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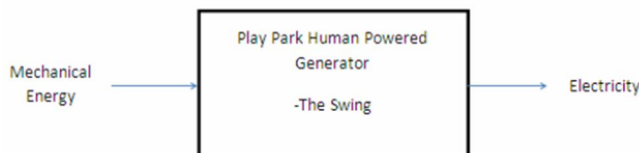
# Electricity Generation by Swing Action

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**Abstract:** Energy is the ability with which work can be done. It can be converted to any form based on the requirement. It is one of the key aspects in economic growth. Depletion of non renewable energy resources has created a need to find other means for the effective energy generation. Generation of energy from renewable resources has got vast scope. This paper proposes a novel methodology which utilises the energy which is created during the swing action. Swing is a seat which is suspended downwards with the help of ropes or chain. Due to the flexibility of these ropes and chain it allows the seated person swing back and forth. Swinging back and forth is referred as swing action. During the swing action mechanical energy is created which is unnoticed. Therefore it can be made use of to generate energy. Energy is created during the swing action which is channelized into the right way to extract energy efficiently from it. Swing can be found in most of the play areas which ensures enough sources. The mechanical energy created from the to and fro action of the swing is converted into an electrical energy by using commutator. The converted energy is stored in the battery for the further utilization. The horizontal beam to which the links of swing is attached is rotated during the swing action. The horizontal beam is rotated through an angle. This shaft is connected to a sprocket. The shaft connected to sprocket transfers the motion to the free wheel which rotates proportionally with respect to the angle of motion of the swing. The angular movement is made to convert into a complete rotation. It is done with the help of a chain drive connecting both sprocket and free wheel. The free wheel is connected to a shaft. Shaft in turn rotates the spur gear and dynamo arrangement to generate electricity.



The above block diagram depicts the conversion of energy from one form to another through a means which is the swing. The swing is assembled with all the equipments in which provides the platform for the conversion. Dynamo is the basic device which helps in performing the conversion. The output is in the form of electrical energy, which is stored in the battery for further use.

## I. INTRODUCTION

Energy is the ability to do work. It is one of the major factors for deciding the growth of the country. The energy consumption is increasing rapidly and it is essential to fulfil the need of the energy in order to achieve economic development. The significant problem is that the need of energy is rapidly increasing and the current conventional systems have become incapable to fulfil the energy requirement resulting in scarcity of the energy. One of the best options is to switch to extract energy from renewable resources. This has many advantages one of which is it is eco friendly. With the depletion of non renewable resources is in not possible to fulfil the energy requirements. When we consider non renewable resources for the generation of energy there are already many electricity generating systems such as OTEC (Ocean thermal energy conversion) which harnesses electricity from the waves of the ocean. Windmills which utilises the force of the wind to rotate the blades of the fan from which electricity is generated. Solar panels which generates electricity from the sunlight. Therefore these are some of the inventions that already exist. In spite of the existence of all these electricity generating system still the scarcity for electricity remains the same. This paper thus proposes a new method for the generation of electricity. Dynamo was one among the novel inventions in 19<sup>th</sup> century which utilized the human power conversion which set an outstanding example. Which utilised a moment of wheel during pedalling to generate electricity. Motivated by this invention this paper proposes a new method of human power conversion. Play ground is the place where lot of mechanical action happen which is most often not utilised. That may be a rotation of a merry-go-round, to and fro action of swing etc. This kind of energy generation does not need much effort and it can be done deliberately. The swing action is made used to generate electricity, during the generation the children are unaffected and the swing action remains the same. These kind of human power conversion systems are very useful in developing countries as it can generate electricity with low cost and its construction is much simpler compared to other electricity generating systems.

This system can be easily implemented as there are many playgrounds and most of the playgrounds consist of swings. Therefore, finding a swing shouldn't be a problem. It can be implemented to a large extent as we find a large number of swings.

This kind of eco-friendly electricity generating system has to be encouraged in order to meet the rising need for electricity. This electricity generation by swing action system is designed in such a way that doesn't let any kind of harmful emission to the environment, causing a serious problem to the environment.

As the swing is used by children, care has to be taken to ensure their protection and no harm is done during the process of generation of electricity. Therefore, it is one of the best-suited systems in the present generation to generate electricity so that they can fulfill the requirement for electricity without damaging the environment.

## II. WORKING PRINCIPLE

A swing consists of two chains attached to both ends, which can help in inducing swing action easily. The main objective is to extract the maximum amount of energy.

The swing action consists of two kinds of motion, i.e., to and fro motion, which are considered as equal and are in opposite directions. To induce the maximum amount of energy, both the to and fro moments have to be made use of.

The swing action results in the generation of torque in the shaft. The torque generated during the forward stroke may or may not be equal to the backward stroke, but they are in opposite directions to each other. The shaft where torque is generated is mounted between two bearings at the extreme ends. One end of the shaft has a sprocket attached to it rigidly. The attached sprocket is large, and this sprocket pivots over the shaft axis when the shaft is displaced. This large sprocket is attached to the comparatively smaller sprocket using a chain. The shaft is connected with the spur gear arrangement.

These arrangements of two sprockets, connecting chain, and spur gear have the ability to generate the mechanical energy. This energy is converted into electrical energy using a dynamo. A dynamo is a device that converts the mechanical energy into electrical energy. The converted mechanical energy is stored in a battery in the form of electrical energy.

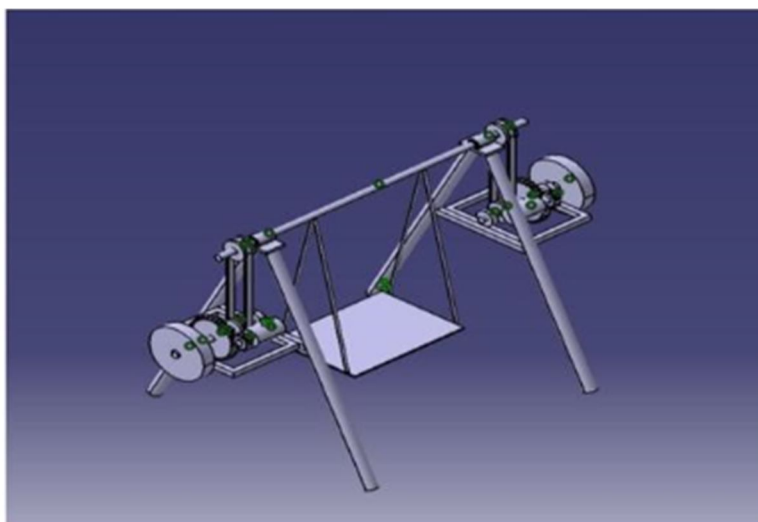
When the seating of the swing set moves forward and backward, some amount of torque is generated in the shaft by the hinging bars of the swing set during both the strokes.

This torque displaces the large sprocket, which is pivoted over the axis of the shaft bearing the swing. When the large sprocket is displaced, it results in the angular displacement. The angular displacement can be converted into the rotational moment. The conversion of angular displacement into rotational moment of the small sprocket is done by utilizing the chain attachment.

Due to the rotational motion, the sprockets rotate in a unidirectional way continuously, which results in the rotation of the spur gear arrangement with the help of the chain. The spur gear rotation runs the dynamo, which produces electricity.

The electricity generated has to be stored in order to use it when required. Therefore, a battery has to be connected to the outlet of the dynamo in order to store the generated energy. There are wide varieties of batteries to choose from. Based on the amount of power generated and the duration, the respective battery can be chosen.

The figure depicts the arrangement of the shaft, sprocket, chain, and spur gear arrangement. The visual representation of the arrangement is designed using CAD software.

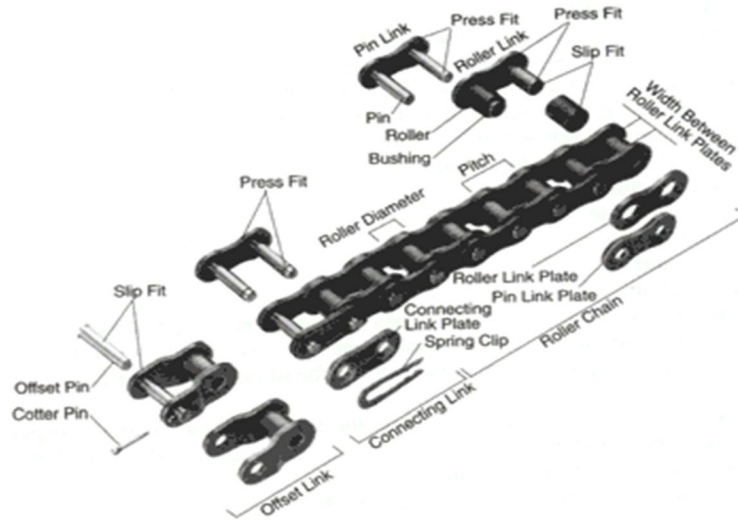


### III. COMPONENTS REQUIRED

#### A. Sprocket And Chain Drive

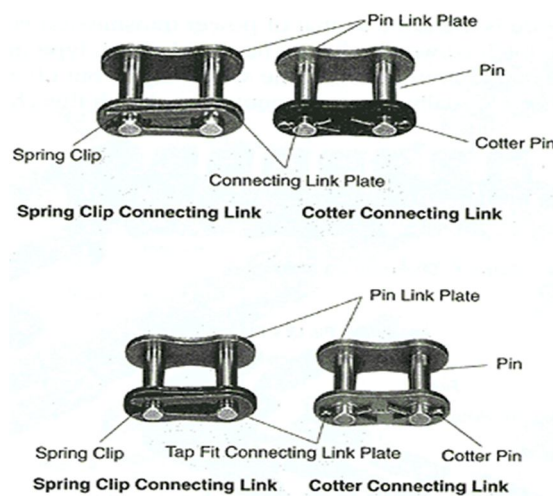


#### B. Power Transmission Chain



#### C. Connecting Link

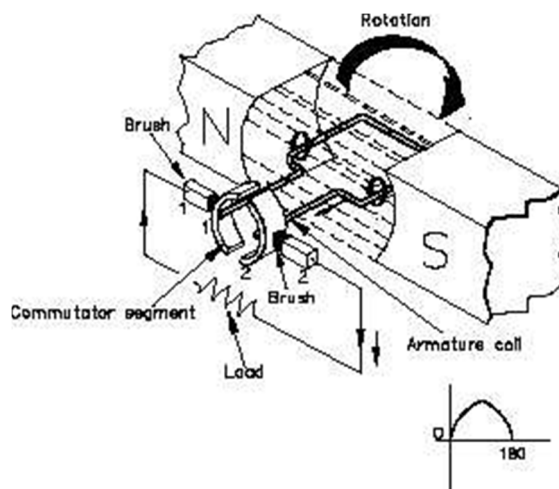
The connecting link has pin and link plate in slip fit which ensures the ease of assembly. This kind of connecting link has twenty percent lower in fatigue strength.



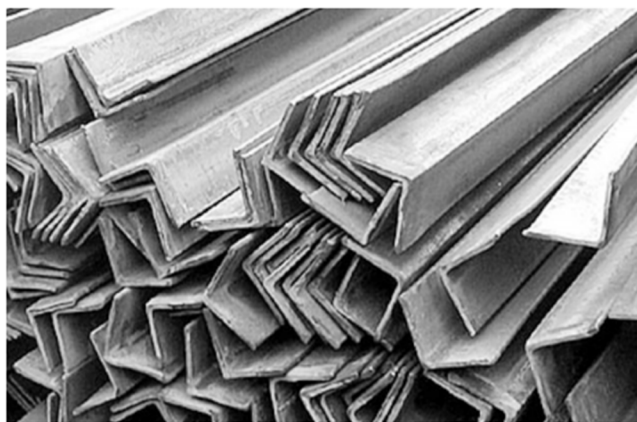
#### D. Fly Wheel

Fly wheel is used to increase the rpm of the system. The RPM from the generator is increased as it is coupled with the shaft.

*E. Permanent Magnet D.C Generator*



*F. Mild Steel*



Mild steel can be used for its cost and strength. It is a carbon steel with 0.25% Carbon and 0.4% of manganese, 0.5% Silicon along with some traces of other elements.

*G. Nut and Bolt*

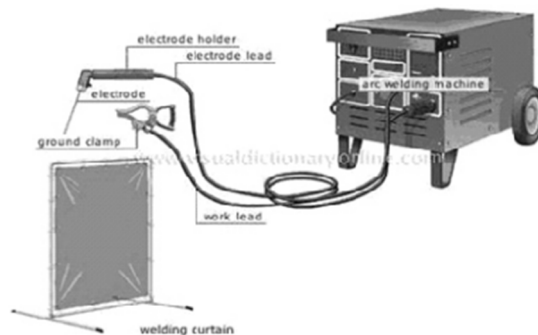


Nut is a fastener along with a threaded hole. Nuts are used in conjunction along with a mating bolt. It is used to fasten two or more parts together.

#### IV. REQUIRED OPERATIONS

##### A. Arc Welding

Arc welding is a process which is required to join two metals. In this case it is used to join the shaft to sprocket, chain of swing to the axis, spur gear etc.



##### B. Corrosion Prevention Operation

Corrosion prevention is one of the most important steps which have to be followed. As the material used for the construction is metal it is essential to coat the metal with the non corrosive substance in order to prevent the metal from rusting and it helps in smooth working. Below steps are followed to prevent corrosion.

- 1) Rust cleaning
- 2) Oxidation
- 3) Red oxide coating
- 4) Finishing coating

These processes are followed in respective order for the effective coating which does not let the metal rust and ensures smooth working.

##### C. Drilling

Drilling operation is performed to drill different kinds of hole in preferable location. Drilling machines vary from hand-held power drills, bench mounted drill and floor-mounted models.

#### V. FUTURE SCOPE

The model of swing that generates electricity by its swing action has got numerous advantages due to which this model is preferred over the models. Some advantages of this model are listed below:

- A. Simplest design which involves fewer components
- B. It Can be implemented by using locally available materials (bicycle and car parts)
- C. Made with locally available tools and limited mechanical and electrical knowledge
- D. DC-DC conversion which results in reduced costs and reduced power loss
- E. Pollution free electricity generation.
- F. This power can be stored in battery array so as to use it further.
- G. Can be installed at places such as schools, playgrounds where mass transit of children is sighted e.g. hotels, fairs etc.
- H. Easy installation and maintenance.
- I. It can be used in remote areas where power supply is not available.
- J. It does not require no running cost because it does not required any fuel.
- K. It can be installed in any place quickly as compare to solar, wind and other plant.
- L. It is portable; it can be used as portable power generator.
- M. It is simple in construction like other conventional part.
- N. It required small area for installation.

Because of all the above mentioned advantages the demand of the model seems to increase in further and in current scenario as well.

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