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Solar Based Tricycle For Differently Abled

Suman gour[1], Shrutika sonune[2], Samruddhi pahade[3]
Shreyas joshi[4] V.vignesh[5] Sajan singh[6] Prerna nagdeote[7]

Dept. of Electrical Engineering, Priyadarshini College of Engineering, Nagpur, -440010

Abstract*- Solar energy is one of the best alternatives for fossil fuels for the purpose of energy generation. They are renewable and inexhaustible unlike the conventional energy sources. The main advantage of using non-conventional energy sources is that they do not create any byproduct in the process of energy generation .Solar plays an important role in all of the sectors. This project is about a solar based tricycle for differently abled. In this paper it is discussed that how the solar based tricycle will help these kind of people in reducing their efforts. It is one of the best inventions of the modern era as not only it has helped the specially challenged but also the elderly. This project is designed to reduce the dependency of these kinds of people on normal people. One of the aims of this is to help them being mobile and also provide the necessary comfort that they deserve. The main component of this project is solar panel, battery, dc servomotor, accelerator, control kit.*

Keywords: - solar panel, battery, dc servomotor, accelerator, control kit.

I-INTRODUCTION

Physical conditions of different individuals are different. Some are while some are not. Due to some mishap or misfortune they become specially challenged and face much discomfort in their lives. Considering the fact that there are a huge number of such specially challenged people, this tricycle is designed and structured in such a way that it focuses on the goal of being a useful tool to these kinds of people. Electric vehicles like these use electric power instead of fossil fuels, electric motors instead of internal combustion engines thus proving to be a big asset in maintaining the balance in nature. Solar driven vehicles use photovoltaic cells in order to convert the solar energy into electrical energy. The electricity goes to the motor that drives the vehicle or in some cases it is fed to a battery for storage purpose. The reason being that battery acts as an energy source when the sunlight is not sufficient. In these kind of vehicles, a loop type system is implemented, enabling the cycle to recharge partially, thus extending the cycle's limit and performance.

II-HARDWARE IMPLEMENTATION

A} COMPONENT DETAILS

1) SOLAR PANEL

Solar panel is an interconnected assembly of tiny cells known as photovoltaic cells. These photovoltaic cells convert the solar radiations falling on them to electrical energy. The reason being is the presence of silicon. Silicon is the most crucial ingredient of the solar panels. It is responsible for converting the solar energy to electrical energy. Being a semiconductor it has a very special feature that most of the semiconductor posses that its performance improves with increase in impurities. Therefore the performance of the complete solar panel can be improved by increasing the amount of doping. Solar panels are used in residential sectors, commercial sectors. In some cases they are used to generate electricity. In some, they are used for heating purposes etc and much more.

2) BATTERY

Battery in most simple words is an electrochemical cell. It converts chemical energy to electrical energy. Batteries are very widely used in all the sectors. They are mainly of two types: - primary and secondary. Primary batteries are non-chargeable types of batteries as the chemical reactions in them are irreversible. On the other hand secondary batteries are chargeable batteries because of the fact that the chemical reactions taking place in them can be reversed. This is one of the reasons that secondary batteries have wide range of applications, one being in solar driven vehicles. On the present market the lead-acid battery is the most favorable and most viable battery that is used in energy conversion.

3) DC SERVOMOTOR

A DC servomotor is actually an assembly of four separate components, namely: - DC motor, gear assembly, position-sensing device, control circuit. The motors that are utilized as DC servomotors generally have separate DC source for field winding and armature winding. Control over the DC servomotor can be achieved either by field current control or armature current control. The type of control is decided depending upon its specific applications. For high voltage power systems, DC servomotors are preferred because they operate more efficiently than comparable AC servomotors.

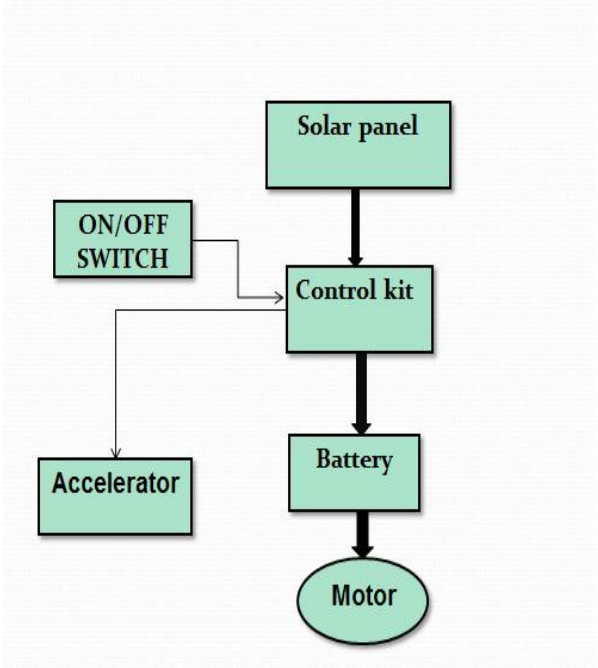
4) CONTROL KIT

Control kit is the connection hub in most of system .in more simple words it is a junction where all the connections of the system meets in electrically driver vehicles. All the connections from solar panels, electric motors batteries etc. either start or end of the control kit. Control kit comprises of general process input output controller or micro controller that performs all the action for it. All the signals from the throttle, solar panel are given to the control kit and it performs according to them. In addition to all of these the control kit also consist of low voltage cut off sensors, over-voltage cut off sensors, over-temperature cut off sensors, over-current cut off sensors, relay drivers and much more

5) ACCELERATOR

The accelerator is also known by the name of throttle. The throttle mode is similar to a typical motorcycle or scooter type. It provides the necessary acceleration to the vehicle. When throttle is engaged the motor provides power and propels the bike forward. A throttle allows pedaling or just kicking back and enjoying a free ride. Most throttles can be fine tuned like a volume dial between low and full power.

B}BLOCK DIAGRAM



C} WORKING

Our tricycle is based on energy generation by renewable sources and hence the main fuel that is going to drive the tricycle is the solar radiations coming from the sun.

The radiations will fall upon the the solar panels which are installed on a roof type of structure on above the person's head. As soon as the radiations fall on it it will convert it into electrical energy.

This electricity generated will get transferred to the control kit which is installed on a welded part above the rear wheel. At first the unstable supply that we'll get will get converted into a steady and stable supply of 24 Volts. And then it will get fed to the battery. Control kit also consists of some sensors such as over-temperature sensor, over-current sensor etc. all for protection purposeThe steady and stable supply that is being supplied to the battery through the control kit will charge the battery. As the battery (batteries) gets charged it will provide necessary and required current to the motor.As the motor gets its current from the battery it will act as a prime mover and will drive the chain that is attached to it and the rear wheel. Basically the chain acts as a link between the chain and the wheels.

As the rear wheel start to rotate it will ultimately force the front wheel to move forward and the cycle will move.Accelerator is used to provide the necessary acceleration to the tricycle. Along with it a simple braking mechanism is also provided which will provide the necessary retardation.

On the periphery of the control kit some additional connections vacant places are also provided. They can be used to install other extra accessories such as headlight, taillight, indicators, electric horn, etc .

A manually driven peddle is also provided on the tricycle. It is connected to the other rear wheel of the tricycle. The reason behind placing it on the cycle is that if due to some unfortunate circumstances if the tricycle is not able to operate electrically then this pedal can be used for the purpose of transportation. In simpler words the role of the pedal is to serve as a backup in case the primary system fails

D} COMPONENT RATINGS

SR NO	COMPONENT NAME	RATING
1)	Solar Panel	24V 80W
2)	Batteries	24V (12 volt each)
3)	Control kit	24V
4)	DC servomotor	24V, 250W, 300 rpm, 25 kmph.

E} SAMPLE CALCULATIONS

1) Motor

Total weight of our Tricycle (Person included) = 110 KG

Assuming Gradient slope = 3%= 0.03

Diameter of Front and Rear Wheels =44.2 CM

Maximum Speed of our Tricycle =DxRPMx0.001885

=44.2x300x0.001885

=25km/h

Therefore, Power will be

=110x9.81x25x(5/18)x0.03

= 224.81W

Therefore, a motor of 250W, 24V is sufficient.

P=2πNT/60

Load Torque T=Px60/2πN

=250x60/2πx300

=7.95 N/m

2) Battery

System voltage =24V

Load current =250W/24v=10.41A

Estimated time of tricycle running per day= 1hour

Load current =1.5x10.41x1.2=18.73Ah/day

Assume 20% overall losses

Size of battery =18.73x1.2=22.4Ah

Energy required for 250w motor=22.4x24=537.6Wh/day

Therefore 28Ah/day, 24V power is sufficient for the system which can be supplied with the help of two 12V batteries of 14Ah/day each

III- ADVANTAGES

1) Solar driven vehicles do not create any pollution, this makes solar more practical and environment friendly then fuel.

2) It reduces the effort of specially challenged people.

3) It is comparatively cheaper than other motor vehicles.

4) It has low maintenance as compare to other fuel driven vehicles.

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