Solar Powered Water Purification Using Reverse Osmosis

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***Abstract*—A Flywheel regenerative braking system is an energy recovery system that reduces vehicle speed by converting some of its kinetic and potential energy into a valuable form of energy instead of dissipating it as heat as in the case of a conventional braking system. The converted kinetic energy is stored for future use or is fed back into the vehicle's power system. This energy can be stored in a battery or bank of capacitors for later use. Energy can also be stored with the help of a rotating flywheel which is one of the most inexpensive and effective methods of storing and regenerating power. The present invention provides an energy-storing regenerative braking system by transmitting the flywheel force as a torque tending to oppose the forward rotation of the wheel on applying the brakes. A brake-pad assembly mounted concentrically with the hub of a ground-engaging wheel is actuated upon braking to provide frictional engagement between the hub and clutch mechanism while applying a decelerating torque to the wheel. The clutch mechanism is engaged only upon braking and does not interfere with wheel rotation during other vehicle operating modes. The unique braking mechanism is selectively held in position by a rider-controlled clutch mechanism to accumulate energy over several braking events. Vehicles driven by electric motors use the motor as a generator when using regenerative braking, and its output is supplied to an electrical load. The energy transfer to the load provides the braking effect and regenerates power**

***Index Terms*—Flywheel, dissipating, electric motors, regenerate power, clutch mechanism, kinetic energy.**

I. INTRODUCTION

A brake is a tool that enables in deceleration of a moving object; they use friction to convert kinetic energy into heat. Conventional braking systems use this mechanism. Once the brake pads rub against the wheels of the car, excessive heat energy is produced. The heat generated is lost into the air nearly accounting for about 30% of the car's generated power. Here "Regenerative Braking System Project for Mechanical Students" introduces a different braking technology. In this system, regenerative braking mechanism reuses the energy created by the braking process and uses this energy to charge the battery for further use. Generally, the energy lost in the conventional use is transferred to the generator of the rotating wheel and is given to the battery. This saves a lot of energy. The driving system of the vehicle is responsible for most of the braking process. As soon as the driver steps onto the brake pedal of the vehicle (either hybrid or electrical), the brakes put the vehicle's motor in the reverse mode enabling it to run backwards causing the wheels to slow down. While in the reverse mode, the motor operates as an electric generator feeding this electricity into the vehicle's batteries. Most of the hybrid and electric vehicles in the market employ this technique to extend the life span of the battery pack. It is highly beneficial to use regenerative mechanism as it reduces pollution and also increases the engine life.When a conventional vehicle applies its brakes, kinetic energy is converted to heat as friction between the brake pads and wheels. This heat is carries away in the airstream and the energy is effectively wasted. The total amount of energy lost in this way depends on how often, how hard and for how long the brakes are applied. Regenerative braking refers to a process in which a portion of the kinetic energy of the vehicle is stored by a short-term storage system. Energy normally dissipated in the brakes is directed by a power transmission system to the energy store during deceleration. That energy is held until required again by the vehicle, whereby it is converted back into kinetic energy and used to accelerate the vehicle. The energy storage unit must be compact, durable and capable of handling high power levels efficiently, and any auxiliary energy transfer or energy conversion equipment must be efficient, compact and of reasonable cost. The regenerative braking system delivers a number of significant advantages over a car that only has friction brakes. In low-speed, stop- and-go traffic where little deceleration is required; the regenerative braking system can provide the majority of the total braking force. This vastly improves fuel economy with a vehicle, and further enhances the attractiveness of vehicles using regenerative braking for city driving. At higher speeds, too, regenerative braking has been shown to contribute to improved fuel economy – by as much as 20%.Consider a heavy loaded truck having very few stops on the road. It is operated near maximum engine efficiency. The 80% of the energy produced is utilized to overcome the rolling and aerodynamic road forces. The energy wasted in applying brake is about 2%. Also, its brake specific fuel consumption is 5%.Now consider a vehicle, which is operated in the main city where traffic is a major problem here one has to apply brake frequently. For such vehicles the wastage of energy by application of brake is about 60% to 65%.Basic Elements of The Regenerative Braking System There are four elements required which are necessary for the working of regenerative braking system, these are Energy Storage Unit (ESU), Batteries, Fly wheels, Continuously Variable Transmission (CVT), Controller, Regenerative Brake Controllers

II. DESIGN & FABRICATION OF REGENERATIVE BRAKING SYSTEM

III.

The Comparison of Dynamic brakes and Regenerative brakesDynamic brakes ("rheostatic brakes" in the UK), unlike regenerative brakes, dissipate the electric energy as heat by passing the current through large banks of variable resistors. Vehicles that use dynamic brakes include forklifts, Diesel-electric locomotives, and streetcars. This heat can be used to warm the vehicle interior, or dissipated externally by large radiator-like cowls to house the resistor banks. The main disadvantage of regenerative brakes when compared with dynamic brakes is the need to closely match the generated current with the supply characteristics and increased maintenance cost of the lines. With DC supplies, this requires that the voltage be closely controlled. Only with the development of power electronics has this been possible with AC supplies, where the supply frequency must also be matched (this mainly applies to locomotives where an AC supply is rectified for DC motors).A small number of mountain railways have used 3-phase power supplies and 3- phase induction motors. This results in a near constant speed for all trains as the motors rotate with the supply frequency both when motoring and braking. Geared DC motors can be defined as an extension of DC motor which already had its Insight details demystified here. A geared DC Motor has a gear assembly attached to the motor. The speed of motor is counted in terms of rotations of the shaft per minute and is termed as RPM. The gear assembly helps in increasing the torque and reducing the speed. Using the correct combination of gears in a gear motor, its speed can be reduced to any desirable figure. This concept where gears reduce the speed of the vehicle but increase its torque is known as gear reduction. This Insight will explore all the minor and major details that make the gear head and hence the working of geared DC motor. The lateral view of the motor shows the outer protrudes of the gear head. A nut is placed near the shaft which helps in mounting the motor to the other parts of the assembly. Also, an internally threaded hole is there on the shaft to allow attachments or extensions such as wheel to be attached to the motor. The outer body of the gear head is made of high-density plastic but it is quite easy to open as only screws are used to attach the outer and the inner structure.

Figure 1.Gear Assembly

The cap that accommodates the gear has an arc cut from its side to avoid frictional resistance forces with the bottom gear assembly. The bottom houses the gear mechanism which is connected to the DC motor through screws. This mechanism rotates the gear at the top which is connected to the rotating shaft. A closer look at the bottom gear assembly shows the structure and connection with other gears.

Figure.2. Shape of Bottom Gear Assembly

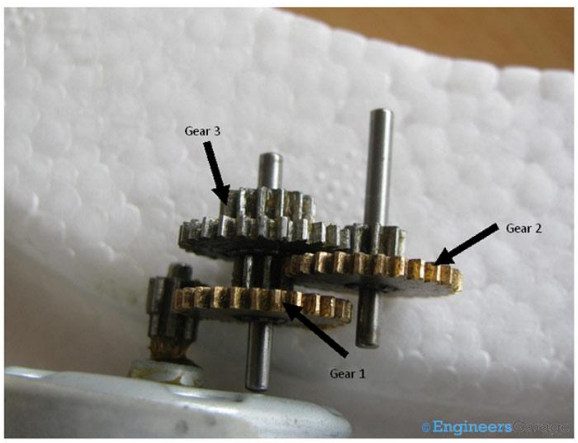

Figure.3.Parts of Bottom Gear Assembly

The gear assembly is set up on two metallic cylinders whose working can be called as similar to that of an axle. A total of three gears combines on these two cylinders to form the bottom gear assembly out of which two gears share the same axle while one gear comes in between them and takes a separate axle.

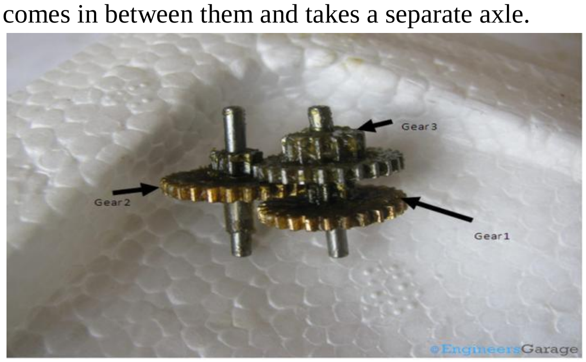

Figure.4Indicating the Types of Gears

The gears are basically in form of a small sprocket but since they are not connected by a chain, they can be termed as duplex gears in terms of a second cog arrangement co axially over the base. Among the three gears, two are exactly same while the third one is bigger in terms of the number of teeth at the upper layer of the duplex gear. The third gear is connected to the gear at the upper portion of the gear head. The manner in which they are located near the upper part of the gear head can be seen through the image shown below.

The major issue behind the mass use of electric vehicles is the battery charging time and lack of charging stations. So here we propose a regenerative breaking system. This system allows a vehicle to generate energy each time brakes are applied. The stronger the brakes, the more power is generated. We use friction lining arrangement in a brake drum. As a drum rotates the friction lining does not tough the drum as soon as brakes are applied, the friction lining touches the drum from inside and moves the motors connected to lining in same direction, thus generating electricity using motors as dynamo. Thus, this system allows for charging car battery each time brakes are applied, thus providing a regenerative braking system. It moves us another step ahead towards a pollution free transportation system.

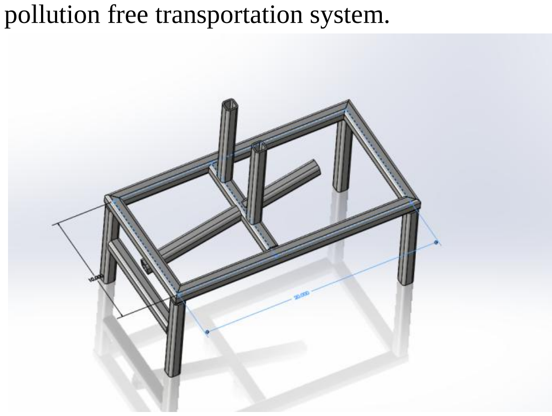

Figure.5.Design of frame using solid works

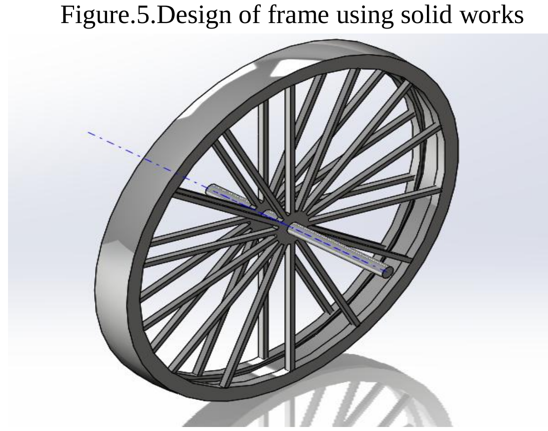

Figure.6.Design of fly wheel using solid works

Figure 7. Frame cutting pipes

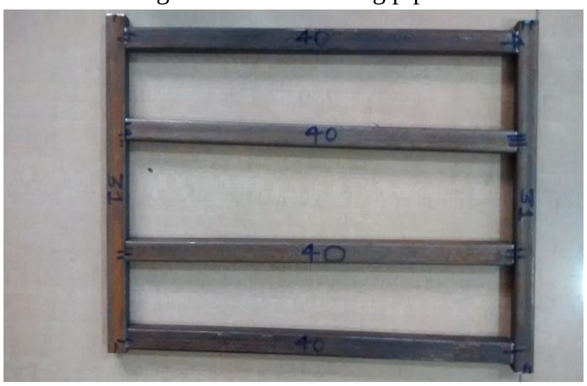

Figure 8.welding frame

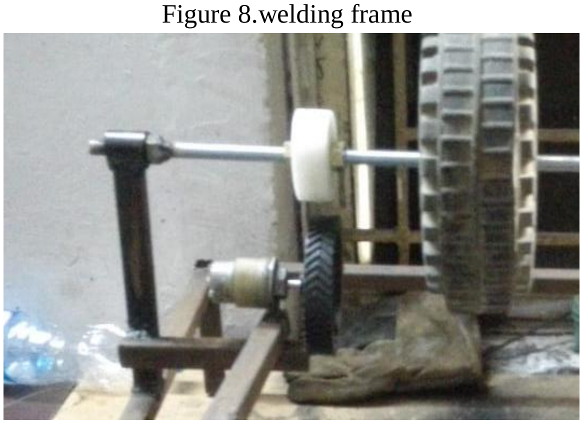

Figure 9.Drive wheel motor

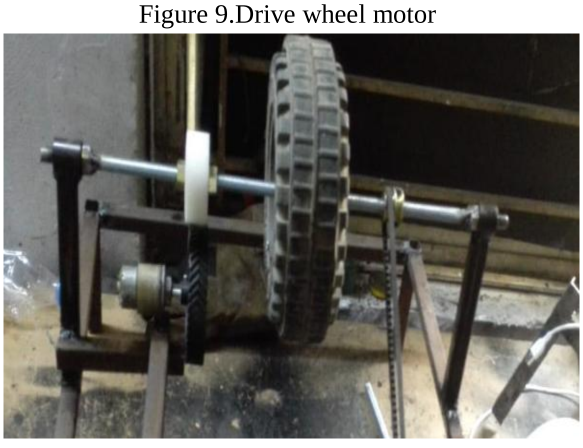

Figure 10.Working Model

Flywheel we found difficulty in testing this setup in an automobile, So that we made a separate setup consists of flywheel and an alternator coupled to it.The flywheel is designed to store certain energy and the experiment is done based on how much input current should beGiven to nullify the energy to stop the flywheel. The results were theoretically compared with other application of automobile

Energy stored in a flywheel

Weight of the flywheel = 5kg

Velocity of rotation = ΠDN/60

Speed of rotation =60 RPM

Diameter of flywheel =20cm =0.2m

Energy stored = mv2 /2 =10x 11.5132 /2 = 0.662 KJ

III. CONCLUSION

Regenerative braking is a small yet significant step toward our eventual independence from fossil fuels. These kinds of brakes allow batteries to be used for more extended periods without being plugged into an external charger. These types of brakes also extend the driving range of fully electric vehicles. This technology has already helped bring us cars like the Tesla Roadster, which runs entirely on battery power. Sure, these cars may use fossil fuels at the recharging stage, that is, if the source of the electricity comes from a fossil fuel such as coal, but when they're out there on the road, they can operate with no use of fossil fuels at all, and that's a big step forward. When you think about the energy losses incurred by battery-electric hybrid systems, it seems plausible that efficient flywheel hybrids would soon become the norm. But of course, it's not entirely so black and white, and further analysis shows that a combination of battery-electric and flywheel energy storage is probably the ideal solution for hybrid vehicles. As designers and engineers perfect regenerative braking systems, they will become more and more common. All vehicles in motion can benefit from utilizing regeneration to recapture energy that would otherwise be lost.

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