

GRASS CUTTING MACHINE USING SOLAR ENERGY

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ABSTRACT: This paper aims at fabricating a grass cutting machine which operates with the non-renewable energy. The solar energy from the sun is trapped in the Photovoltaic cell to generate electricity which runs the electric motor in the grass cutter. In this solar grass cutting machine sliding blades are used to cut the grasses in the lawn at an even length. Manual machines and other high cost sophisticated devices are used for cutting grasses in large lawns, grounds as of now. Since energy savings is essential, this proposed model comes into play and made some changes in the existing machine to make its application easier at reduced cost. The main objective in pollution control is attained through this. Unskilled operation can operate easily and maintain the lawn very fine and uniform surface look.

Keywords: Photovoltaic cell, solar grass cutting machine, solar energy

1. INTRODUCTION

Nowadays scarcity of fossil fuels induces the usage and necessity of alternate fuels. So researchers are busy in evaluating the sources, solar powered projects are given more importance; many fields are depended on solar energy now. The first grass cutter was invented by Edwin Budding in 1830, just outside Stroud, in Gloucestershire, England [5]. Budding's mower was designed primarily to cut the grass on sports grounds and extensive gardens, as a superior alternative to the scythe, and was granted a British patent on August 31, 1830. Budding's first machine was 19 inches (480 mm) wide with a frame made of wrought iron[4]. The mower was pushed from behind. Cast iron gear wheels transmitted power from the rear roller to the cutting cylinder, allowing the rear roller to drive the knives on the cutting cylinder; the ratio was 16:1. Another roller placed between the cutting cylinder and the main or land roller could be raised or lowered to alter the height of cut. The grass clippings were hurled forward into a tray-like box. It was soon realized, however, that an extra handle was needed in front to help pull the machine along. Overall, these machines were remarkably similar to modern mowers [6-8]. Moving the grass cutters with a standard motor powered grass cutter is an inconvenience, and no one takes pleasure in it. Cutting grass cannot be easily accomplished by elderly, younger, grass cutter moving with engine create noise pollution due to the loud engine, and local air pollution due to the combustion in the engine[3]. Also, a motor powered engine requires periodic maintenance such as changing the engine oil. Even though electric solar grass is environmentally friendly, they too can be an inconvenience. Along with motor powered grass cutter, electric grass cutters are also hazardous and cannot be easily used by all [1-2]. Also, if the electric grass cutter is corded, mowing could prove to be problematic

and dangerous. This paper aims at fabricating a grass cutting machine system which makes the grass cutter based motor running through solar energy. A Solar grass cutter is a machine that uses sliding blades to cut a lawn at an even length. Even more sophisticated devices are there in every field power consumption becomes essential for future. Solar grass cutter is a very useful device which is very simple in construction. It is used to maintain and upkeep lawns in gardens, schools, colleges etc. and have made some changes in the existing machine to make its application easier at reduced cost. The main aim in pollution control is attained through this. Unskilled operation can operate easily and maintain the lawn very fine and uniform surface look. This paper has been arranged as follows. After the introduction in section I, Section II gives an introduction about photovoltaic system. Proposed method is presented in Section III. Conclusion and final remarks are made in Section IV.

2. PHOTO VOLTAIC SYSTEM

A Photovoltaic (PV) system directly converts sunlight into electricity. The basic device of PV system is the PV cell. Cells may be grouped to form panels or arrays. The voltage and current available at the terminals of a PV device may directly feed small loads such as lighting systems and DC motors. A photovoltaic cell is basically a semiconductor diode whose $p-n$ junction is exposed to light. Photovoltaic cells are made of several types of semiconductors using different manufacturing processes. The incidence of light on the cell generates charge carriers that originate an electric current if the cell is short circuited.

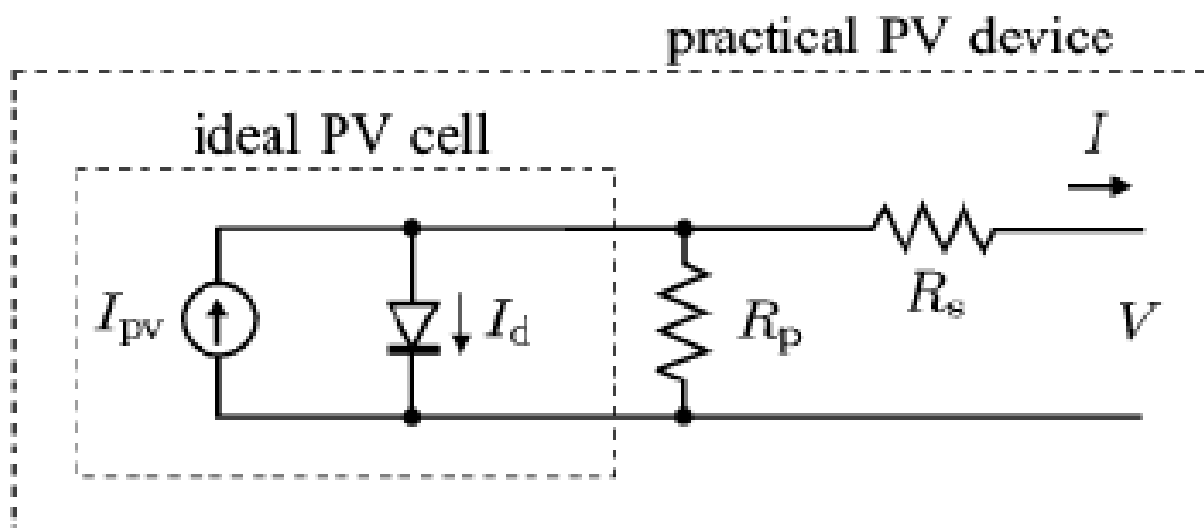


Fig.1. Equivalent Circuit of a PV Device

The equivalent circuit of PV cell is shown in figure 1. In the above diagram the PV cell is represented by a current source in parallel with diode. R_s and R_p represent series and parallel resistance respectively. The output current and voltage from PV cell are represented by I and V .

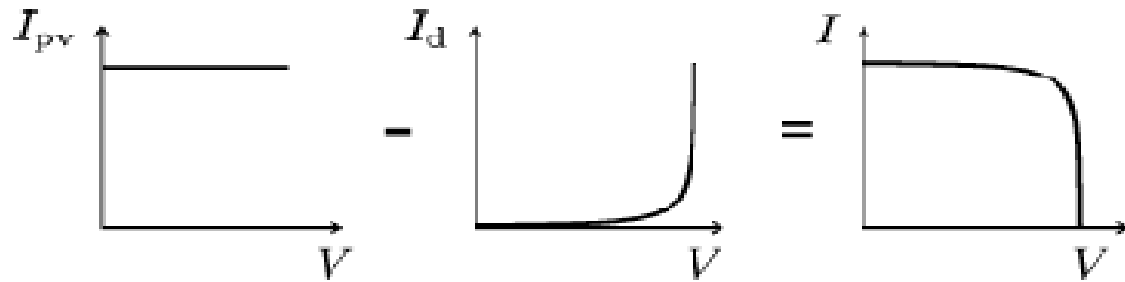


Fig.2. V-I Characteristic of PV Cell

The V-I Characteristics of PV cell is shown in fig.2. The net cell current I is composed of the light-generated current Ipv and the diode current Id

$$I = I_{pv} - I_d \quad \dots\dots\dots(2)$$

Where

$$I_d = I_o \exp(qV/akT)$$

I_o = leakage current of the diode

q = electron charge

k = Boltzmann constant

T = temperature of pn junction

a = diode ideality constant

The V-I characteristic of a practical PV cell with maximum power point (MPP), Short circuit current (I_{sc}) and Open circuit voltage (V_{oc}) is shown in fig.3. The MPP represents the point at which maximum power is obtained.

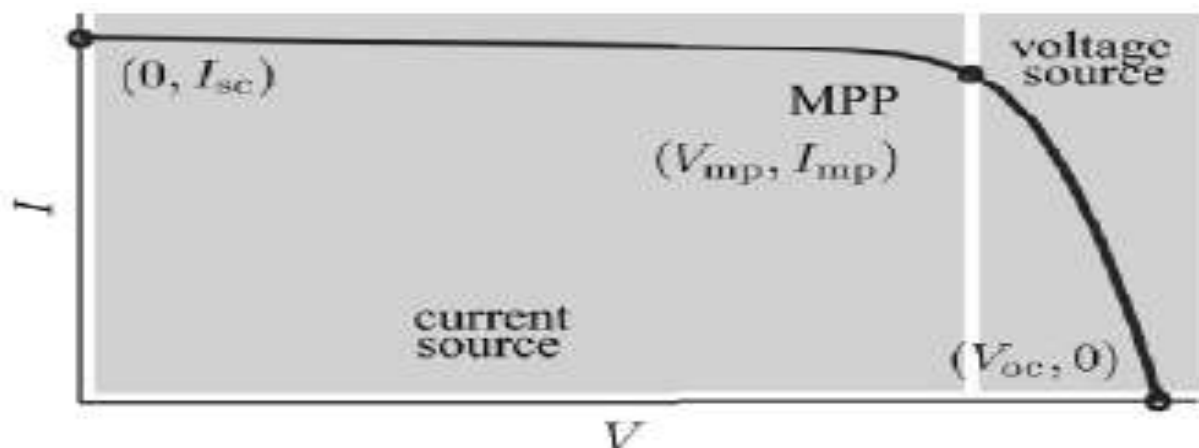


Fig.3. V-I Characteristic of Practical PV Module

Where V_{mp} and I_{mp} are voltage and current at MPP respectively. The output from PV cell is not the same throughout the day; it varies with varying temperature and insolation (amount of radiation). Hence with varying temperature and insolation maximum power should be tracked so as to achieve the efficient operation of PV system.

3. PROPOSED METHOD

The working of solar powered grass cutter is based on Law of Conservation of Energy. It has panels mounted in a particular arrangement at an angle of 45 degrees in such a way that it can receive solar radiation with high intensity easily from the sun. These solar panels convert solar energy into electrical energy. Now this electrical energy is stored in batteries by using a solar charger. The main function of the solar charger is to increase the current from the panels while batteries are charging, it also disconnects the solar panels from the batteries when they are fully charged and also connects to the panels when the charging in batteries is low. The motor is connected to the batteries through connecting wires. Between these two mechanical circuit breaker switch is provided. It starts and stops the working of the motor. From this motor, the power transmits to the mechanism and this makes the blade to slide on the fixed blade and this makes to cut the grass. The method consists of the following parts as solar panel, Dc motor, Linear blades, Wheel. The rotary blade is used in this paper to cut the grasses. The height of the grass can be adjusted by adjusting the ground clearance as per the requirement. A hardware prototype as shown in Fig. 4 is built. The components considered for implementation are presented in Table 1 for the proposed method.



Fig.4 Experimental set up

Table 1

Experimental Parameters of the proposed method

COMPONENT	QUANTITY
Solar panel	1
DC motor	1
Batteries	2
L angular	20 foot
Electrical components	
a. Wires	5 Meters
Mechanical components	1
a. Clamp	10
b. Welding electrode	

4. CONCLUSION

This paper solar powered grass cutter is successfully completed and the results obtained are satisfactory. This paper is more suitable for a common man as it is having much more advantages i.e. no fuel cost, no pollution, no fuel residue, less wear and tear because of less number of moving components and this can be operated by using solar energy. This will give much more physical exercise to the people and can be easily handled. This system is having facility of charging the batteries while the solar powered grass cutter is in motion. So it is much more suitable for grass cutting also. The same thing can be operated in night time also, as there is a facility to charge these batteries in day light.

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