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Automatic Profile Grass Cutter

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Abstract— **Design and fabrication of an auto profile grass cutter is a new innovative concept mainly used in agricultural field. It is simple in construction and its working is easy. It is mostly used in the agricultural field to cut the plants, crops etc.**
A grass cutter is a machine that uses revolving blades, to cut a garden land spaces, at an even length. Grass cutters employing a blade that rotates about a vertical axis are known as cutters, while those employing a blade assembly that about a horizontal axis are known as cylinder or reel cutters.
Many different 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.

Keywords- Keywords: Profile, DC motor, Blade, Omni wheel, PIC Microcontroller, Voltage regulator

I Introduction

In earlier days mowing the lawn with a standard motor powered lawn mower is an inconvenience, and no one takes pleasure in it. Cutting grass cannot be easily accomplished by elders, younger, or disabled people. This prototype is a robotic user friendly, cost efficient, safe to use, efficient to use, and environmentally friendly. The prototype will also be automatic and will run on a charged battery with no cords to interfere with operation. This self-propelling lawn mower design comprised of autonomous capability that is user friendly so most consumers will be able to this device.

The primary objective of the project is to implement the basic knowledge of Engineering Design in a practical application. Hence the project focuses on every engineering steps starting from design consideration of a profile grass cutting robot. The primary stage of the project includes the design calculations and the design drawings of the profile grass cutting robot. The second and the final stage of the project is the fabrication of the designed project. The first lawn mower (grass cutter) was invented by Edwin Budding in 1827 in Stroud, Gloucestershire. Budding's mower was designed primarily to cut the lawn on sports grounds and expensive gardens, as a superior alternative to the scythe, and was patented in 1830. It took ten more years and further innovations to create a machine that could be worked by animals, and sixty years before a steam-powered lawn mower was built. In an agreement between John Ferrabee and Edwin Budding dated May 18, 1830, Ferrabee paid the costs of development, obtained letters of patent and acquired rights to manufacture, sell and license other manufacturers in the production of lawn mowers. Elwood McGuire of Richmond, Indiana designed a human-pushed lawn mower, which was very lightweight and a commercial success. John Burr patented an improved rotary-blade lawn mower in 1899, with the wheel placement altered for better performance. Amariah Hills went on to found the Archimedean Lawn Mower Co. in 1871. Around 1900, one of the best known English machines was the Ransomes' . [4] proposed a principle in which another NN yield input control law was created for an under incited quad rotor UAV which uses the regular limitations of the under incited framework to create virtual control contributions to ensure the UAV tracks a craved direction. Utilizing the versatile back venturing method, every one of the six DOF are effectively followed utilizing just four control inputs while within the sight of un demonstrated flow and limited unsettling influences.

Automaton, available in chain- or gear-driven models. JP Engineering of Leicester, founded after World War I, produced a range of very popular chain driven mowers. About this time, an operator could ride behind animals that pulled the large machines. These were the first riding mowers.

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II.BACKGROUND STUDY

We have fabricated the components of our robot throug design parameters and provided the fabrication details drawings including the mechanical component fabrication drawings, electronic component pin detailsMaintaining the Integrity of the Specifications

A DC motor is any of a class of electrical machines that converts direct current electrical power into mechanical power. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic; to periodically change the direction of current flow in part of the motor. Most types produce rotary motion; a linear motor directly produces force and motion in a straight line. Prepare Your Paper Before Styling

Omni wheels or poly wheels, similar to Mecanum wheels, are wheels with small discs around the circumference which are perpendicular to the turning direction. The effect is that the wheel can be driven with full force, but will also slide laterally with great ease. These wheels are often employed in holonomic drive systems.

If a system is developed with a microprocessor, the designer has to go for external memory such as RAM, ROM or EPROM and peripherals and hence the size of the PCB will be large enough to hold all the required peripherals. But, the micro controller has got all these peripheral facilities on a single chip so development of a similar system with a micro controller reduces PCB size and cost of the design. In our project the main device is a micro controller. It is used to control the whole unit of this project. The micro controller is connected to the control unit. The control unit is connected with the battery to get the power supply..

III.BLDC MOTOR CALCULATION SPECIFICATION:

Speed N = 4000 RPM
Voltage V = 12 Volt
Current I = 2.5 A (maximum load condition)
Power P =V x I=12 x 2.5 =30 WATT
P= 0.08HP
Motor Efficiency = 80%
(a)FORMULEA
Electrical power of the motor is defined by the following formula: Pin = I * V
Where,
Pin – input power measured in watts (W)
I – current, measured in amperes (A)
V – applied voltage, measured in volts (V)
Pout = T * ω
Where,
Pout – output power, measured in watts (W) τ – torque, measured in Newton meters (Nm) ω – Angular speed, measured in radians per second
(rad/s).
Calculate angular speed if you know rotational speed of the motor in rpm:
ω = N * 2π / 60 Where,
ω – Angular speed, measured in radians per second (rad/s); rpm – rotational speed in revolutions per minute; π – Mathematical constant pi (3.14). 60 – Number of seconds in a minute.
E = Pout / Pin
Therefore
Pout = Pin * E
After substitution we get
T * ω = I * V * E
T * N * 2π / 60 = I * V * E
(b)TORQUE OF THE MOTOR:
The formula for calculating torque will be
T = (I * V * E *60) / (N * 2π)
= (2.5x12x0.8x60)/4000x2π
Torque = 0.115 Nm
Torque (T) = 1.15 kg cm

(C)WHEEL DC MOTOR CALCULATION:
SPECIFICATION

Speed N = 78 RPM
Voltage V = 12 Volt
Loading Current I = 1 A
Power P =V x I
=12x1
= 12 WATT
P= 0.017 HP
Motor Efficiency E = 36%
Electrical power of the motor is defined by the following formula: **Pin = I * V**
Where,
Pin – input power, measured in watts (W)
I – current, measured in amperes (A)
V – applied voltage, measured in volts (V)
Pout = T * ω
Where,
Pout – output power, measured in watts (W) τ – torque, measured in Newton meters (Nm) ω – Angular speed, measured in radians per second
(rad/s).

Calculate angular speed if you know rotational speed of the motor in rpm:
ω = N * 2π / 60 Where,
ω – Angular speed, measured in radians per second

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(rad/s); rpm – rotational speed in revolutions per minute; π – Mathematical constant pi (3.14). 60 – Number of seconds in a minute. Efficiency of the motor is calculated as mechanical output power divided by electrical input power:

E = Pout / Pin

After substitution we get

$T * \omega = I * V * E$

$T * N * 2\pi / 60 = I * V * E$

(d) TORQUE OF THE MOTOR

The formula for calculating torque will be

$T = (I * V * E * 60) / (N * 2\pi)$

$= (1x12x0.36x60)/78x2\pi$

T = 0.528 Nm

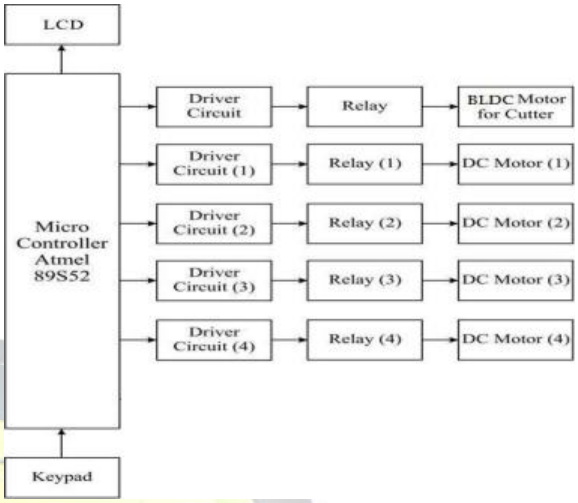
Torque (T) = 5.38 kgcm

IV.WORKING PRINCIPLE

Here we fabricate the model of grass cutter. This is a new innovative concept mainly used in agricultural field. It is simple in construction and its working is easy. It is mostly used in the agricultural field to cut the plants, crops etc.

In our project we fabricate the cutting machine for the use of agricultural field, crops in the field. Its construction is of simple manner. The components that are used are motor and grass cutting arrangement. Here we have used four motors for vehicle movement and one dc motor for grass cutting operation. And we have used special wheel called Omni wheel which can be used for vehicle to move in two directions. When the vehicle is operated by dc motor, the grass cutter is operated by dc motor. The cutting blade height can be adjusted by bolt and nut. This project can be used in future for agricultural field.

V.BLOCK DIAGRAM



VI.CONCLUSION

The profile grass cutter robot was designed successfully and it will evolve to serve its purpose without any profound flaws. The system, when implemented in processing industries will help for easy maintenance of garden.

This project is made with pre planning, that it provides flexibility in operation. Easiest operation is obtained by the control unit in the "PROFILE GRASS CUTTER". The comparative gain that can be accomplished is the utilization of motor in control unit. This innovation has made the more desirable.

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