DESIGN AND FABRICATION ON BLUTOOTH BASED SOLAR GRASS CUTTER

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Abstract: The grass cutter uses a solar-based energy source, which is easier to use, more advantageous compared to another energy source especially for a gas-based source of power. Solar grass cutter is based on solar power because this energy is a renewable source of energy and it is easy to work. Due to the continuous increase in the cost of fuel and the effect of emission of gases from the burnt fuel into the atmosphere, this necessitates and the use of the abundant solar energy from the sun as a source of power to drive a lawnmower. A solar-powered lawn mower was designed and developed, based on the general principle of mowing. The designed solar-powered lawnmower comprises of direct current (D.C) motor, a rechargeable battery, solar panel, and Bluetooth control. In this present work the idea has been created a 3D model with the help of CATIA V5 and the fabricated as per the model. The solar grass cutter fully automatic and arduino program were used to instructions the machine.

Key words: *Solar Panel, Battery, Arduino Board, Bluetooth, Grass Cutter etc.*

I. INTRODUCTION

In today's climate of growing energy needs and increasing environmental concern, alternatives to the use of non-renewable and polluting fossil fuels have to be investigated. One such energy is solar energy. In this solar based grass cutter, the advantage of powering a grass cutter by solar rather than by gasoline is mainly ecological. We manufactured this grass cutter because it is very easy method and many problems are overcome by this type of grass cutter [1-3].

The self- powered objective is to come up with a cutter that is portable, durable, easy to operate and maintain. It also aims to design a self- powered cutter of electrical source; a cordless electric grass mower. The heart of the machine is a battery powered DC electric motor. It is also useful method for our grass cutter [4-6]. The present technology commonly used for trimming the grass is by using the manually handle device. In this project we have automated the machine for trimming the grass. The device consists of blade which is operated with the help of the motor the power supply for the motor is by using battery. The battery can be charge by using power supply and solar panel [7 &8}.

Moving the grass cutters with a standard motor is inconvenient, and no one takes pleasure in it. Classical grass cutters with heavy engines create pollution due to the combustion in the engine. Motor powered engines require periodic maintenance such as changing the engine oils etc. If electric grass cutter is corded, moving could prove to be problematic and dangerous. Along with motor powered lawn mowers, electric lawn mowers are also hazardous and cannot be easily used by all. Also, if the electric lawn mower is corded, mowing could prove to be problematic and dangerous. The self-propelling electric remote control lawn mower is a lawn mower that has remote control capability [9-12].

The main objective of our project is to develop a lawn mower which reduces human effort so that elderly users can fulfill their tasks by themselves. The working range is also increased due to absence of main supply wire

A lawn mower is a device or a robot which helps human to cut grass automatically. Rapid growth of various high-tech tools and equipment makes our job done comfortable and sophisticated. This project considers the implementation of a robot which can be operated wirelessly using Bluetooth technology [13].

Every action of the lawn mower is controlled by the microcontroller which eliminates the use of perimeter wires to maintain the robot within the lawn. In addition, the project aims at fabricating a lawn mower which makes the grass cutter motor run through solar energy. The electricity requirement of the world is increasing at an alarming rate due to industrial growth, increased and extensive use of electrical gadgets. Hence solar energy is the best alternative source. This project will reduce environmental and noise pollution. This prototype is user friendly, cost efficient and environmental friendly [14 & 15].

2. EXPERIMENTAL SETUP

A Solar Grass Cutter is a machine that uses a revolving blade or blades to cut a lawn at an even height. Lawnmowers employing a blade that rotates about a vertical axis are known as rotary mowers, while those employing a blade assembly that rotates about a horizontal axis are known as a cylinder or reel mowers. Many designs have been made, each suited to a particular purpose. The smallest types, pushed by a human, are suitable for small residential lawns and gardens, while larger, self-contained, ride-on mowers are suitable for large lawns, and the largest, multi-gang mowers pulled behind a tractor, are designed for large expanses of grass such as golf courses and municipal parks.

2.1 MATERIALS USED

Table No.1 Components Used

Sl.No	COMPONENTS
1	Chassis
2	Bluetooth module
3	Arduino uno
4	Jumper pins with wires
5	Wheels
6	Connecting pins
7	Battery
8	Motor
9	Bearings
10	Solar

Above table no. 1 denotes the list of components used in the assembly of the prototype of Bluetooth Based Solar Grass Cutter. Each component is linked to its parts with various Means of joining process.

2.2 METHODOLOGY

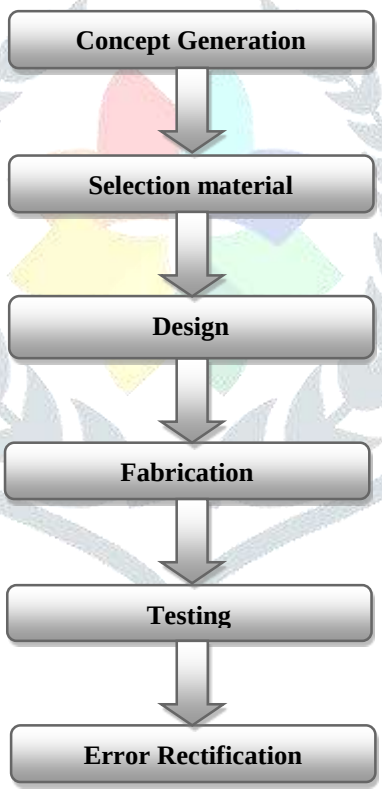

Fig.1 Methodology of Solar Grass Cutter

I. Literature study Make review on other model and focusing on how to make it simple and relevance to the project title.
II. Conceptual design sketching several type of design based on concept that being choose. State the dimension for all part.
III. Materials Selection selected the true material based on model design and criteria. Light, easy to joining and easy to manufacture. Assemble all the part to the design.
IV. Fabrication model refinement. Fabricate according to the main frame and design. Refinement at several part of joining and sharp edge.
V. Performance testing.
VI. Documentation preparing a report for the project.

3. RESULTS AND DISCUSSION

3.1 DESIGN OF BALL BEARING

Bearing No. 6202

Outer Diameter of Bearing (D) = 35 mm
Thickness of Bearing (B) = 12 mm
Inner Diameter of the Bearing (d) = 15 mm
r_1 = Corner radii on shaft and housing

r_1
Maximum Speed = 14,000 rpm (From design data book)
Mean Diameter (d_m) = (D + d) / 2

= (35 + 15) / 2

d_m = 25 mm

WAHL STRESS FACTOR

$$Ks = \frac{4C-1}{4C-4} + \frac{0.65}{C}$$

$$= \frac{(4 \times 2.3) - 1}{(4 \times 2.3) - 4} + \frac{0.65}{2.3}$$

Ks = 1.85

3.2 SELECTION OF D.C. MOTOR

Torque in a motor: By the term torque, it is meant the turning or twisting moment of a force about an axis. It is measured by the product of the force and the radius at which this force acts.

For an armature of a motor, to rotate about its centre, a tangential force is necessary. This force is developed within the motor itself.

Torque (T) = ½ (Ia / A) BDC Z Newton meters

Using the relation,

B = φ / a
= φ / (Π D / P) ł
= φ x P / (Π Dł)

T = ½ x (Ia / A) x Z x φ x {P/ (ΠDł) } x Dł
= φ Z P Ia / (2ΠA) Newton meters
= 0.159 x φ x Z x Ia X (P/A) Newton meters
= 0.162 x φ x Z x Ia x (P/A) Kg-m

The torque given by the above equation is the developed torque in the machine. But the output torque is less than the developed torque due to friction and wind age losses.

3.3 AURDINO PROGRAM

```
#include<LiquidCrysal.h>
#include<dht.h>
liquidCrystal lcd(2,4,8,9,10,11);
int temph=analogread(A1);
dht DHT;
dht sensor;
void setup() {
lcd.begin(16,2);
Serial.begin(9600);
delay(500);
lcd.clear();
lcd.setCursor(0, 3);
lcd.print("Auto Irrigation Based on Aurdino");
lcd.scrollDisplay();
dealy(200);
lcd.clear();
lcd.setCursor(0,3);
lcd.print("Humidity & Temperature Sensor\n\n ");
```

3.4 ARDUINO UNO

Figure 2 shows the Arduino UNO is software to program the Arduino UNO. This software is an open source and can download from the web for free. Arduino UNO have their own programming library which is simple and user-friendly. All the coding is given as well as example. With the existing of library, the user does not need to have a great knowledge on c programming to write Arduino program. The specifications are:

♣ Name: Arduino UNO
♣ Board: atMEGA328
♣ Pins: Digital I/O 14 Analog Pins 6
♣ Voltage: 5V
♣ Clock Speed: 16 MHz

Fig. 2 Aurdino UNO

3.5 RELAY

In figure 3 shows are a relay is an electrically operated switch. Several relays use a magnet to automatically operate a switch, however alternative in operation principles are used, like solid state relays. Relays are used wherever it's necessary to regulate a circuit by a separate low-power signal, or wherever many circuits should be controlled by one signal. The essential relays were handling in long distance communicate circuits as amplifiers, they unbroken the signal coming back in from one circuit and re-transmitted it on another circuit.

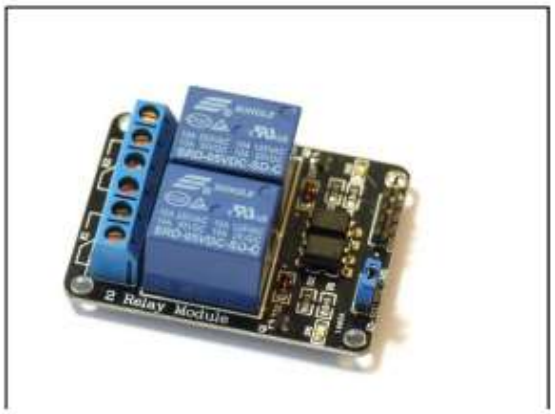

Fig. 3 Relay used in solar grass cutter.

Arduino Software (IDE) : The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. It runs on Windows, Mac OS X, and Linux. The environment is written in Java and based on Processing and other open-source software. This software can be used with any Arduino board.

History of AVR was developed in the year 1996 by Atmel Corporation. The architecture of AVR was developed by Alf-Egil Bogen and Vegard Wollan. AVR derives its name from its developers and stands for Alf-Egil Bogen Vegard Wollan RISC microcontroller, also known as Advanced Virtual RISC. The AT90S8515 was the first microcontroller which was based on AVR architecture however the first microcontroller to hit the commercial market was AT90S1200 in the year 1997 (Fig. 4).

Fig. 4 AVR microcontroller.

4. CONCLUSION

Our project entitled Fabrication of solar powered grass cutter is successfully completed and the results obtained are satisfactory. It will be easier for the people who are going to take the project for the further modifications. This project is more suitable for a common man as it is having much more advantages i.e., no fuel cost, no pollution and no fuel residue, less wear and tear because of less number of moving components and this can be operated by using solar energy. Manual work is removed by the implementation of Bluetooth control. The lawn mower can be further developed by implementing sensors so that any obstacles in the path can be sensed. Not only skilled but unskilled persons can also operate the device easily using an application in mobile phones and can control it in simple touch. Apart from fulfilling the basic job, this model is meant to be an alternate green option to the present available machines. In a nutshell, it is an economical method as compared to an existing method if it is produced on large scale. Also it provides flexibility to the user controlling it.

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