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MODIFICATION OF SOLAR HYBRID TRICYCLE FOR *DIVYANG* PEOPLE BY USING ELECTRONICS SYSTEM

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Abstract - *Now a day's solar energy play vital role in our day to day life. This paper deals about the solar hybrid tricycle which is a mobility-aided device for person with physical disabilities as well as Senior citizen. A normal tricycle need paddle to move, a motorized tricycle that uses fuel as its prime power and an electric tricycle that can only be sufficient for an hour, because of this limitation in existing system the proposed model is possible alternative. There is a scope that this tricycle may be also used by common people due to recently increasing fuel prices. This paper will discuss about solar panel to absorb solar radiations to generate power which is stored in the battery. Stored energy in the battery is used to drive the motor. The battery can also be charged by using generator power which can be generated by mechanically when tricycle is in running condition. In this paper also study microcontroller will be programmed such that it will provide the facilities like protection and obstacles detection system, antitheft system, emergency alert for user.*

Key Words: *Battery, Dynamo, DC Motor, GSM, Microcontroller, Motor-controller, Tricycle*

1. INTRODUCTION

Today in these current times, this fast moving world is definitely to meet dangers like scarcity of fuel, problem of reducing pollution in atmosphere, and the rapidly increasing use of fuel like petrol, diesel, and coal because of this problem people are phasing economical problems. So to overcome all these problems it has been planned to utilized maximum amount of solar energy and decided to design and manufacturing of solar tricycle. The Solar Hybrid Tricycle project is presented as a mobility technology that retains many of the benefits of automobiles while having many of the economical and personal benefits of bicycles. This paper begins with a brief review of existing mobility options of a similar nature, comparing their strengths and weaknesses with those of the ST vehicle. While the vehicle is likely to find application in developing countries such as India, China, where many handicap people is presented, so such projects are very helpful those people. A solar tricycle can provide a non-polluting and a very silent transport system.

2. OBJECTIVES

As the core technology to propel the tricycle is not enough and some modifications for reliable, accurate and safety measure we implemented various technologies to develop the tricycle and also provide better facility to the raider. In that case, these are the list of the objective to be conduct before continue to proceed on this project:

- To develop a vehicle that use renewable energy.
- To develop eco-friendly and cheap tricycle.
- To develop an electrical tricycle that can charge the battery.
- To develop low speed tricycle, but for a longer distance.
- To provide the protection to raider from accident.

3. Literature Review And Theory

3.1 Introduction

In order to perform this project, literature review has been made from various sources like journal, books, article and others. This chapter includes all important studies which have been done previously by other research work. It is importance to do the literature review before doing the project because we can implement if there are information that related to this project. The most important thing before starting the project we must clearly understand about the topic that we want to do. So by doing the literature review we can gain knowledge to make sure we fully understand and can complete the project. A review of the article was performed to identify studies that relevant to the

topic. The search to find material that related to the topic is categories as solar panel, solar charger, battery, motor, electric tricycle and speed control.

3.2 Literature review

a) Solar panel

Fig.3.2 (a): Solar Panel

A photovoltaic module or photovoltaic panel is a packaged interconnected assembly of photovoltaic cells, also known as solar cells. The photovoltaic module, known more commonly as the solar panel, is then used as a component in a larger photovoltaic system to offer electricity for commercial and residential applications. The primary difficulty with solar power and indeed with its cousin wind power has been one of efficiency. There is more than enough energy hitting the earth in the form of solar radiation to meet power needs of our species. Estimates indicate that there is four times as much wind energy available for our use as the species uses every year. Solar power is even more dramatic, the sun showers the planet with more energy every day than we use in a year. So the difficulty has never been the availability of sun and wind, they are readily available.

b) Solar charge controller

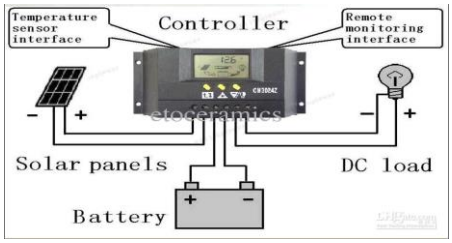

Fig.3.2 (b): Solar Charge Controller

Solar battery chargers are an inexpensive, environmentally friendly, and convenient way to make sure your batteries are always fully charged and ready to go all the time. The problem with charging a battery from a solar panel is the Sun. It does not shine all the time and clouds get in the way. Our eyes adjust to the variations in the strength of the sun but a solar panel behaves differently. As soon as the sun loses its intensity, the output from a solar panel drops enormously. Not only does the output current fall, but the output voltage also decreases. Many of the solar panels drop to below the 13.6v needed to charge a 12v battery and as soon as this occurs, the charging current drops to ZERO. This means they become useless as soon as the brightness of the sun goes away.

c) Battery

Fig.3.2 (c): Lead Acid Battery

In the current market, lead-acid is the only avilable battery technology for electric vehicle conversion. The following is a list of criteria to use in selecting an electric vehicle battery.

- **Voltage.** Batteries are available in both 6V and 12V units. Most standard, wet-cell, golf cart batteries are 6V units. Most sealed batteries are 12V units.
- **Amp-hour rating.** The capacity of a battery is rated in amp-hours. This rating must be specified with a given discharge rate.
- **Discharge rate.** The discharge rate of a battery is the minimum length of time during which the battery must be discharged in order to meet the specified amp hour rating.
- **Watt-hour rating.** The watt-hour rating is a true indication of the energy Capacity of a battery, like the amp hour rating, this rating must be specified with a discharge rate. The watt-hour rating of a battery is the amp-hour rating multiplied by the specified voltage of the battery.

d) Dynamo

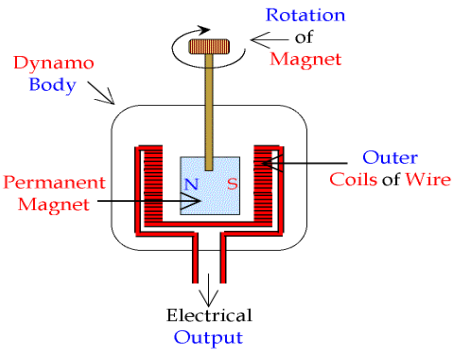

Fig.3.2 (d): Bicycle Dynamo

Bicycle Dynamos are alternators equipped with permanent magnets, which produce ac current. Two types of dynamos available are the hub dynamo and the bottle dynamo. Hub dynamo is built into the hub of a bicycle wheel. Here generation of electricity is done by using the rotation of

the bicycle wheel. A bottle dynamo is also small electric generator like hub dynamo. It is generally placed to the rear wheel of the bicycle. A bottle dynamo acts like a small alternator.

e) GSM

Fig.3.2 (d): GSM Module

GSM (Global System for Mobile communication) is a digital mobile telephone system that is widely used in Europe and other parts of the world. GSM uses a variation of time division multiple access (TDMA) and is the most widely used of the three digital wireless telephone technologies (TDMA, GSM, and CDMA). GSM digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. It operates at either the 900 MHz or 1800 MHz frequency band. GSM is the de facto wireless telephone standard in Europe. GSM has over 1 billion users worldwide and is available in 120 countries, according to the GSM MoU Association. Since many GSM network operators have roaming agreements with foreign operators, users can often continue to use their mobile phones when they travel to other countries.

e) Description Of Microcontroller

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8 Kbytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density non volatile memory technology and is compatible with the industry-standard 80C51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional non volatile memory programmer. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications. The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes.

The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM contents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset. Microcontroller is the heart of our circuit. It acts as an interface between GPS and GSM. In this project we have to use AT mega16 microcontroller. The ATmega16 is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in single clock cycle, the ATmega16 achieves throughputs approaching 1 MIPS per MHz allowing the system designed to optimize power consumption versus processing speed

4. Design and Description

The title of the project may be lead, because it going to be easy fabricating a full solar tricycle. It is not only difficult to design but also very costly. So it is better to do this as a project which includes lots of study and then a demonstration of how the solar energy can be converted and stored in batteries and then how it can be used to run the vehicle. May be with the staffs permission you may be able to use your college's water heater solar panel if there is any. The project includes lots of calculations on how much energy can be stored and how much time it takes too charged.

4.1 Solar Panel:

Fig.4.1: Solar Panel

24V, 7amp, two PV solar panel has been used. This two PV panel placed on framed provided on top of the solar tricycle which are connected by parallel connection.

4.2 Solar battery:

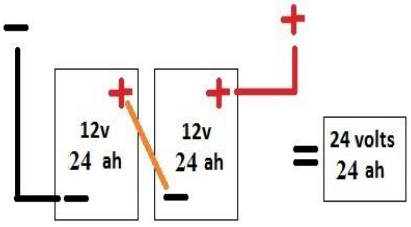

Fig.4.2: Series connection of battery

Solar Battery A solar battery converts the sun's energy to electricity. In 1954, Gerald Pearson, Calvin Fuller and Daryl Chapin invented the first solar battery. 12 V, 24 amp and 12 V, 24 amp Lead acid batteries has been selected. These two batteries connected by series connection. It can easily run 2650 rpm, 24 V, D.C motor. It is fully charge within 2 hrs using two PV panel.

4.3 D.C Motor:

Fig.4.3: PMDC motor

Specification of D.C Motor:
Power capacity = 2.5 Kw
Motor R.P.M = 2650 rpm
Volt = 24

Above mention Specified motor has been used to run the solar tricycle with 16 km / hrs.

4.4 Throttle

The maximum speed of a tricycle is 16 kmph. It is required to vary the speed depending upon the road conditions & traffic. Therefore an accelerator or a throttle is necessary. Throttle allows us to drive the motor from zero speed to full speed. The throttle is fitted on right side of the handle bar and is connected to controller. The throttle converts DC voltage from battery to an alternating voltage with variable amplitude and frequency that drives the hub motor at different speeds.

5. Construction and Working

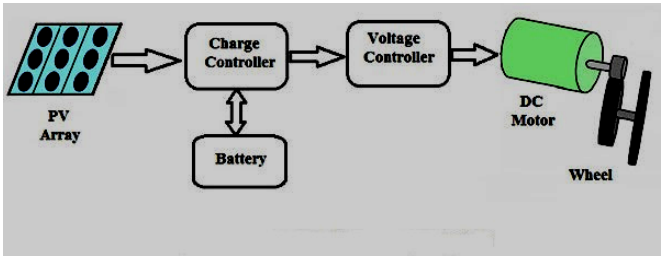

Fig.5.1: Block Diagram for solar tricycle system

PV Solar panel is placed on the frame providing on tricycle. This PV solar panel is connected with 12 V, 24amp and 12 V 24 amp lead acid batteries. These batteries connected in a series connection to operate 24 V 2650 rpm D.C motor. So sun rays are incident on the solar panel D.C current will produced which will charge the battery. By using accelerator the current will be transferred and varied from battery to motor. Countershaft placed between motor and wheel of tricycle. This shaft reduced speed also increased torque. So the solar tricycle can resist 120 to 150 kg weight easily. At the initial starting of tricycle it consumes 13.7 amps and in its running phase it consumes 4.3 amps, which is fulfilled by the battery. Battery when full charge works for round about 4.15 hours. The tricycle runs at speed of 18 km/ph. So even after the sunset it can run up to 55 km. By using throttle the speed tricycle can be increased or decreased.

6. Electronics system

6.1 Automatic Breaking System

Vehicle technology has increased rapidly in recent years, particularly in relation to braking systems and sensing systems. ASS (active safety systems) are being researched and developed to prevent accidents and target mitigation. Among many useful active safety systems, it has been reported that AEBS (Advanced Emergency Braking Systems) effectively prevents accidents and reduces casualties simultaneously. The system aims to distinguish between systems currently in production like traction control (TC), electronic brake force distribution (EBD), brake assist (BA) and electronic stability control (ESC) functions and future systems that are currently in development. This system aims to develop a prototype system that offers a collision functionality in production vehicle, a system which can operate automatically with the help of high profile sensors based relay circuit and some modification in traditional braking system that can alert the driver in front collision and apply the brake automatically in emergency or critical situation.

6.2 Anti-Theft System

The main motto of the system is to use the wireless technology effectively for the automotive environments by using the GSM Modem used in sending sms in case of theft situation. The main aim of this system is to protect the tricycle from theft. This can be done whenever a person trying to steal the tricycle, at that time sends an interrupt to a programmable microcontroller of 8051 family that stores owner's number upon a miss call for the first time. When someone tries to steal the tricycle then microcontroller gets an interrupt and orders GSM Modem to send the sms, the owner receives a SMS that his tricycle is being stolen.

7. RESULT

The initial torque required to start the movement of tricycle is higher because the torque required by motor to cut the flux and generate power is high. But once the tricycle is in motion the torque is reduce and speed is increase.
POWER = 2.5 KW
Load on tricycle = 120 kg
No load speed of d c motor = 2650 rpm
Speed of motor under loading condition = 883.33 rpm
Speed at counter shaft under loading condition = 346.04 rpm

Speed at wheel of solar tricycle under loading condition = 130.25 rpm
Diameter of the front wheel = 23 inches
Diameter of the back wheel = 26 inches
Calculation: V = w * r
V= 2πnwd/60 =2*π*130.25*d/60
Finished solar tricycle
V = 13.04*0.3546 = 4.62 m/s.
V = 4.62*3600/1000= 16.64 km/hr
V ≈ 16 km/hr. solar tricycle developed can run up to 16km/hr.

8. CONCLUSIONS

From the Current work following points are concluded:

i) The convenient use of solar energy save money for fuel and due to its clean nature avoids pollution.
ii) The designed of this tricycle is very much reliable for the handicapped person which is also can operate by one hand.
iii) The max speed of tricycle is 16 km/hour in loading condition.
iv) It can smoothly accommodate the weight up to 150 kg.

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