

Automatic Bush Trimming Machine

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Abstract- This paper presents a literature review and development of Bush Trimming Machine use for trimming the plants of road side. Maintenance of private and public premises is becoming necessary and involves high cost. In general manually operated trimmers were used just like simple and most common type is shearing of scissors. This project focuses on development of bush trimming machine in societal view with low cost system. The manually operated trimmers involve more effort & time consuming, where the operator required more efforts to lift the trimmer at suitable height and it is having very heavy weight. The uniformity of cutting varies from one operator to another. Different operator will cut in different way. The time also be saved using this trimming machine.

Keywords- Bush, trimmer, Garden, farming, motorized power.

I. INTRODUCTION

Automatic Bush trimming machine is the new ingenious and most effective machine used for trimming of road divider plants. Work should be completed in time and automatically. Wing assembly, material handling and many different things can be utilised for automatic machines. All we know that there is increase in vehicle traffic. The main motive of our project is to remove manual working of labour with automation. We can change the shape and size of plant just by replacing the Blade holder. Our assembly is having semi-circular blade holder with adjustable height and width of machine. We can adjust height and width as per requirement.

The entire setup of cutting is mounted so that it can rotate around the plant for precious trimming. It can rotate in 360° around plant. Many workers feel difficult to operate manual trimmers as they are time consuming. The process involves trimming of bushes into small pieces. The motors used are easily available in the market. We have used two types of motors i.e. wiper motor to rotate blade assembly and 12 volt dc gear motor to rotate blades at a speed of 1000 rpm. This trimmer will save the time of labour and will work efficiently. This machine can be useful to government to trim road divider plants easily and effective.

II. LITERATURE REVIEW

The summary of these reference papers tells us that, they have made controller takes the embedded LINUX ARM9 processor as the core. With the help of the developed control software it can control the trimming process automatically, making the trimming speed faster and the precision higher, and with its single-person operation

feature, it greatly reduces the labor intensity and improves the labor efficiency. We are not using any software because the unskilled operator also can run the machine. Software requires frequently updates to work efficiently. We removed all this difficulties with just simple mechanical linkages. In recent research they were using scissor trimmers with gear linkages. We have replaced it by simple Dc gear motor and flat blades.

The concept of the paper of our paperwork is to make a machine that can trim leaf and bushes of plants. We can change height and width of the main frame as per requirement. Some required modification is done in cutting Blades.

III. COMPONENTS

1. Frame:

The frame is of MS material. The frame of our machine is basically used to support all the components mounted on it. That is motor, transmission components, battery wheels etc. are mounted on frame. Function: It is used to mount all typed of components just like motor, bearing, shaft, battery etc.



Fig 1. Frame.

2. Wheels:

A wheel is a circular component that is intended to rotate on an axle bearing. The wheel is one of the main components of the wheel and axle which is one of the six simple machines. Function: It is used to carry whole weight of frame and components.



Fig 2. Wheels.

3. Blades:

The material used for blade is high speed alloy steel. The speed of the cutter is 1000 rpm. Function: It is used to trim the bush and leaves of the plants.

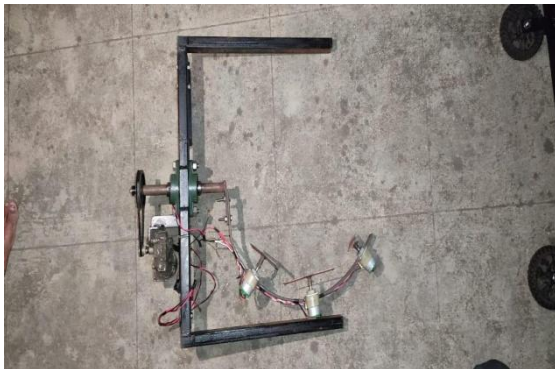


Fig 3. Blades.

4. Motors:

We have used Dc 12 volt Motors. In a machine wiper motor is used to rotate blade assembly. And Dc gear motor for rotating cutting blades.

- Voltage: 12 volts
- Speed:
- Wiper motor: 60 rpm.
- Dc gear motor: 1000 rpm.



Fig 4. Wiper motor.



Fig 5. Dc Gear Motor.

5. Battery:

Voltage: 12 volt

Capacity: 30 Amp

It is rechargeable and can be charged fully in just 5 hours and will run 7-8 hours on single charge.



Fig 6. Battery.

IV. WORKING AUTOMATIC BUSH TRIMMING MACHINE

This machine finds the most suitable application in general field like gardening applications for trimming the leaves and bushes of plants. It consists of motors, rotating cutting blades with central shaft, adjustable metallic square pipe frame and a dry battery cell with switch box. This machine is portable and can be easily carried to the point of application.

The metallic pipe is telescopic steel pipe which can easily adjustable in width and breadth to clear the application in different working zone. Wiper motor is mounted on top side of frame and connected to main shaft with the help of belt drive. Circular frame which attached to driving shaft is having 3 Dc gear motors.

On the top of the frame Battery is mounted along with switch box to operate the equipment. The wiper motor can rotate in anticlockwise as well as clockwise motion. The battery is rechargeable lead dry charge battery which serves as the power source for the operation.

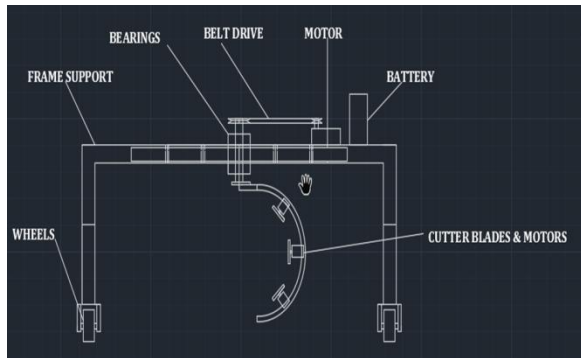


Fig 7. Actual Diagram of Bush Trimming Machine.



Fig 8. Actual Image of Model.

V. CALCULATIONS

1. Cutter blade:

Maximum force acting on blades to cut the leaves (F)
Assume that Maximum load sustain by Bushes (m) is 5N.
Gravitation force (g) is 9.81N

$$\begin{aligned} F &= mg \\ &= 5 \times 9.81 \\ &= 49.05 \text{ N.} \end{aligned}$$

Hence, maximum force acting on blades is 49.05 N.

2. Selection of Motors:

2.1 for wiper motor:

Let the torque on wiper motor be 5kg approx. (Ta), Nm.
So that power will be transmitted by belt drive having pulley dia. 60mm.

$$r = d/2 = 60/2 = 30 \text{ mm}$$

We require 60 rpm motor,

$$\begin{aligned} \text{Total Torque, } T &= 2 \times T_A \times g \\ T &= 2 \times 5 \times 9.81 \\ T &= 98.1 \text{ Nm} \end{aligned}$$

$$p = 2\pi NT/60 = 2\pi \times 60 \times 98.160$$

$$p = 616.38 \text{ W} = 0.6163 \text{ kw}$$

Power = 0.6163 kw, 60rpm wiper motor.

2.2 for dc gear motor:

We require 1000 rpm motor,

$$\begin{aligned} p &= 2\pi NT/60 = 2\pi \times 1000 \times 98.160 \\ p &= 10273 \text{ W} = 10.27 \text{ kw} \\ \text{Power} &= 10.27 \text{ kw, } 1000 \text{ rpm Dc gear motor} \end{aligned}$$

3 Torque Analysis:

Torque (t) = 98.1

Considering 125% overload on dc gear motor,

$$\begin{aligned} T &= 1.25 \times t \\ T &= 1.25 \times 98.1 \\ T &= 122.51 \text{ Nm} \end{aligned}$$

VI. CONCLUSION

A system is eco-friendly and simple mechanism is introduced. This paper mainly focused on trimming the leaves and small bushes. It is the simple solution to limitations of scissor trimmers.

VII. FUTURE SCOPE

This project uses the prototype technology to design & fabrication of the bush trimmer's design. We can use solar panels to charge the battery and we can save the energy. And that solar panel will work as roof for operator. Solar panel can charge fully discharged battery within 5-6 hours.

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