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Electromagnetic Foot Step Power Generation

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Abstract- 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.

The main aim of this project is to develop much cleaner cost effective way of power generation method, which in turns helps to bring down the global warming as well as reduce the power shortages. In this project the conversion of the force energy in to electrical energy by using electromagnetic induction. In this project the force energy is converted into electrical energy. The control mechanism carries the copper coil and bar magnetic which is used to generate voltage, a rechargeable battery is used to store this generated voltage.

Index Terms- Non-conventional renewable energy source, Electromagnetic principle, etc

I. INTRODUCTION

1.1 Introduction to the project

Energy is the ability to do work. While energy surrounds us in all aspects of life, the ability to harness it and use it for constructive ends as economically as possible is the challenge before mankind. Alternative energy refers to energy sources, which are not based on the burning of fossil fuels or the splitting of atoms. The renewed interest in this field of study comes from the undesirable effects of pollution (as witnessed today) both from burning fossil fuels and from nuclear waste by products. Fortunately there are many means of harnessing energy, which have less damaging impacts on our environment [1].

The alternatives are,

- Solar
- Wind Power
- Tides
- Hydroelectric

In addition to these we have developed a new methodology of generating power using human energy and the name of this alternative is a foot step power generation. The usage of traditional power generation .

II. LITERATURE SURVEY

Method such as burning of coal, wood, diesel (generators) etc is continuously depleting our natural resources such as fossil fuels, which is the demand for power has exceed the supply due to the rising population. In addition to this the traditional methods cause pollution,

Global warming is the increase in the average measured temperature of the Earth's near surface air and Oceans since the mid-20th century, and its projected continuation. Global surface temperature increased 0.74 ± 0.18 °C (1.33 ± 0.32 °F) during the 100 years ending in 2005[2]. The Intergovernmental Panel on Climate Change (IPCC) concludes that most of the increase since the mid-twentieth century is "very likely" due to the increase in anthropogenic greenhouse gas concentrations. Natural phenomena such as solar variation combined with volcanoes probably had a small warming effect from pre-industrial times to 1950 and a small cooling effect from 1950[2] onward.

Climate model projections summarized by the IPCC indicate that average global surface temperature will likely rise a further 1.1 to 6.4 °C (2.0 to 11.5 °F) during the twenty-first century [2]. This range of values results from the use of differing scenarios of future greenhouse gas emissions as well as models with differing climate sensitivity. Although most studies focus on the period up to 2100, warming and sea level rise are expected to continue for more than a thousand years even if greenhouse gas levels are stabilized. The delay in reaching equilibrium is a result of the large heat capacity of the oceans.

Increasing global temperature is expected to cause sea levels to raise, an increase in the intensity of extreme weather events, and significant changes to the amount and pattern of precipitation, likely including an expanse of the subtropical desert regions. Other expected effects of global warming include changes in agricultural yields, modifications of trade routes, glacier retreat, mass species extinctions and increases in the ranges of disease vectors.

Remaining scientific uncertainties include the amount of warming expected in the future, and how warming and related changes will vary from region to region around the globe. Most national governments have signed and ratified the Kyoto Protocol aimed at reducing greenhouse gas emissions, but there is ongoing political and public debate worldwide regarding what, if any, action should be taken to reduce or reverse future warming or to adapt to its expected consequences.

Global dimming, the gradual reduction in the amount of global direct irradiance at the Earth's surface, may have partially mitigated global warming in the late 20th century. From 1960 to 1990 human-caused aerosols likely precipitated this effect. Scientists have stated with 66-90% [2] confidence that the effects of human-caused aerosols, along with volcanic activity, have offset some of the global warming, and that greenhouse gases would have resulted in more warming than observed if not for these dimming agents.

Ozone depletion, the steady decline in the total amount of ozone in Earth's stratosphere, is frequently cited in relation to global warming. Although there are areas of linkage, the relationship between the two is not strong.

2.1 Problem definition:

Some developing countries and newly-industrialized countries have several hours of daily power-cuts in almost all cities and villages because the increase in demand for electricity exceeds the increase in electric power generation. People in these countries may use a power-inverter (rechargeable batteries) or a diesel/petrol-run electric generator at their homes during the power- cut. The use of standby generators is common in industrial and IT hubs. This ultimately increases the shortage of power.

2.2 Objective of project:

The main aim of this project is to develop much cleaner cost effective way of power generation method, which in turns helps to bring down the global warming as well as reduce the power shortages. In this project the conversion of the force energy in to electrical energy by using electromagnetic induction. The control mechanism carries the copper coil, bar magnetic and dc rechargeable battery.

2.3 Existing system

Other people have developed Rack-pinion [3] (mechanical-to-electrical) and piezoelectric [4] method in the past. The Crowd Farm floor is composed of standard parts that are easily replicated but it is expensive to produce at this stage and produce less power. 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, railway stations, bus stands, subways, airports etc. like capable of Harnessing human location for electricity generation.

2.4 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 ultimate aim of this project is to develop much cleaner cost effective way of power generation method, which in turns helps to bring down the global warming as well as reduce the power shortages 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 uses electromagnetic induction principle.

In this project the pressure energy is converted into electrical energy. The control mechanism carries the copper coil and bar magnetic which is used to generate voltage, a rechargeable battery is used to store this generated voltage.

III. BLOCK DIAGRAM

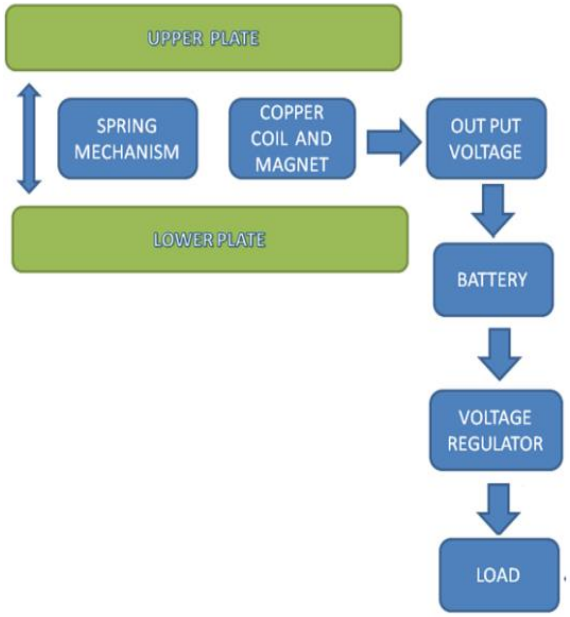

Fig-1: block diagram

IV. LINE DIAGRAM

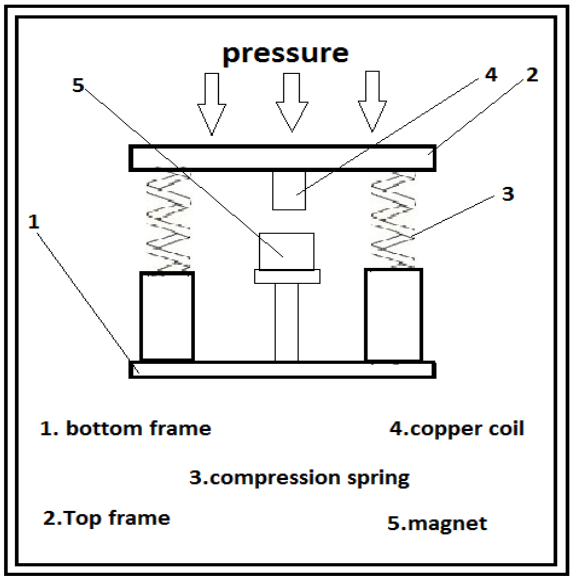

Fig-2: line diagram

4.1 Step by step procedure

Step1: when force is applied on the plate by virtue on stamping on the plate the spring gets compressed

Step2: The magnet fixed at the top plate hit the copper coil fixed at bottom plate and emf is induced in the copper coil.

Step3: The generated voltage is stored in the battery.

V. WORKING PRINCIPLE

5.1Electromagnetic Induction

We have seen previously that when a DC current pass through a long straight conductor a magnetizing force, H and a static magnetic field, B is developed around the wire. If the wire is then wound into a coil, the magnetic field is greatly intensified producing a static magnetic field around itself forming the shape of a bar magnet giving a distinct North and South pole.

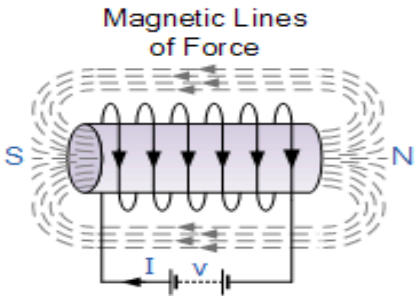

Fig-3: Air-core Hollow Coil

The magnetic flux developed around the coil being proportional to the amount of current flowing in the coils windings as shown. If additional layers of wire are wound upon the same coil with the same current flowing through them, the static magnetic field strength would be increased.

Therefore, the magnetic field strength of a coil is determined by the *ampere turns* of the coil. With more turns of wire within the coil the greater will be the strength of the static magnetic field around it But what if we reversed this idea by disconnecting the electrical current from the coil and instead of a hollow core we placed a bar magnet inside the core of the coil of wire. By moving this bar magnet "in" and "out" of the coil a current would be inducted into the coil by the physical movement of the magnetic flux inside it.

Likewise, if we kept the bar magnet stationary and moved the coil back and forth within the magnetic field an electric current would be induced in the coil. Then by either moving the wire or changing the magnetic field we can induce a voltage and current within the coil and this process is known as Electromagnetic Induction and is the basic principal of operation of transformers, motors and generators.

Electromagnetic Induction was first discovered way back in the 1830′s by Michael Faraday. Faraday noticed that when he moved a permanent magnet in and out of a coil or a single loop of wire it induced an Electromotive Force or emf, in other words a Voltage, and therefore a current was produced [5].

So what Michael Faraday discovered was a way of producing an electrical current in a circuit by using only the force of a magnetic field and not batteries. This then lead to a very important law linking electricity with magnetism, Faraday's Law of Electromagnetic Induction. So how does this work?

When the magnet shown below is moved "towards" the coil, the pointer or needle of the Galvanometer, which is basically a very sensitive centre zero moving-coil ammeter, will deflect away from its centre position in one direction only. When the magnet stops moving and is held stationary with regards to the coil the needle of the galvanometer returns back to zero as there is no physical movement of the magnetic field.

Likewise, when the magnet is moved "away" from the coil in the other direction, the needle of the galvanometer deflects in the opposite direction with regards to the first indicating a change in polarity. Then by moving the magnet back and forth towards the coil the needle of the galvanometer will deflect left or right, positive or negative, relative to the directional motion of the magnet.

5.2 Electromagnetic Induction by a Moving Magnet

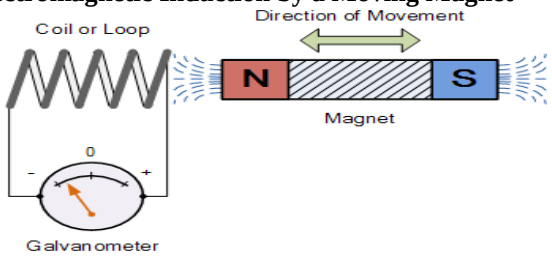

Fig-4: Electromagnetic Induction by a Moving Magnet

Likewise, if the magnet is now held stationary and ONLY the coil is moved towards or away from the magnet the needle of the galvanometer will also deflect in either direction. Then the action of moving a coil or loop of wire through a magnetic field induces a voltage in the coil with the magnitude of this induced voltage being proportional to the speed or velocity of the movement.

Then we can see that the faster the movement of the magnetic field the greater will be the induced emf or voltage in the coil, so for Faraday's law to hold true there must be "relative motion" or movement between the coil and the magnetic field and either the magnetic field, the coil or both can move.

5.3 Lenz's Law of Electromagnetic Induction

Lenz's law is one of the basic laws in electromagnetic induction for determining the direction of flow of induced currents and is related to the law of conservation of energy. According to the law of conservation of energy which states that the total amount of energy in the universe will always remain constant as energy cannot be created nor destroyed. Lenz's law is derived from Michael Faraday's law of induction. One final comment about Lenz's Law regarding electromagnetic induction. We now know that when a relative motion exists between a conductor and a magnetic field, an emf is induced within the conductor [6]. But the conductor may not actually be part of the coils electrical circuit, but may be the coils iron core or some other metallic part of the system, for example, a transformer. The induced emf within this metallic part of the system causes a circulating current to flow around it and this type of core current is known as an Eddy Current.

VI. DESCRIPTION OF PARTS

6.1Compression springs

Fig-5 compression spring

Spring free length = 80mm
Outer diameter = 40mm
Inner diameter = 35mm
Quantity =4

6.2 Copper coil

Fig-6 copper coil

Gauge size = 18awg
Normal wire diameter =0.0403
Ohms/mgt normal =6.386

6.3 Magnet

Fig-7 Magnet

Magnet type NdFeB Rare Earth
Permanent Magnet Grade = 35
Length =50mm
Width =30mm

VII. MERITS AND DEMERITS

7.1 Merits

- Power generation is simply walking on the step
- Power also generated by running or exercising on the step.
- No need fuel input
- This is a Non-conventional system
- Battery is used to store the generated power
- Less moving parts.
- Easy maintenance.

7.2 Demerits

- Only applicable for the particular place.
- Initial cost of this arrangement is high.
- Coil winding may damaged when we apply high pressure

VIII. APPLICATIONS

- Street-1lightening.
- Colleges.
- Cinema theatres.
- Shopping complex.
- Railway stations.
- Airports.
- Bus stand.
- Speed breakers.
- Suspension system.
- Dancing floors.

IX. KIT PHOTO REPRESENTATIONS

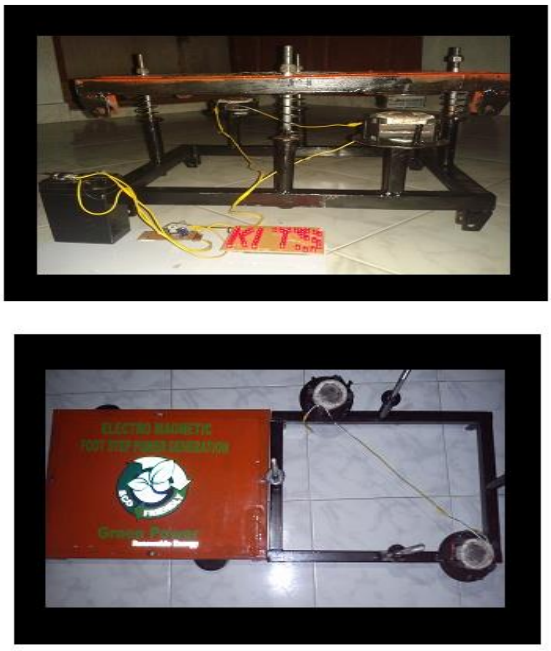

Fig-6: kit photo representations

X. CONCLUSIONS

The project **"ELECTRO MAGNETIC FOOT STEP POWER GENERATION"** is successfully tested and implemented which is the best economical, affordable energy solution to common people. This can be used for many applications in rural areas where power availability is less or totally absence. As India is a developing country where energy

management is a big challenge for huge population. By using this project we can drive both AC as well as D.C loads according to the force.

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Working principle

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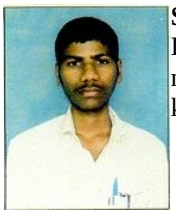

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