Design and Fabrication of Automated Grass Cutting Machine

Sathya V[1], Rahul R[2], Visakh M[3], Sanjay S Thomas[4]

[1234]B.Tech Student, Dept. Of Mechanical Engineering, Saintgits College of Engineering, Kerala, India

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Abstract - *A grass cutting machine is a device used for cutting grasses. A traditional grass cutting machine involves a lot of human effort. In order to overcome these challenges we had introduced an "Automated grass cutting machine". The automated grass cutting machine is a "camera-remote" controlled device used to cut grasses of different lengths. An Automated cutting blade adjustment system is used for adjusting the blade for different lengths of grass. The device is operated using a continuous track wheel, which helps the smooth running of machine in different terrains. A camera is fitted in-front of the automated grass cutting machine to detect and control the movement.*

Key Words: **Grass cutter, camera-remote, cutting blade, automation, terrain.**

1. INTRODUCTION

The typical grass cutting machine consists of revolving blades which are operated using a motor. This machine requires a human to walk behind and guide it. We redesigned this existing machine to make it an automated one with some additional features. The automated grass cutting machine is a remote controlled device used for cutting grass. The main objective of this machine is to reduce human effort and to perform the cutting operation without stepping on the lawn.A camera-remote control is used in the machine to detect its movement and change the direction of movement if needed. The machine also uses a continuous track wheel to enable the cutting operation in different terrains. The Automated grass cutting machine reduces human effort by using a camera-remote control that can be operated from a distance. The camera fitted in the machine will help to detect obstructions for the movement of the machine. The visuals from the camera will be displayed on the screen of remote control. This will help in effective controlling of the machine.

2. LITERATURE REVIEW

From the journal titled as 'Hybrid Remote Control Lawn Mover' authored by Luis Marcial Medina in the year 2008, we understood the basic design of the machine and the possibilities of operating the machine using a remote control.

We found the possibilities of automating a traditional lawn mower using programming from the journal titled as 'Automated Lawn Mower' authored by Russell G. Nelson in the year 1999. From the journal titled as 'Grass Cutting Machine' authored by Basil P. Strong in the year 1949 we found the possibilities of adjusting the vertical position of the cutting blade.

3. METHODOLOGY

The following methodology was followed in the course of the design of the proposed project:

1. Identifying the problem – difficulty in cutting the grass in different terrains and in different lengths using minimum human effort.

2. Identifying the existing technology.

3. Identifying the major problems in existing technology – involvement of human effort, alternation of cutting length, difficulty in cutting in irregular surfaces, difficulty in operation.

4. Identification of components that are required for the manufacturing of machine.

5. Designing a new machine that can be operated using a camera-remote control and a cutting height adjusting mechanism. Calculations are done.

6. Design is analyzed and corrections are made for achieving efficient and simple design.

7. Fabrication of machine using the design and calculations.

8. Testing of fabricated machine and correction of defects if any.

4. CONCEPTUAL & ACTUAL DESIGN

The figure below shows the conceptual design of machine that was prepared using CATIA. The main parts are camera, remote control, continuous track wheel, cutting blade, Grass collector, motors, circuit boards, etc.
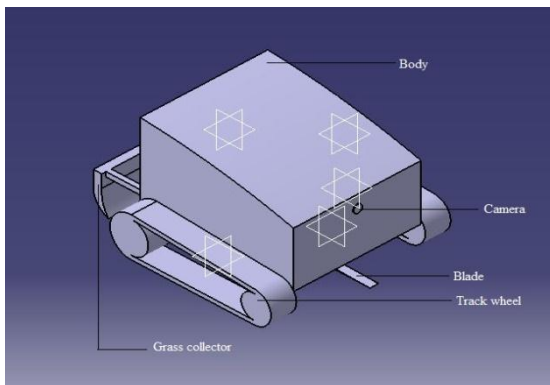
Fig -1 : Conceptual Design

Fig – 2 : Actual Design

5. FABRICATION

The fabrication of the machine was carried out using various manufacturing techniques such as arc welding, grinding, drilling, metal cutting, etc. Different machines that are used during the manufacturing process are, hand cutter, hand grinder, hand driller, welding machine, etc. The frame of the machine is made using GI pipes. The GI pipes are either welded together or joined using a screw. The frame is supported using wheels for moving it over the ground and an endless belt is trained around the wheels. A casing made of GI pipe is used to hold the battery and the mother board in the frame of the machine. The battery provides power to the dc motors, which in turn helps to carry out the various functions of the machine. A car jack mechanism is provided in front of the machine for adjusting the height of the cutting blade. A small GI casing is also provided for the cutting blade to prevent any type of damage to the blade during the cutting operation. The camera is placed on the upper end of a GI pipe whose lower end is fitted on the rear side of the body.

6. RESULTS AND DISCUSSIONS

The human effort is reduced when compared to the traditional machine. Smooth and easy handling of the machine is possible by the use of remote control. The Automated Grass Cutting machine uses a continuous track wheel which helps to operate the machine in different terrains. The main parts of the machine are motor, continuous track wheel, blade, grass collector, camera, circuit board and a remote control. There are 4 motors: two 45 rpm motors (wheel motors), a 60 rpm motor (for adjusting the blade height), a 2000 rpm motor (for rotation of cutting blade).

Power consumed by 45 rpm motor, $P_1 = 20$ W

Power consumed by 60 rpm motor, $P_2 = 10$ W

Power consumed by 2000 rpm motor, $P_3 = 10$ W

Power consumed by circuit board, $P_4 = 2$W

Power of battery , $P_b = V \times I = 12 \times 32 = 384$Wh

 V-Voltage of battery, I-Current

Total power consumed , $P = (2 \times P_1) + P_2 + P_3 + P_4$

 $= (2 \times 20) + 10 + 10 + 2$

 $= 62$ W

Machine working time $= P_b / P = 384 / 62$

 $= 6.19$ hrs

7. CONCLUSION

The automated grass cutting machine is a lot more efficient and effective as compared to the traditional one. The main advantage of the machine is that the cutting operation can be carried out without stepping on the lawn, thus reducing human effort. The grass cutting in hilly areas and many other terrains are difficult with the existing machines, but the automated grass cutting machine rectifies those difficulties.

ACKNOWLEDGEMENT

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