International Journal of Advances in Engineering and Management (IJAEM)
Volume 2, Issue 5, pp: 665-672 www.ijaem.net ISSN: 2395-5252

Foot-Step Power Generation

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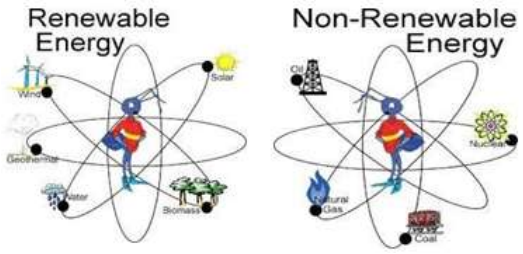
Date of Submission: 30-08-2020 Date of Acceptance: 08-09-2020

ABSTRACT: In this project we are generating electrical power as non-conventional method by simply running on the Gear train mechanism in the 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 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. So, this project is implemented to all foot-step, the power generation is very high.

I. INTRODUCTION:

Man has needed and used energy at an increasing rate for his sustenance and well being ever since he came on the earth a few million years ago. Primitive man required energy primarily in the form of food. He derived this by eating plants or animals, which he hunted. Subsequently he discovered fire and his energy needs increased as he started to make use of wood and other bio mass to supply the energy needs for cooking as well as for keeping himself warm. With the passage of time, man started to cultivate land for agriculture. He added a new dimension to the use of energy by domesticating and training animals to work for him. With further demand for energy, man began to use the wind for sailing ships and for driving windmills, and the force of falling water to turn water for sailing ships and for driving windmills, and the force of falling water to turn water wheels. Till this time, it would not be wrong to say that the sun was supplying all the energy needs of man either directly or indirectly and that man was using only renewable sources of energy.



II. LITERATURE SURVEY:

This paper is all about generating electricity when people walk on the Floor if we are able to design a power generating floor that can produce 100W on just 12 steps, then for 120 steps we can produce 1000 Watt and if we install such type of 100 floors with this system then it can produce 1MegaWatt As a fact only 11% of renewable energy contributes to our primary energy. If this project is deployed, then not only we can overcome the energy crises problem but this also contributes to create a healthy global environmental change. 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. 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 215approx... Twice by a single tile push. The movement of the prevailing shaft turn the gearbox shaft which builds it 15 times (1:15) then its movement is smoothen by the help of fly wheel which temporary store the movement, which is convey to the DC generator (it generates 12V 40 amp at 1000 rpm).

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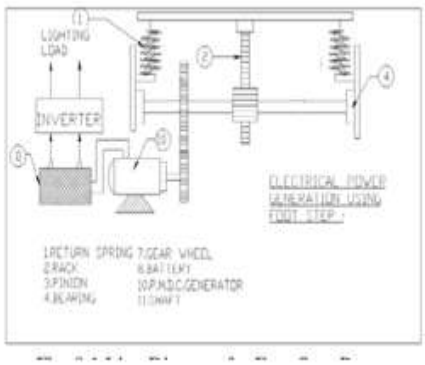
Existing System:

Other people have developed piezo-electric (mechanical-to-electrical) surfaces in the past, but the Crowd Farm has the potential to redefine urban space by adding a sense of fluidity and encouraging people to activate spaces with their movement. The Crowd Farm floor is composed of standard parts that are easily replicated but it is expensive to produce at this stage. This technology would facilitate the future creation of new urban landscapes athletic fields with a spectator area, music halls, theatres, 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,

Along with this the following system of harvesting electricity was adopted.

BLOCK DIAGRAM

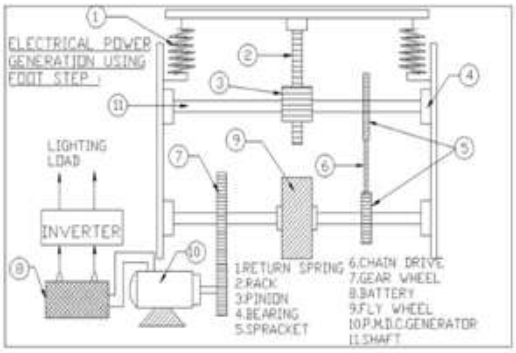


Proposed System:

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 creation of new source of perennial environmentally acceptable, low cost electrical energy as a replacement for energy from rapidly depleting resources of fossil fuels is the fundamental need for the survival of mankind. We have only about 25 years of oil reserves and 75 – 100 years of coal reserves. Resort to measure beginning of coal in thermal electric stations to serve the population would result in global elemental change in leading to worldwide drought and decertification. The buzzards of nuclear electric-stations are only too will.

Now electric power beamed directly by micro-wave for orbiting satellite. Solar power stations (S.P.S) provide a cost-effective solution even though work on solar photo voltaic and solar thermo electric energy sources has been extensively pursued by many countries. Earth based solar stations suffer certain basic limitations.



Manufacturing Techniques & Process involved:

Hand Hacksaw:

A **hacksaw** is a fine-toothed saw, originally and mainly made for cutting metal. The equivalent saw for cutting wood is usually called bow saw.

Arc Welding:

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Arc welding is a process that is used to join metal to metal by using electricity to create enough heat to melt metal, and the melted metals when cool result in a binding of the metals. It is a type of welding that uses a welding power supply to create an electric arc between an electrode and the base material to melt the metals at the welding point. They can use either direct (DC) or alternating (AC) current, and consumable or non-consumable electrodes. The welding region is usually protected by some type of shielding gas, vapor, or slag. Arc welding processes may be manual, semi-automatic, or fully automated. Today it remains an important process for the fabrication of steel structures and vehicles.

Drilling:

Drilling is a cutting process that uses a drill bit to cut a hole of circular cross-section in solid materials. The drill bit is usually a rotary cutting tool, often multi-point. The bit is pressed against the work-piece and rotated at rates from hundreds to thousands of revolutions per minute. This forces the cutting edge against the work-piece, cutting off chips (swarf) from the hole as it is drilled.

Lathe Turning:

Turning can be done manually, in a traditional form of lathe, which frequently requires continuous supervision by the operator, or by using an automated lathe which does not. Today the most common type of such automation is computer numerical control, better known as CNC.

III. METHODOLOGY:

The foot step arrangement is used to generate the electric power. Now a day's power demand is increased, so the foot-step arrangement is used to generate the electrical power in order to compensate the electric power demand. In this arrangement the mechanical energy is converted into electrical energy. To implement this we adjust the metallic plates above and below the sensors and moveable springs. Non-conventional energy using foot step is converting mechanical energy into the electrical energy. When the pressure is applied, the rack and pinion will convert mechanical energy into electrical energy. This electrical energy will be storing in the 12V rechargeable battery connected to inverter. We are using conventional battery charging unit also for giving supply to the circuitry. Arrangement of foot-step in this project we are converting Mechanical energy into Electrical energy.

We are trying to utilize the wasted energy in a useful way. By using Rack and Pinion arrangement. We are converting to and fro motion of the steps into rotational motion of the dynamo. In first foot step we are using rack and pinion arrangement directly to rotate the dynamo. But in second step we are using chain drive mechanism to obtain better efficiency. Through Dynamo the rotational energy is converted into electrical energy. This electrical energy output will be shown by glowing the LEDs. The output power is expected to be 3V to 4V in prototype.

Design Details:

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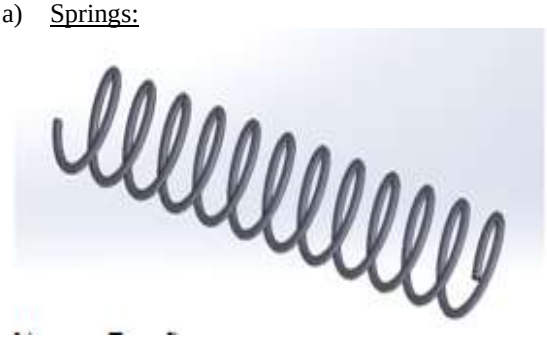
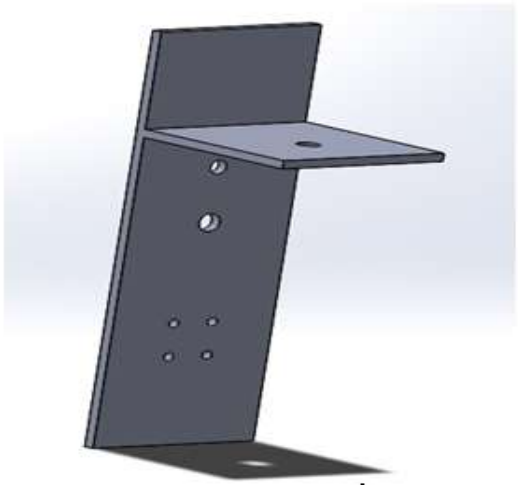
Components Used:

a) Springs:

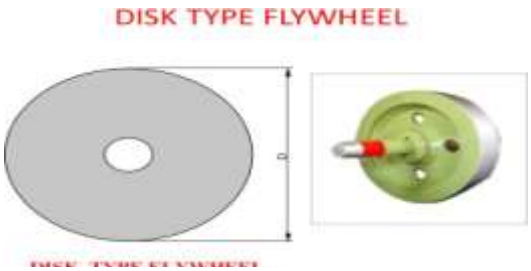


b) Foot-Step:

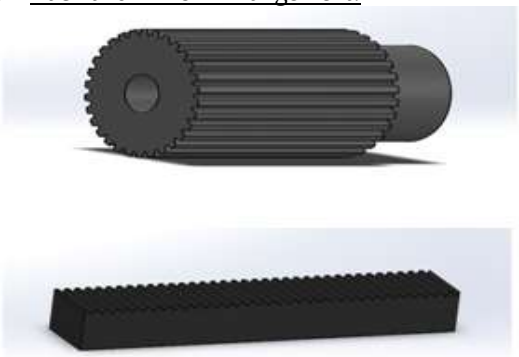


c) Gear-Wheel Arrangement:

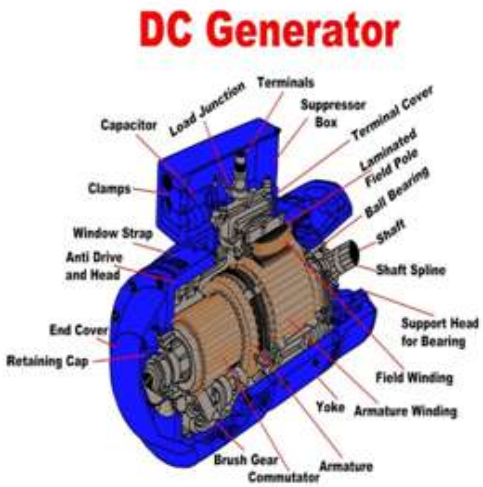
d) Fly-Wheel:



e) Rack and Pinion Arrangement:



f) DC Generator:



g) LEDs:

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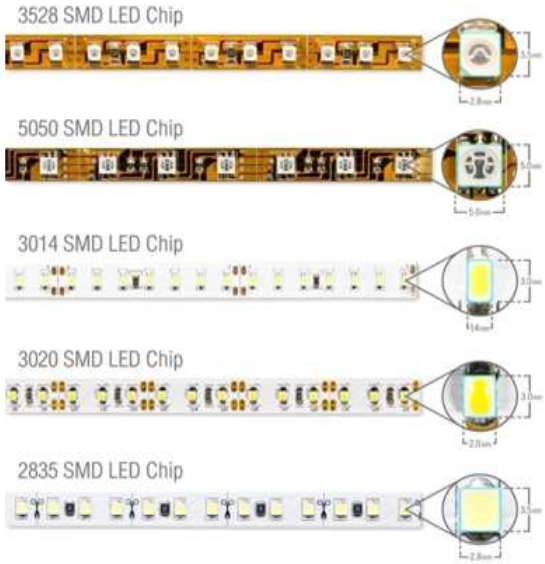

h) Shaft:

i) Battery:

Working Principle:

The complete diagram of the power generation using FOOT-STEP is given below. 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 bellow 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).

This larger sprocket is used to transfer the rotation force to the smaller sprocket. The smaller sprocket is running same direction for the forward and reverse direction of rotational movement of the larger sprocket. This action locks like a cycle pedaling action.

The flywheel and gear wheel is also coupled to the smaller sprocket shaft. The flywheel is used to increase the rpm of the smaller sprocket shaft. The gear wheel is coupled to the generator shaft with the help of an other gear wheel. The generator is used here, is permanent magnet D.C generator. The generated voltage is 12 Volt 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. This working principle is already explained the above chapter. This 230 Volt A.C voltage is used to activate the light, fan etc.

By increasing the capacity of battery and inverter circuit, the power rating is increased.

This arrangement is fitted in FOOT-STEPs; the complete arrangement is kept inside the floor level except the pushing arrangement.

Model Design in Solid Works:

The complete fabricated model picture of Foot-Step is shown below. The upper plate is mounted on two springs; the weight impact is converted into electrical power with proper control unit. The spring and rack & pinion arrangement is fixed below the foot step which is mounted on base. Spring system is used for return mechanism of upper plate after release of load. The shaft along with pinion is supported by end bearings. A gear is provided there also. A gear is coupled to the shaft. The gear wheel which is provided in shaft is coupled to the Dynamo. The dynamo capacity used here is 12V. From the dynamo the wires are taken. These wires are connected to LEDs, to show the output power. The generator is used here is 12 Volt permanent magnet DC generator. The terminal of DC generator is connected to lightning LEDs. In the

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first step the footsteps is directly connected to the Rack & pinion arrangement. To the pinion shaft dynamo is provided and LEDs are coupled to it. Thus Mechanical energy is converted in to Electrical energy. With the help of block diagram as show in the block diagram the working procedure is explained in step by stepmanner.

Step 1: When force is applied on the plate by virtue on stamping on the plate the force spring gets compressed.

Step 2: Due to this the rack moves vertically down.

Step 3: The pinion meshed with the rack gear results in circular motion of the pinion gear.

Step 4: For one full compression the pinion Moves one semicircle, when the force applied on the plate released the pinion reverses and moves another semicircle.

Step 5: The intermediate gear with more number of teeth will rotate as a result of motion of pinion.

Step 6: The generator attached to the intermediate will obtain the rotating motion, hence results in the sinusoidal waveform (for single Generator).

Step7: The obtained voltage is passed through Ac neutralizer in order to reduce the ripples that are produced due to uneven motion of generator.

Step 8: From here the power is stored directly in 12V lead acid battery.

Step 9: So the 12V DC is connected to the inverter to convert it into 230AC.

Step 10: Now the voltage obtained is used for small applications.

Step 11: The display unit takes signal from battery and converts it into digital signal by ADC and transfers its data to microcontroller.

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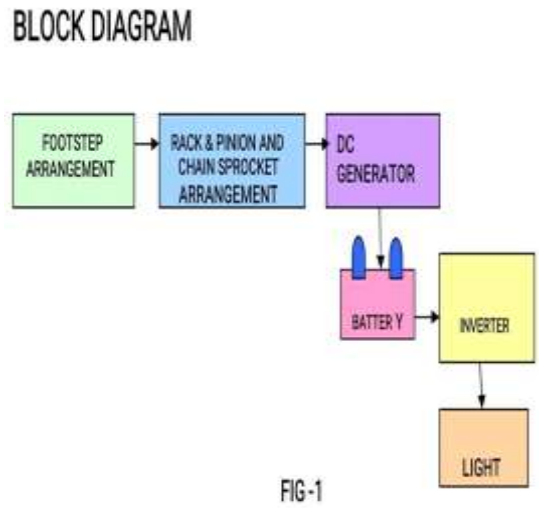
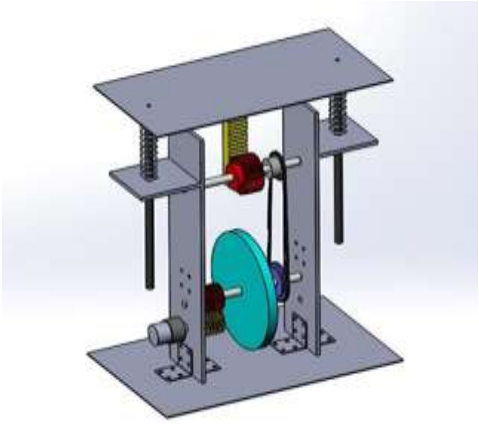


FIG-1



Economical and Environmental Feasibility:

This device is completely in the favor of Human economy; its Components are not so expensive and can be easily installed.

By using this device we can save electric energy and part of money in schools, cinemas, station, etc.

The materials and the components used in it is completely also in the favor of environment and any type of pollution is not be created. The materials used in this device are not harmful to the nature components in any way.

General Applications:

1) Railway, subway stations.
2) Roads.
3) Temples.
4) Bus stands.
5) Airports.
6) Music halls.
7) Auditoriums.
8) Markets.
9) In car parking systems.

Advantages:

This process depends on human resources which is available in plenty in our country which makes our country a favorable place for this project.

1) This is a Non-conventional system.
2) No need fuel input.
3) Power generation is simply walking on the step.
4) Power also generated by running or exercising on the step.
5) Battery is used to store the generated power.
6) No pollution content is produced.
7) It is fully eco-friendly.
8) Easy construction.
9) It can be used at any time when it necessary.
10) Easy maintenance because of less moving parts.
11) Highly efficient in more crowded places.
12) Depending upon the power generator and number of them, power output is very high.
13) Promising technology for solving power crisis to an affordable extent.
14) Low cost level.
15) Reduces transmission losses.
16) Wide areas of application.
17) Maintenance cost is low.
18) Conversion of mechanical energy into electrical energy is easy.

Disadvantages:

1) Major disadvantage is that it cannot be used as a primary energy source in places where continuous supply is required. This is because of the fact that energy is generated only when there is motion on the floor.
2) Storing charge is also quite cumber some.
3) The conversion from AC to DC involves rectifier.
4) The diodes used are temperature sensitive and can even be destroyed at high temperatures. Thus, there is high maintenance cost involved with this method.

Expected Result and Model:

When the foot is placed on the tile the kinetic energy of the foot-step is transferred to the piezo material. It then produces low voltage D.C. current which can directly be measured by multimeter. The D.C. current is then stored in a battery. As D.C. voltage cannot be used for powering an A.C. bulb, we create an inverter circuit to convert D.C. to A.C. It is connected to a transformer from which the appliance gets its power.

IV. CONCLUSION:

In concluding the words of our project, since the power generation using foot-step get its energy requirements from the 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 foot-steps speed breaker so that increase the power production rate by fixing school and colleges, highways etc.

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