Regenerative Smart Solar Vehicle

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Abstract—**This project is all about regeneration. In this project current is produced by the phenomenon of braking torque. During the regeneration reverse current is produced which is transferred to battery for recharging it. As the current produced by regeneration is insufficient to charge the battery, additional solar panel is installed at the roof of the vehicle so that 2 sources of current will charge the battery. In this the battery will recharge at faster rate so as to run for more than 3-4 hours depending on the solar panel. This is a cyclic process where first battery is used to run the vehicle and then the moving vehicle will produce current (additional solar panel) which will lead to recharging of battery.**

Keywords—*regeneration, battery, solar panel, recharching.*

I. INTRODUCTION

Electric vehicles are the huge achievement for human beings in the 21st century. Due to the global warming problem and depleting natural resources like petrol and diesel, the enforcement for production of electric vehicle is increasing by the Government. Electric vehicles are also called as green vehicles. The emission from these electric vehicles is zero, no toxic gases are released that cause depletion of ozone layer which ultimately leads to global warming.

Every possible step is being taken to save earth from air pollution. Development of the electric vehicles is one of them, but mileage is the biggest limitation in the use of electric vehicles. It is the main obstacle in the development of electric vehicles.

Interest in green vehicles has grown in recent times due to their pollution free characteristics. The global dependence on fossil fuels is increasing day by day, predominantly in the automobile sector. One type of green vehicle which is very popular is the solar powered vehicle. Solar cars have the solar energy tapped using rows of solar panel, charging batteries and used to power the electric motor of the vehicle. Electromagnetic energy from the sun comes to earth by radiation. The power flux reaching the top of the Earth' s atmosphere is about 1400 Watt/m2. Approximately 30% is reflected back to space while the rest is absorbed by the clouds, oceans and land masses. This amount of energy is very much to utilize for useful work

If we use electric motors in reverse manner, it produces electrical energy. In this project we are using this technique to charge the battery. The main source for running the vehicle is the battery. The battery helps to run the main motor which ultimately runs the vehicle. The brushless motors are attached to the wheels with the help of chain and sprocket. The wheel helps to rotate the electric motors in reverse manner, which causes electricity generation. This is the concept of regeneration. This electric current goes to the battery to charge the battery. We are using solar panel also. The solar panel is also used to recharge the battery. A charge controller is used to connect the electric motor and solar panel to the battery. The charge controller send suitable amount of electrical current to the battery.

II. EXPERIMENTATION/FABRICATION

A. Problem Defination

- The global warming is increasing day by day because of emissions of IC engine vehicles; it also causes various skin diseases and also respiratory diseases. The solar vehicles are the need of future to reduce this kind of problems.
- The project is aiming to design and build an automobile that runs on electrical batteries while partially on solar energy and electricity generated by wheels which will be the secondary source of power.
- The aim of this project is to build and design a vehicle which runs on battery charged by solar energy and the electricity generated by the wheels which is the secondary source of power.
- In terms of battery, the battery can be charged using the secondary source of power. We are designing and creating a cleaner source of transport than an ICE dependent vehicle.

B. Objectives

- To design and manufacture a cleaner and economical vehicle with minimized dependency on fossil fuel and produce zero emission.
- Maximize generation and minimize power consumption.
- Explain and demonstrate a fully functional prototype.

C. *Working Principle*

- The battery is completely charged initially.
- As the current flows from battery it drives the main driving motor.
- The main driving motor accelerates the wheels which result in the forward movement of vehicle.
- Due to forward movement it rotates the small motors attached on wheels through chain sprocket system.
- Breaking torque is produced which help in the generation of current with the help of small motors.
- The generator current is transferred to the battery to recharge it.
- Also the solar panel charges the battery as a secondary charging source with the regulation of charge controller.
- All the regenerative current is transferred to battery (that is from wheels/motors and solar panel) through connecting wires.

D. *TABLE:TABLE OF COMPONENTS*

Sr. no	**Components**	**Specifications**	**Quantity**
1	Battery	36aH	2
2	Motor	24V 500W	1
3	Solar panel	2*40W	2
4	Motor	24V 120W	4
5	Charge controller		1
6	Wheels	D = 20mm	4
7	Speed controller and throttle	24V 500W	1

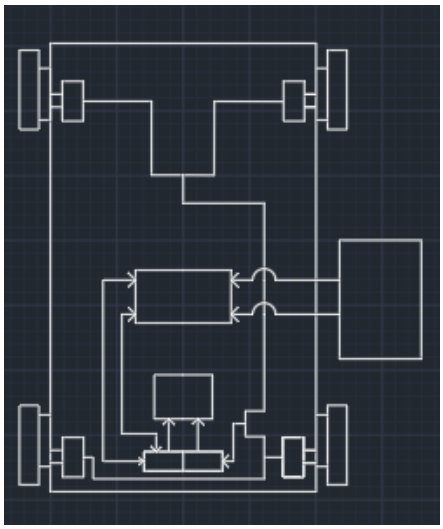

Fig:-working setup

Fig:-working model

E. *Specifications Of Components.*

Motors:

1. 24V 500W
   - 2600 rpm
   - Powerful 4 brush permanent magnet electric motor with 100% ball bearing
   - 15 tooth freewheel sprocket
   - Dimensions: 4”(h)*4”(w)*5-1/4”(l) including shaft
   - Weight: 2.76 kg
   - This motor runs the vehicle
   - This motor is used to run the vehicle. It is directly connected to the batteries. This motor is attached to the rear wheels of the vehicle only which run the vehicle.
2. 24V 120W
   - 2500rpm

- Powerful 2 brush permanent magnet design with ball bearing
- 9 tooth sprocket
- Shaft rotation reversible by reversing power leads
- Dimensions: 2-5/8" wide * 3-7/8" long excluding shaft, 4-7/8" long including shaft
- Weight: 1.45 kg
- There are four 24V 120W motors used in this project, each one attached to each wheel. These motors carry out the function of regeneration. These 4 motors are connected to charge controller. This charge controller further supplies the generated current to the batteries.

3.Battery

- Voltage: 12v
- Weight: 11.5 kg
- 36 ah= 36*12=432w
- Dimensions: 210*175*175 mm
- Battery type: automotive battery
- Resistant to shock, heat and dust
- We are using 2 batteries which are connected in series. This is the main power source of vehicle. We can charge the batteries by regeneration, solar panel and by external charging.

4. Charge Controller

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- Charge controller is most important part in the electric circuit. 3 of 4 ports of charge controller are connected to different components. One port is connected to small motors, second port is to solar panel and the third port is connected to the battery. Charge controller collects electricity generated by regeneration and solar energy and sends suitable amount of electricity to battery. It acts as a bridge between generating system and battery.

5. Solar Panel

- Rated peak power: 40W
- Rated voltage: 18.02 V
- Short Circuit current: 2.36 A
- Dimensions: 450*600*40mm
- Two solar panels are used for this project. The electricity produced from these solar panels is given to charge controller and further it is supplied to battery.

6. Speed Controller and Throttle Grip

- 24V 500W motor brushed controller
- Dimensions: 80*65 mm
- Handlebar: Dimensions: 100*20 mm Twist throttle accelerator.
- Speed controller is used to vary the speed of the motor according to actuation of the throttle.

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