

Design and Implementation of Solar Based Electric Wheelchair

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Abstract: *This paper concentration on the reducing expenditure for the mechanically setup & designation of a solar based electric wheelchair with solid structure design and control system for the handicapped persons. In a country like India, most of the people distressed of temporary or permanent disabilities due to illnesses or accidents there are some person can't afford to be expensive electric wheelchair. That's why a developed of electric wheel chair is proposed in this paper which contains more features and a developed control system along with the reduced of manufacturing price & design about two to three times of recent market cost.*

Keywords: Wheelchair Motor, Solar Powered, Disability, DPDT Switches

I. INTRODUCTION

Now a days, pollution is the common issue in the universe. Also the cost of fuel is increasing. Physical disability is one of the disabilities which requires more time for its healing. Probably months or even years and sometimes the disability is permanent, So there is a huge question on the movement of these disabled people, Because for the day to day work of a human it requires movement from one place to another due to the lack of ability to move this disabled people unwillingly need the help of a wheelchair, But the manual wheelchair is so constructed that it is dragged by the other person apart from the disabled people, This lead to the requirement of the person for the movement of the disabled person in Manual wheelchair. This demerits can be eliminated by introducing automatic wheelchair. As the horizontal of automation is increasing day by day the whole world is moving towards by using switches eliminated by introducing a sustainable source of energy for supplying power, that is Solar energy. Solar energy is one of the major source of energy which is present in abundance and free of cost. Our project "Design & Implementation of Solar Based Electric Wheelchair" is based on the Automatic wheelchair which is driven by the DC motors and it gets the power generated by the Solar Panel. The Automation involves the movement of the wheelchair forward, backward, right, and left with the help of switches which is connected to the Wheelchair works on the 24 volt DC supply to the motors through the circuit. This paper gives an idea about the construction, working and component used in the Automatic Wheelchair and supplying energy to this Wheelchair through solar energy (solar panel) which ultimately reduces fuel cost and creates the whole wheelchair eco-friendly.

II. WORKING

The "Solar based electric Wheelchair work on the power generated by the solar panel 40Watt/12V which gives approx. the same power is feed to the Lead-acid battery of 24 volt (two 12 volt battery are connected in series) Hour through charging. As we know that solar power is not constant in supply so it needed to be stored first for the constant supply to the DC motors. There is a allotment of a charge controller before the battery to limit the over-charge of the battery.

There is also a provision to charge the battery through rectified AC supply via charge controller in extreme weather condition when the sunlight is not enough to generate the power. In between battery and solar panel there is a control by solar charge controller.LED screen which can be show the percentage of battery motion.

The specification of DC motor is 24 VDC, torque generated is approx. 10kg/n and the speed is 60 RPM. LEFT motor and RIGHT motor and FORWARD and BACKWARD motion. We are using dc MCB for protected the overload current.

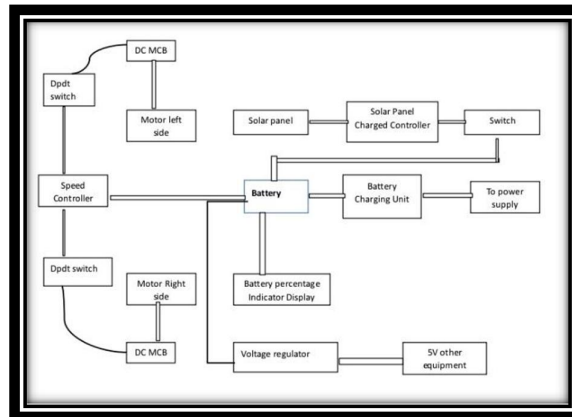


Figure: Block Diagram

II. COMPONENTS USED

2.1 DC Motor

The motor converts electrical energy into mechanical energy. The conversion is done through the generation of a magnetic field by means of current flowing into one or more coils. The DC motor is used to drive the wheels of the wheelchair. It is connected to the back wheels by couplings. The motor has a built-in gearbox which provides torque of 31.2 Nm.



2.2 Battery Charging Controller

It regulates current from the solar panel into the battery to prevent overcharging. The battery charging controller found to be suitable for this design was the Firststar solar charge controller 20 A because of its price and user ecofriendly. This device also has a slot where a cell phone charger cable can be connected to charge a phone.



2.3 Lead Acid Battery

The power needed to run the DC motor comes from the rechargeable battery. There are different types and sizes of rechargeable batteries. The battery stores the energy from the sun, which is controlled by the charging controller. This energy is then converted into electric energy to run the motor. The battery used in this design was the two battery 12 V 36 AH they are connected in series.



2.4 DC Operated MCB



The DC circuit breaker's thermal protection protects against an overload current that is slightly higher than the typical operating current. When strong fault currents are present, magnetic protection trips the DC breakers, and the response is always instantaneous.



2.5 DPDT Switches

We are used two DPDT switches for controlling the Wheelchair forward and reverse direction.



2.6 LED Display

We are used led display they can show the Percentage of battery.



2.7 Solar Panel

We have used 40W solar panel in our project the rating of panel is as;)

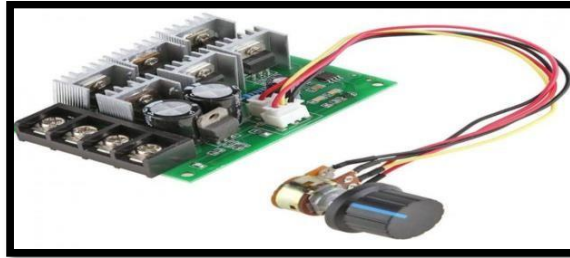
1. Maximum power voltage= 19.25 V
2. Maximum power current= 2.08 A
3. Short circuit current= 2.22 A
4. Open circuit voltage= 22.5 V



2.8 Motor Speed Controller

We are using Motor Speed Controller with Potentiometer. Maximum Power: 2000W. The speed of the DC motor can be controlled by adjusting the pulse width modulation (PWM). The knob realizes 0-100% adjustment, supports step-less speed regulation and facilitates positioning speed.

- Maximum Power: 2000W
- Operating Voltage: 9-55 VDC
- Operating Current: 0-40 A
- Control Frequency: 25KHZ



2.9 Others

We are use led flashlight & horn it also operate on switches. both are operate on 12 volt dc supply.

III. HARDWARE

We have successfully design and implemented solar based Electric wheelchair. We are using chain sprocket . 25 H, 11 tooth chain sprocket . the pulsar chain are used . the cycle freewheel can be installed mechanically .we are using magwheel for better result. the weight of wheelchair without battery and motor is 18 kg. After installed all components the wheelchair weight is 30 kg. The following pictures are the successfully project.



IV. CONCLUSION

This Wheel Chair is mechanically & Electrically controlled machine .they can be developed by the cost-saving, low maintenance & other features. This decrease the user's person troubles and force to drive the heavy chairs. Additionally it also provides an opportunity for actually or physically handicapped persons to shift from one place to another places. These devices are useful in transportation, medically from one place to another. The machines can also be used in homes for old & handicapped person. The devices serve as a boon for those who have lost their strength. Non identical types of electric wheelchair have been designed in the past but the new creation of wheelchairs are solar based being Designed and used which features the use of unnatural reasons and increasing confidence.

V. FUTURE SCOPE

The project can be improved. Solar battery chargers: solar panel deplete no fuel and give green environment wheelchair which will charge the different batteries like lead-acid, lithium ion batteries being used on the wheelchair. Stair climbing facility: The perception of the wheelchair can be build up by adding a providing to move up the climb on keeping the weight of the wheelchair and constrain of the tolerant in mind. And it can be more efficient in future

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