

Handy Grass Cutter Machine

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Abstract:

In current days, grass cutter machines have bulky and heavy construction which is costly and requires high maintenance. Hence in this study, a hand held operated machine for grass cutting was designed and fabricated by using locally available materials. Important aspects such as durability, strength and light weight were taken into design consideration for better performance characteristics. The handy grass cutter is powered by a 12V lithium ion rechargeable battery which drives the dc motor. As a result, the generated torque will be transferred to the cutting head mechanism for efficient grass cutting. The entire configuration set up was mounted on a PVC pipe. This handy grass cutter can be used as to maintain and trim grass in gardens, home, schools or yards also we can obtain different application by replacing the cutting head mechanism with different attachments like drilling, cleaning, fan, grinding

Keywords —grass cutter, lawn mower, hand-held, battery, portable.

I. INTRODUCTION

The aesthetic value of this environment is as important as food and shelter to the modern man. In the olden day and even until now, cutting of grasses in the schools, sports, tracks, fields, industries, hotels, public-centre was done with cutlass. This method of manual cutting is time consuming because human effort is needed for the cutting. Also inaccuracy in cutting level was observed using the manual cutting method.

Mechanical mowing became possible early in the 19th century by an English engineer named Edwin Budding. While working in a textile mill, Budding noticed a machine that was used to shear the nap of velvet, which to Budding, was very similar to his overgrown grass at home that he had to cut with a scythe.

Through Budding's ingenuity he developed a cylinder, or reel type mower. It was a series of

blades arranged around a cylinder with a push handle.

This work deals with the cutting of verdant (shrubs, stubborn grass, flowers, leaves of trees) and also with the design of this cutter its efficiency, rigidity, mode of operation can be improved. The design gives a greater degree of flexible mobility and interchange ability.

The aim of this work includes, but not limited to the following:

- To reduce labour input in the cutting of not only weeds or grass but also in the trimming of flowers and trees.
- To reduce cost, time of cutting and also to beautify the environment.

II. LITERATURE REVIEW

All paragraphs Prof. C. J. Shende (1)
(VOLUME 6, Feb2018)

In this paper they have prepared manually handle device which is capable to cut the grass. This device consists of linear blades and it does not affected by climatic conditions. The main objective of this paper is to move the grass cutter is different directions to prepare various designs as per requirements. By using link mechanism the height of the cut can be adjusted. The unskilled labour can easily operate this device.

Prof. BhaskarH.B(2)
(IJERT VOLUME 2, Feb2015)

In this paper they prepared a manually operated rotary lawn mower to clean the lawn. Rotary mower has a set of three wheels, one front wheel and two rear wheels. The shaft between the two rear wheels is connected to the compound gear train system. The wheels are rotated in forward motion and bevel gear system convert the forward motion to the vertical motion. This lawn mower is used to minimize the cost and power requirement for the domestic purpose. Since heavy machine cannot be introduced in domestic purpose to the limited space of lawn.

Ms. Lanka Priyanka(3)

In this paper they have fabricated grass cutting machine with tempered blades are attached to this grass cutter. This grass cutter is manually operated as well as automatic operated. The materials commonly used GI sheet, motor, wheel, Al sheet, switch, wire, square pipe and insulating material.

P.Bulski(4)

Bulski identify the sound created by the machine is making noise pollution. He research on sound created by the machine and giving the result how to remove the sound while cutting the grass of lawn or ground. As looking to the petrol engine it make air pollution to environment so from my recommendation it should be implement on electric operated lawn mower.

Praful P. Ulhe(5)

In this paper they have prepared manually operated grass cutter with spiral roller blades due to spiral blades increases the efficiency of cutting. For

adjusting the height reel cutter is component placed on grass cutter. This grass cutter used to cut the grass uniformly and also it can cut the different types grasses.

III. COMPONENTS OF GRASS CUTTER MACHINE

MOTOR: A DC motor is any motor within a class of electrical machines whereby direct current electrical power is converted into mechanical power. Most often, this type of motor relies on forces that magnetic fields produce. Smaller DC motors are commonly used in the making of appliances, tools, toys, and automobile mechanism. 12v DC motor is small and inexpensive, yet powerful enough to be used for many applications.

Fig. 1 Motor

CUTTER BLADES: Cutter blades are the



cutting components of grass cutter. They are usually made of sturdy metals as they must be able to withstand high-speed contact with a variety of objects in addition to grass. The materials used (as well as size, thickness, and design of the blades) vary by manufacture. The maintenance problems, such as blunting or the breaking of blades will make you replace them.

Fig. 2 Cutting Blade

BATTERY: A lithium-ion battery or Li-ion battery is a type of rechargeable battery in which

lithium ions move from the negative electrode to the positive electrode during discharge and back when charging.

Advantages of Li-ion batteries:

- High specific energy and high load capabilities with power cells
- Long cycle and extended shelf-life; maintenance-free
- Reasonably short charge times
- Low self-discharge

Limitations of Li-ion batteries:

- Requires protection circuit to prevent thermal runaway if stressed
- Degrades at high temperature and when stored at high voltage
- No rapid charge possible at freezing temperature.



Fig. 3 Battery

PVC PIPE AND ELBOW: PVC pipe are lighter in weight and cheap in cost. The whole assembly is mounted on this PVC pipe. The motor is fixed in the elbow having 45° angle.



Fig. 4 PVC Pipe and Elbow

SWITCHES: A switch is an electrical component that can “make” Or “break” an electrical circuit, interrupting the current or diverting it from one conductor to another. The mechanism of switch removes or restores the conducting path in a circuit

when it is operated. DC switches are used when the system is powered by battery (DC supply).

Fig. 5 Switches

BMS UNIT: A battery management system



(BMS) is any electronic system that manages a rechargeable battery (cell or battery pack), such as by protecting the battery from operating outside its safe operating area, such as:

- Over-current (may be different in charging and discharging modes)
- Over-voltage (during charging)
- Under voltage (during discharging), especially important for Li-ion cells
- Over temperature
- Over pressure.

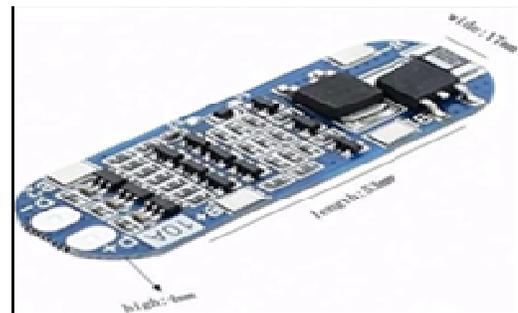


Fig. 6 BMS Unit

IV. METHODOLOGY

SELECTION OF CUTTING BLADE

The grass cutter is mounted on the shaft of the motor. It is the only component of the machine which is in contact with the branches of trees, lawn, grasses, leaves of shrubs etc...

Varieties of cutting blades are available in market with different shape and sizes for the application of cutting the cutting blade should have following characteristics:

- It should be lightweight.
- It should have sharp curve edges.
- It should be withstand to instantaneous shock
- It should be easily available in market

In this machine the blades used are made up of stainless-steel material, having a curve shape.

MOUNTING OF CUTTING BLADE

The blades are mounted on the shaft of the motor. The blades are fixed to the shaft of the motor with the help of brazing.



Fig. 7 Mounting of Cutting Blade

SELECTION OF BATTERY

The battery is the only power source used in this machine. The battery used is LI-ION battery to perform efficient work the battery should possess following features:

- It should have high specific energy and high load capabilities
- It should have long cycle
- It should have high capacity, low internal resistances
- It should have low self-discharge
- As the machine is portable the weight of battery should be less.

SELECTION OF MOTOR

As the part of the selection process for choosing the right DC motor, we should consider the exact application and then consider several different characteristics and specification to ensure end up with the best product possible.

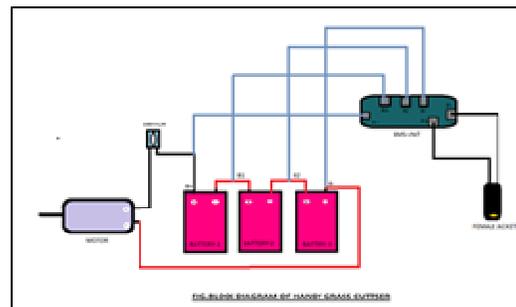
One characteristics of a 12V DC motor is the operating voltage when a motor is powered by batteries, low operating voltages are typically preferred since fewer cells are required to obtain the specified voltage.

V. CONSTRUCTION AND WORKING

The whole component of this handy grass cutter is mounted on PVC pipe which is 5 ft. long.

Fig. 8 Construction

Set of three battery of LI-ION are arrange in



series (3S-1P). The positive terminal of battery is joined to the positive terminal of motor via DC switch. The negative terminal of battery is joined to the negative terminal of motor as shown in above block diagram. All the connection between the battery and bms-unit are made as shown in the fig. alongside. The P+ and P- of bms unit are connected to the female connector for charging purpose.

The blades are mounted on a shaft of motor with the help of arbours. The whole circuit connections are enclosed in casing which is mounted on the PVC pipe.

When the switch made on the circuit get completed, the motor start rotating at high torque. The rotation of motor in one minute is 1300 RPM approximately. The blades also start rotating as they fixed with the shaft of the motor.

Hence as a result of which the obstacle (leaves of shrub, small branches of shrubs grass) get cut in efficient way.

VI. CALCULATIONS

LI-ION BATTERY SPECIFICATION

Code name: - li-ion 18650 cell
Volts :- 3.7V
Capacity :- 8000 MAH(8AH)
FOR OBTAINING 12V PACK

To run the motor of 12v we require battery pack of same voltage.

As the voltage of one battery is 3.7V
 $3.7V \times 3 = 11.1V$ (Approximately 12V)

Now,

THE POWER GENERATED IN ONE CHARGE OF BATTERY

$11.1V \times 8AH = 88.8$ WH (Watt-hour)

Consider the battery of wattage 40 watt

BATTERY CYCLE FOR ONE CHARGE IS

= Power generated by battery \div wattage of motor

= $88.8 \div 40$

= 2.22 hour (2 hour and 22 min)

The motor run for 2.5 hour in one charge of battery pack.

VII. ADVANTAGES AND DISADVANTAGES

ADVANTAGES:-

- Cutting can be done up to 10 ft. height from the ground which is the common limitation in conventional lawn mower.
- As the construction of handy grass cutter is compact in nature, hence it is Easy to storage after the use.
- As the components selected are light in weight hence the weight of handy grass cutter is much less as compare to any other lawn mover.
- Lower maintenance as compare to any other lawn mower as it have less rotating part.
- As it is totally run on DC electrical supply, it is eco-friendly in nature.

DISADVANTAGES:-

- It works for 2-3 hour in one charge; hence it is not preferred for finishing of large area.
- Very thick branches are not cut in one strike of blades. It is only use to cut little shrubs, grasses.

- Chances of breaking of blades if the rigid obstacle comes in contact with the blades suddenly.
- In case of breaking of blades while working the operator may get injured.

VIII. CONCLUSION

The presented work was aimed to reduce the wastage of human power (energy) in cutting of grasses with the help of cutlass. We have presented a detailed description of fabrication of handy grass cutter. In this we concluded that the modern grass cutter machine having better efficiency as compare to conventional cutting equipment's i.e. cutlass, sickle, scythe, spade etc... because of using DC motor, battery and also better design of blades and it also reduces the manpower. A lawn mower which is simply called as a grass cutting machine becomes very popular today and it is very commonly used for furnishing soft grasses. Now it is necessary for cleaning gardens since it is easily operating machine so now it is use for various application.

IX. REFERENCE

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