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A NOVEL DESIGN AND FABRICATION OF ROAD SWEEPER BY USING PHOTO-VOLTAIC SYSTEM

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Abstract: In our country, Governments are taking some actions towards the avoidance of accidents by placing dividers on the majorroads of the city. But there is a usage of heavy trucks and loaded vehicles are polluting the roads by dust which is not a major concern but one of the issues that the bikers are skidded by the dust-sand enclosed along the dividers. Multinational companies are concentrating on this with high cost of Sweepers with Diesel Engines but this proposed scheme would help to solve in the case of low cost of manufacturing and effective way of renewable energy resource. This Photovoltaic based sweeper come with solar powered vacuum cleaner with spiral sweepers, automated divider tracker and a loader bag thus this total system is operated only using the renewable energy resource. This would make the platform that all the corners of the roads are clean with less traffic accidents and economical to the municipalities to change over with this efficient system.

Keywords: PV-Photo Voltaic, PM-Particulate Matter.

1. INTRODUCTION

HISTORY OF SWEEPERS

The very first street sweeping machine was patented in 1849 by an inventor named C. S. Bishop. For along time, since street sweepers were made of rotating disks with the wire bristles.

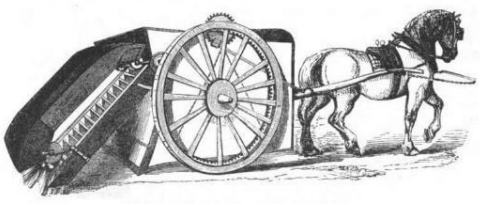

Figure 1 First Invented Sweeper

The Rotating disks served as the mechanical brooms that were swept the dirt on the streets. In the fall of 1913, the city of Boise, Idako, purchased the first Elgin Sweeper, the following a demonstration Boise Street Commissioner, Thomas Finegan made a comparison showing a saving of $ 2,716,77 from Elgin motorized sweeper when used rather than a horse drawn sweeper.

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Figure 2 Modern Sweeper

Never street sweepers are capable of collecting small particles of debris. Many street sweepers produced fromtoday are PM 10 and PM 2.5 certified. Thus, the meaning that they are capable of collecting and holding particulatematters sized less than that 10 micro meter and even down to 2.5 micro meter. Despite advancement in street sweeping technology, the mechanical broom type street sweeper's accounts for approximately 90 % of all street Sweepers used in the United States today.

NEED FOR SOLAR ENERGY

Earth has limited amount of energy resources which is very soon going to extinct. Fortunately, population models have suggested that the world's population will probably level out at about two to three times the present numbers over the next hundred years. As the population is increasing the demands of people is also increasing. Thequestion is whether the earth's resources are sufficient to sustain that population at a high standard of living for all. In this the key issue is energy.

Now-a-days, dealers of natural resources like fuel, coal etc. are facing a hard time to keep pace with the increasing demand. At one hand, there are more cars or motor vehicles are dominating the transport medium, on the other hand these cars are being dominated by the fuel. As a result, the limited resources are being quashed by the producers and dealers to satisfy this need which is leading us to an uncertain future with having the scarcity offuel and minerals. So, it is clear that present trends in energy consumption, especially oil, cannot be sustained much longer. Also, these are responsible for Global Warming, Environmental Imbalance, Ozone layer depletion etc. which in turn is a big threat to the future human race.

Again, in view of the possibility of global warming, these resources are playing a negative role. Therefore, under this circumstance, it is quite necessary to make a new exploration of natural resource of energy and power. But why exploration when the resource is in front of our bear eye. It is effective, less expensive and above all, it isan endless source of energy. With greatly improved energy efficiency, a transition to this energy-based economy capable of sustaining the anticipated growth in the world economy is possible. This effective source is- Solar Energy.

2. SYSTEM DESCRIPTION

2.1 EXISTING SYSTEM

The Road sweepers used now-a-days are made of large multinational companies with the high cost of local Municipal Responsible for the sanitary cannot afford the rate of cost to buy for the purpose of cleaning. They are operated at fossil fuel with the heavy usage of energy. The Existing system is of a vehicle which looks like a truck withthe storage and it to be operated manually using a Driver. And there will be huge level of Maintenance is required.

2.2 PROPOSED SYSTEM

A Solar Powered road sweeper for cleaning process along the dividers in the mid of road with minimal size and can work efficient on short time with high diligence . This will reduce the Risk Man-power on risk area of working as well as make Our City Smarter.

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DETAILED DESCRIPTION OF PROPOSED SYSTEM

2.3 COMPONENTS

2.3.1 SOLAR PHOTOVOLTAIC MODULE

A Solar PV module can be considered to be a big solar cell. That is array of many solar cells are connected in series and parallel with larger voltage and current generated by a solar module depends on its efficiency. The power generated per unit area is usually of 10mW/cm2to 25m W/cm2 which corresponds to 10% to 25% cell efficiency.

2.3.2 LITHIUM-ION BATTERY

The lithium-ion battery was introduced in the market in 1991, is the choice in most consumer electronics, having the best energy density and a very slow loss of charge when not in use. Such incidents are rare and according to experts, they can be minimized by "via appropriate design, installation, procedures and layers for safeguards" so the risk is acceptable.

2.3.3 CHARGING CIRCUIT

Solar chargers convert light energy into low voltage DC current. Although portable solar chargers obtain energy from the Sun only, they still can (depending on the technology) be used in low light (i.e., cloudy) applications. Portable solar chargers are often used for trickle charging, although some solar chargers (depending on the wattage), can completely recharge batteries. Other devices may exist, which combine this with other sources of energy for added recharging efficacy.

2.3.4 POWER CONVERTER

A DC-to-DC converter is used an electronic circuit or electromechanical device that converts a source of direct current (DC) from one voltage level to another. It is a type of electric power converter. Power levels range from very low (Lithium-ion Batteries) to very high (High voltage Operating Drives).

2.3.5 MOTOR DRIVES

The Motor Drivers are used for the system of which the Sweepers and Wheels are controlled by using the motor drives which are powered using Battery of Solar charged. The motors used in the proposed system is of various voltage specifications, but the battery is of 12V and 8 Ah specification. So that the power converter is used for the system to drive.

2.3.6 SWEEPING BRISTLES

There are two conventional sweepers are used in the system for the linear flow of sweeping on the road. And a Single arm provided sweeper used with the vacuum tube for the absorption of Dust around the Indicators present on the road.

3. SYSTEM MODEL & WORKING

The Drawbacks of the existing system is overcome through the system by which the use of alternative source of energy. Solar Photovoltaic panels are the important source for the system to be operated. The below block diagram shows the schematic representation of this proposed system.

The charging and discharging circuit are of related with the energy storage device Battery. Thus, the solar Photovoltaic panel exhibits as the energy source to perform the charging source of the battery. The Power converting system is used in the proposed system that the charge stored in the battery is used for the sweepers and wheels to rotate. They are controlled by using the arduino which are an In-build one to perform the drive system through the control signals.

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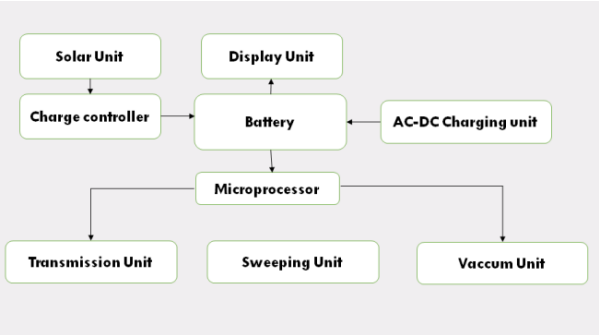

Figure 3 Block Diagram

CIRCUIT FLOW REPRESENTATION

Figure 4 Circuit flow representation

ADVANTAGES

Solution: The system is semi-automatically clean the sides of the dividers in the mid of the road along the moving vehicles with the supervisor.

Need: To reduce Man-Power in risk areas with Efficient solution on cleaning with roads.

Impact: Conventional forms of High Energy consuming sweepers will be replaced with the Renewable sources.

Control: Integration of Photo-voltaic leads to reduction of Green-House Effect and control the emission of CO2.

CONCLUSION

Our Photovoltaic Based road sweeper solves many problems related to the environment and is the best pollution free method. We need to make use of this proposed system so that we can reduce our dependence on fossil fuel. This Photo-voltaic based road sweeper will become the new era on cleaning the roads by local municipalities with low cost of Investment.

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