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# DESIGN AND FABRICATION OF CONTACTLESS ENERGY GENERATION BY FLYWHEEL

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*Abstract*— **The production and use of energy are vital to the economies of all countries and it is needed for many activities such as lighting and phone charging and driving the bike and lot of other stuff, Energy is usually produced by non-renewable sources such as petrol, Kerosene and nuclear which unfortunately create pollution. This idea that could generates electricity without any friction with flywheel car or commercial Tyre are known to be richest source of kinetic energy , so we are converting directly kinetic energy to electrical energy for generating electricity, which can generate upto 230 volt energy. A flywheel is an electrical approach to energy storage to store electricity a motor is used to convert the electrical energy from an external source into rotational energy of flywheel .using the motor as a generator and extracting energy retrieve the stored energy and slows the flywheel. A complete arrangement consist of flywheel, bike tyre ,free wheel chain sprocket, motor engine as input power for tyre rotation ,battery charging unit. To avoid Dynamo mechanism we have designed this system, in this we are replacing the conversion of kinetic energy to mechanical energy and then electrical energy we directly converting kinetic energy to electrical energy hence there is no chance of energy loss and we get 100% energy output without any friction and no effect to other parts.**

***Keywords— flywheel, kinetic energy, friction, battery charging unit***

## I. INTRODUCTION

The flywheel is an old means of storing energy a smoothing out power variations. The potter's wheel and the spinning wheel are examples of historical uses of flywheels. The focus in this review is on applications where flywheels are used as a significant intermediate energy storage in automotive applications. This is a mechanical device which uses the flywheel to store energy in the form of inertia. In this system we applied an additional energy source to start the main motor like electricity. In this system main motor is used to drive a series of pulley and belt arrangement which forms a gear train arrangement which produce a twice/ thrice speed at the shaft of generator. The significant thing about the system is that the electricity

Generated at the output of the shaft is more than that of input. The inertia of flywheel can be increased by increasing the radius of flywheel and weight of flywheel. It also increase if the flywheel weight is concentrated as far out toward the rim of the flywheel as is possible. Firstly, the requirement for an effective system needs to be a suitable flywheel with a large diameter and vast majority of the weight needs to be close to rim. The construction needs to be robust and secure as ideally. The rate of rotation will be as high as possible as the weight on the flywheel is concentrated outward of the rim which needs to be exactly at right angles to the axle on which it rotates and exactly centered on the axle. The main motor is at low speed, low voltage input motor, the generator is high speed, and high voltage output generator. Therefore, when we apply an extra energy to the main motor it starts running, which causes to rotate the flywheel. When the motor is reaches the highest speed (constant speed) we switch the power by applying the electrical energy generated by the generator. We add the extra thing in the system like transformers, rectifier, inverter etc. to run the system and take the efficiency output. Electric trains, cars, and other electric vehicles are powered by electric motors connected to batteries. When we're driving along, energy flows from the batteries to the motors, turning the wheel and providing us with the kinetic energy we need to move. When we stop and hit the brakes, the whole process goes into reverse: electronic circuits cut the power to the motors. Now, our kinetic energy and momentum makes the wheels turn the motors, so the motors work like generators and start producing electricity instead of consuming it. Power flows back from these motor-generators to the batteries, charging them up. So a good proportion of the energy we lose by braking is returned to the batteries and can be reused when we start off again. In practice, regenerative brakes take time to slow things down, so here our system zero friction no physical contact of vehicle connected, the flywheel plate just connected parallel with the type shaft to get the good output continuously even when there is braking.

## *II. LITERATURE SURVEY*

**K. Ghedamsi**- "The flywheel energy storage system (FESSs) are suitable for improving the quality of the electric power delivered by electric motor. Jamie Patterson, 2004, "The broad goal of this project was the development and demonstration of a complete prototype Flywheel Power System (FPS) and successful proof of the feasibility of this energy storage

technology. The next step in development will be final system modifications for the transition from laboratory to field testing, and interface engineering for a field experiment."

**Michael Mathew**, 2009, "Flywheels serve as kinetic energy storage and retrieval devices with the ability to deliver high output power at high rotational speeds as being one of the emerging energy storage technologies available today in various stages of development, especially in advanced technological areas, i.e., spacecraft's. Today, most of the research efforts are being spent on improving energy storage capability of flywheels to deliver high power at transfer times, lasting longer than conventional battery powered technologies. Mainly, the performance of a flywheel can be attributed to three factors, i.e., material Strength, geometry (cross-section) and rotational speed. While material Strength directly determines kinetic energy level that could be
produced safely Combined (coupled) with rotor speed, this study solely focuses on exploring the effects of flywheel geometry on its energy storage/deliver capability per unit mass, further defined as Specific Energy".

**B.Sneha, Dr.M.Damodar Reddy**, October 2015 "Generation of Power from Bicycle Pedal". It is known that the supply of fossil fuels are scarce and their usage as energy source cause environmental degradation ,in addition to this as the world population increases the energy demand is also increasing day by day, so we are in a search of new renewable energy sources. In this paper an easy way of generating power at small levels by using bicycle pedal was analyzed. Dynamo attached to the cycle pedal can serves as a mechanism for converting mechanical energy from pedal to electrical energy. For running of appliance we need to convert this dc power to ac power by using inverter .Output of the dynamo or generator depends on the pedaling speed. A hardware prototype of this model is developed and tested for various loads. Currently, this significant (in our opinion) amount of energy is actually wasted and transformed into heat. Instead, in this study, a prototype scavenging system (dedicated to fitness/stationary bikes) to collect and (re)use this energy is presented. Specifically, we depict the design of a low-budget system that uses existing, discrete components and is able to scavenge some of the energy spent by the biker. The experimental results show that the system is functional, but its efficiency is limited by (mechanical) losses before the collection.

**Suraj A.Sevatkar, Eknath M. Pise, and Pravin S. Ghawade** "DESIGN AND FABRICATION OF FLYWHEEL ON BICYCLE USED AS KINETIC ENERGY RECOVERY SYSTEM" When riding a bicycle a great amount of kinetic energy is lost while breaking. To use this energy we are using a flywheel to store the energy which is normally lost during breaking and reuse it to help propel the rider when starting. By designing the flywheel which is more suitable to the frame properties and rider compatibility the efforts of the rider can be reduce. The rider can charge the flywheel during downward motion on hilly road and boost the bicycle when accelerating. This project preliminary deals with one of the method for recovering the kinetic energy from the Flywheel, which is implemented in a bicycle. In this we are concentrating on the mass of the flywheel and re-designing it.

**PRAVEEN, M. ARUN**, (Dec 2014), "KINETIC ENERGY RECOVERY SYSTEM IN BICYCLE" Kinetic Energy Recovery System (KERS) is a system for recovering the moving vehicle's kinetic energy under braking and also to convert the usual loss in kinetic energy into gain in kinetic energy. When riding a bicycle, a great amount of kinetic energy is lost while braking, making start up fairly strenuous. Here we used mechanical kinetic energy recovery system by means of a flywheel to store the energy which is normally lost during braking, and reuse it to help propel the rider when starting. The rider can charge the flywheel when slowing or descending a hill and boost the bike when accelerating or climbing a hill. The flywheel increases maximum acceleration and nets 10% pedal energy savings during a ride where speeds are between 12.5 and 15 mph.

## III. Components of Experimental Setup

### A. ALL PARTS DESCRIPATION

i. Neodymium Magnets-

The Neodymium metal element is initially separated from refined Rare Earth oxides in an electrolytic furnace. The "Rare Earth" elements are lanthanides (also called lanthanides) and the term arises from the uncommon oxide minerals used to isolate the elements. The Rare Earth elements are abundant e.g. Neodymium element is more common than gold. The Neodymium, Iron and Boron are measured out and put in a vacuum induction furnace to form an alloy. Other elements are also added, as required for specific grades e.g. Cobalt, Copper, Gadolinium and Dysprosium (e.g. to assist with corrosion resistance).

| Material | Typical Shapes | Pro | Cons |
|---|---|---|---|
| Cast Alnico AlNiCo | Rods, Bars ,U shape and other cast types | High Br, High working T, Good T coefficient | High Br, High working T, Good T coefficient |
| Sintered Alnico AlNiCo | Powder pressed to shape | Complex shapes High Br,T | HighBr, High working T, Good T coefficient |
| Ceramic/Ferrite SrFe2O3 | Blocks ,Rings, Arcs, Discs | Most flux High usage Low corrosion | High Br, High working T, Good T coefficient |
| Samarium Cobalt SmCo | Blocks, Rings, Arcs, Discs, Segments | Highest magnetic properties No tooling | High Br, High working T, Good T coefficient |
| Neodymium NdFeB | Blocks,Rings,Arcs,Discs ,Segments | Highest magnetic properties No tooling | Corrodes Low working T |
| Bonded Grades | Bonded Grades All materials | Complex shapes Various resins | High tooling |

The mixture is melted due to the high frequency heating and melting the mixture. In simplified terms, the "Neo" alloy is like a cake mixture with each factory having its own recipe for each grade. The resultant melted alloy is then cooled to form ingots of alloy. The alloy ingots are then broken-down by hydrogen decrepitating (HD) or hydrogenation disproportionate desorption and Recombination (HDDR) and jet milled down in a nitrogen and argon atmosphere to a micronized powder (about 3 microns or less in size). The neodymium magnet is given a protective coating. It is imperative that the drying is thorough otherwise water is locked into the plated Neodymium magnet and the magnet will corrode from the inside out. Permanent magnets are magnets that are permanently charged. They are different from electro-magnets in that electro-magnets only have magnetic properties when an electrical current is flowing through them. Permanent magnets, on the other hand, are always magnetic.

ii. FLYWHEEL

A flywheel is a mechanical device specifically designed to efficiently store rotational energy. Flywheels resist changes in rotational speed by their moment of inertia. The amount of energy stored in a flywheel is proportional to the square of its rotational speed.

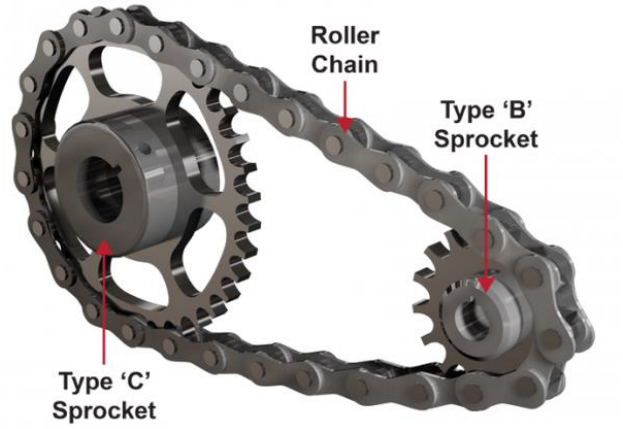
The way to change a flywheel's stored energy is by increasing or decreasing its rotational speed applying a torque aligned with its axis of symmetry.

Why we need flywheel?

Engines are happiest and at their most efficient when they're producing power at a constant, relative high speed. The only trouble is, the vehicles and machines they drive need to operate at all kinds of different speeds and sometimes need to stop altogether. Clutches and gears partly solve this problem. (A clutch is a mechanical "switch" that can disengage an engine from the machine it's driving, while a gear is a pair of interlocked wheels with teeth that changes the speed and torque (turning force) of a machine, so it can go faster or slower even when the engine goes at the same speed.) But what clutches and gears can't do is save. The energy you waste when you brake and give it back again later. That's a job for a flywheel

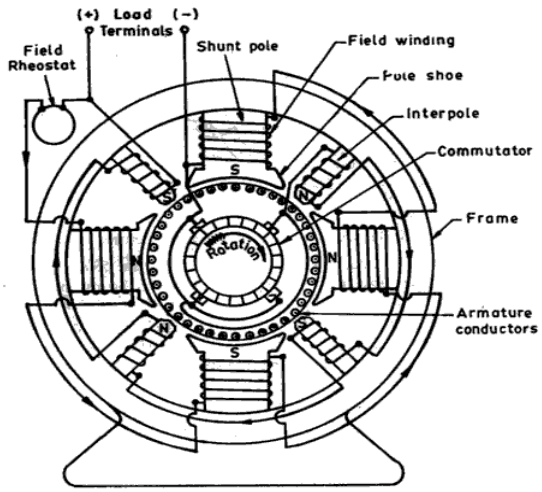
iii. CHAIN DRIVE

Chain drive is a way of transmitting mechanical power from one place to another. It is often used to convey power to the wheels of a vehicle, particularly bicycles and motorcycles. Most often, the power is conveyed by a roller chain, known as the drive chain or transmission chain, passing over a sprocket gear, with the teeth of the gear meshing with the holes in the links of the chain. The gear is t turned, and this pulls the chain putting mechanical force into the system




iv. GENERATOR

The basic understanding of a generator is that it converts mechanical energy to electrical energy. Generators are utilized extensively in various applications and for the most part have similarities that exist between these applications. However the few differences present is what really distinguishes a system operating on motors.



With the axial flux generator design, its operability is based on permanent magnet alternators where the concept of magnets and magnetic fields are the dominant factors in this form of generator functioning. These generators have air gap surface perpendicular to the rotating axis and the air gap generates magnetic fluxes parallel to the axis.

v. BATTERY

An automotive battery is a rechargeable battery that supplies electrical energy to a motor vehicle. It is also known as an SLI battery (starting-lighting-ignition) and its main purpose is to start the engine. Once the engine is running, power for the car's electrical systems is supplied by the alternator. Typically, starting discharges less than three per cent of the battery capacity. SLI batteries are designed to release a high burst of current and then be quickly recharged. They are not designed for deep discharge, and a full discharge can reduce the battery's lifespan

vi. Bearing

A **bearing** is a machine element that constrains relative motion to only the desired motion, and reduces friction between moving parts. The design of the bearing may, for example, provide for free linear movement of the moving part or for free rotation around a fixed axis; or, it may *prevent* a motion by controlling the vectors of normal forces that bear on the moving parts. Most bearings facilitate the desired motion by minimizing friction. Bearings are classified broadly according to the type of operation, the motions allowed, or to the directions of the loads (forces) applied to the parts.

## IV. FUTURE SCOPE:

We are primarily developing the project for charging electric vehicles battery while travelling in remote place and it can be expanded by increasing the magnets and coils in quantity and reducing the space in between the disks on which magnets and coils are placed, by this maximum line of force is cut by the coil and flux fill generate more and

Induced voltage will be maximum. Using this project on motor cycle we can charge battery which takes 1 to 1:30 hour to get full charge. By using this project we are going remove the disadvantage of conventional power generator which make use of dynamo as a power generator which produces friction and decrease the speed of bicycle. In this project we have overcome this friction and produces clean energy .We can implement it for electric vehicle. On all tires, this assemble can be set up generate more electricity.

## V. CONCLUSIOIN

We conclude that, by using the components like flywheel, motor, neodymium magnets, chain sprocket arrangements, electricity up to 230volts can be generated and this energy generated will be stored in battery and can be utilized for charging other components.

## VI. RESEARCH PAPER

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