shaft drive systems. DC motors can operate directly from rechargeable batteries, providing the motive power

for the first electric vehicles. Today DC motors are still found in applications as small as toys and disk drives, or in large sizes to operate steel rolling mills and paper machines.

LED (Light Emitting Diodes):

As its name implies it is a diode, which emits light when forward biased. Charge carrier recombination takes place when electrons from the N-side cross the junction and recombine with the holes on the P side. Electrons are in the higher conduction band on the N side whereas holes are in the lower valence band on the P side. During recombination, some of the energy is given up in the form of heat and light. In the case of semiconductor materials like Gallium arsenide (GaAs), Gallium phoshide (Gap) and Gallium arsenide phoshide (GaAsP) a greater percentage of energy is released during recombination and is given out in the form of light. LED emits no light when junction is reverse biased.

LM7812 AND LM7805:

• Output Current of 1.5A

• Output Voltage Tolerance of 5%

• Internal thermal overload protection

• Internal Short-Circuit Limited

• No External Component

• Output Voltage 5.0V, 6V, 8V, 9V, 10V,

12V, 15V, 18V, 24V

• Offer in plastic TO-252, TO-220 & TO-263

• Direct Replacement for LM78XX

Description:

The Bay Linear LM78XX is integrated linear positive regulator with three terminals. The LM78XX offer several fixed output voltages making them useful in wide range of applications. When used as a zener diode/resistor combination

Replacement, the LM78XX usually results in an effective output impedance improvement of two orders of magnitude, lower quiescent current.

The LM78XX is available in the TO-252, TO-220 & TO-263 Packages

Applications:

• Post regulator for switching DC/DC converter

• Bias supply for analog circuits

Packaging Information

1. Input
2. GND
3. Output

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Electrical Characteristics (LM7805)
(V_I=10V, I_O=500mA, 0°C ≤T_J≤125 °C, unless otherwise specified. (Note 1)

Parameter	Symbol	Conditions	MIN	TYP	MAX	UNIT
Output Voltage	V_O	T_J = 25 °C	4.8	5.0	5.2	V
Line Regulation	ΔV_O	V_I = 7V to 25V T_J = 25 °C		3	100	mV
		V_I = 8V to 12V T_J = 25 °C		1	50	
Load Regulation	ΔV_O	I_O = 5mA to 1.5A, 25 °C		15	100	mV
		I_O = 250mA to 750mA, 25 °C		5	50	
Ripple Rejection	RR	V_I = 8V to 18V, f=120Hz	62	78		dB
Output Noise Voltage	V_N	F= 10Hz to 100Hz T_J = 25 °C		40		μV
Dropout Voltage	V_D	T_J = 25 °C		2.0		V
Quiescent Current		T_J = 25 °C		4.2	8	mA
Quiescent Current Change	ΔI_Q	V_I = 7V to 25V, T_J = 25 °C			1.3	mA
		I_O = 5mA to 1A, T_J = 25 °C			0.5	

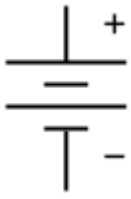
Electrical Characteristics (LM7812)
(V_I=19V, I_O=500mA, 0°C ≤T_J≤125 °C, unless otherwise specified. (Note 1)

Parameter	Symbol	Conditions	MIN	TYP	MAX	UNIT
Output Voltage	V_O	T_J = 25 °C	11.50	12	12.5	V
Line Regulation	ΔV_O	V_I = 14.5V to 30V T_J = 25 °C		10	240	mV
		V_I = 16V to 22V T_J = 25 °C		3.0	120	
Load Regulation	ΔV_O	I_O = 5mA to 1.5A, 25 °C		12	240	mV
		I_O = 250mA to 750mA, 25 °C		4	120	
Ripple Rejection	RR	V_I = 15V to 25V, f=120Hz	55	71		dB
Output Noise Voltage	V_N	F= 10Hz to 100Hz TJ = 25 °C		75		μV
Dropout Voltage	V_D	T_J = 25 °C		2.0		V
Quiescent Current		T_J = 25 °C		4.3	8.0	mA
Quiescent Current Change	ΔI_Q	V_I = 14.5V to 30V, T_J = 25 °C			1.0	mA
		I_O = 5mA to 1A, T_J = 25 °C			0.5	

BATTERY:

In our prototype, we use 12v battery and they have variety of uses in our daily life. From consumer electronics to robotics, from health care products to industries, almost every second device we use has one battery or the other. Battries have become an indispensible part of our lives. We cannot comprehend living without cellphones, torches, laptop computers, music players like the ipod, but how do we power them up? Answer lies in the battries. Similarly cars are one of the main modern day necessties which use battries to power the head lamps and backlights. In electricity, a **battery** is a device consisting of one or more electromechanical cells that convert stored chemical energy into electrical energy. Since the invention of the first battery (or "voltaic pile") in 1800 by Alessandro Volta and especially since the technically improved Daniell cell in 1836, batteries have become a common power source for many household and industrial applications. According to a 2005 estimate, the worldwide battery industry generates US$48 billion in sales each year,[2] with 6% annual growth.

There are two types of batteries: primary batteries (disposable batteries), which are designed to be used once and discarded, and secondary batteries (rechargeable batteries), which are designed to be recharged and used multiple times. Batteries come in many sizes, from miniature cells used to power hearing aids and wristwatches to battery banks the size of rooms that provide standby power for telephone exchanges and computer data centers.



A battery is a device that converts chemical energy directly to electrical energy It consists of a number of voltaic cells; each voltaic cell consists of two half-cells connected in series by a conductive electrolyte containing anions and cations. One half-cell includes electrolyte and the electrode to which anions (negatively charged ions) migrate, i.e., the anode or negative electrode; the other half-cell includes electrolyte and the electrode to which cations (positively charged ions) migrate, i.e., the cathode or positive electrode. In the redox reaction that powers the battery, cations are reduced (electrons are added) at the cathode, while anions are oxidized (electrons are removed) at the anode.[23] The electrodes do not touch each other but are electrically connected by the electrolyte. Some cells use two half-cells with different electrolytes. A separator between half-cells allows ions to flow, but prevents mixing of the electrolytes.

Each half-cell has an electromotive force (or emf), determined by its ability to drive electric current from the interior to the exterior of the cell. The net emf of the cell is the difference between the emfs of its half-cells, as first recognized by Volta.[12] Therefore, if the electrodes have emfs $\mathcal{E}_1$and $\mathcal{E}_2$, then the net emf is $\mathcal{E}_2 - \mathcal{E}_1$; in other words, the net emf is the difference between the reduction potentials of the half-reactions.

As stated above, the voltage developed across a cell's terminals depends on the energy release of the chemical reactions of its electrodes and electrolyte. Alkaline and zinc–carbon cells have different chemistries but approximately the same emf of 1.5 volts; likewise NiCd and NiMH cells have different chemistries, but approximately the same emf of 1.2 volts. On the other hand the high electrochemical potential changes in the reactions of lithium compounds give lithium cells emfs of 3 volts or more.

All of this power requirement means that we need a robust, portable and an efficient source of power. There are a couple of factors one has to look out while choosing the type of 12v battry. Because a twelve volt battery can be of many types, sizes, form factors, and materials. 12 volt is just the rating of the battery and it does not specify something physical. Batteries are also available in other voltage ratings such as 24, 9 and 5 volt. Its rather a quantity. There are many types of batteries depending upon the construction.

CONCLUSION:

Thus this is a promising technology to provide efficient solution to power crisis to affordable extent. This will be the most acceptable means of providing power to the places that involves difficulties of transmission. Moreover walking across a power producing platform then will be a fun for idle people who can improve their health by exercising in such platforms with earning. The electrical energy generated at such farms will be useful for nearby applications.

This technology would facilitate the future creation of new urban landscapes, athletic fields with a spectator area, music halls, theaters, nightclubs and a large gathering space for rallies, demonstrations and celebrations, railway stations, bus stands, subways, airports etc. like capable of harnessing human locomotion for electricity generation.

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