Design and Development of Remote Control Lawn Mower

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Abstract - Remote control lawn mower comprises of a system of speed multiplication pulleys which drive the cutting blade. Thus the machine is considered highly efficient and is readily adaptable to different cutting conditions. The signal will be transpose from the remote control to the lawnmower by the aerial joystick and the signal transfer is using radio frequency signal (RF). RF is totally effective in long distance and the components are cheap and easy to get in the market. In this project, transmitter and receiver circuit is build to control the movement of the lawn mower. The most striking feature of this design is that it can be controlled by hand-held remote control and allows the mower to take left/right turn and 360 degree turn. It results in fine cut at the sharp corners too. There are various problems related to the use of ordinary lawn mower such as, the need to follow the mower, take care of a long cable so that it does not gets damaged, etc. For example, in case of the mower working with fuel, it creates air pollution. To d-emphasize those problems it is desirable to make use of "Remote Controlled Lawn Mower".

Key words: Lawn mower, grass cutter, remote control lawn mower, trimmer, gardening tools.

I. INTRODUCTION

The goal of this project is to design an remote control lawnmower that safely and effectively mows an area of a homeowner's yard. The first two generations confide on the principle of randomness to mow an area. Thus, they did not mow in any type of pattern as a human ordinarily would. The third generation would be a great departure from the first two in many aspects. It is easy to operate as well as this is economically suitable for casual needs. It is easy to carry as its size is apparently small. The cost of lawn mower is relatively less so it can be employed for house backyards.[1]

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II. WORKING PRINCIPLE

This mower is environmentally friendly; it runs on 12V DC supply which is powerful and emission-free. It is equipped with DC motor which controls the turning movement of the lawn mower. It is light weight, making it lighter than most other battery/cordless lawn mowers. Innovation: the grass combs cut your lawn perfectly right up to the edge.

Lightweight: easy to handle and transport – only 15kg. Enjoy effortless mowing even in long grass thanks to the powerful 1200W power drive motor with 3450 rpm, which provides more than enough power to get the job done. The lawn mower provides a clean cut with its sharpened blade and grass combs for cutting edge performance.

III. METHODOLOGY

Firstly, we designed the chassis for the lawn mower which can easily lift the weight of the machine as well as can efficiently take turn about its current position that is, zero turning radius. Moreover, it is useful in cutting the grass from sharp corners.

Secondly, the preparation of list of different equipment was done so that it becomes easy to shop those things and do not miss anything, this can save much time.

Thirdly, the main task was that we have to select appropriate elements which perfectly coincide to our project design. The reason of choosing perfect elements is to overcome the requirement of "Remote Controlled Lawn Mower".

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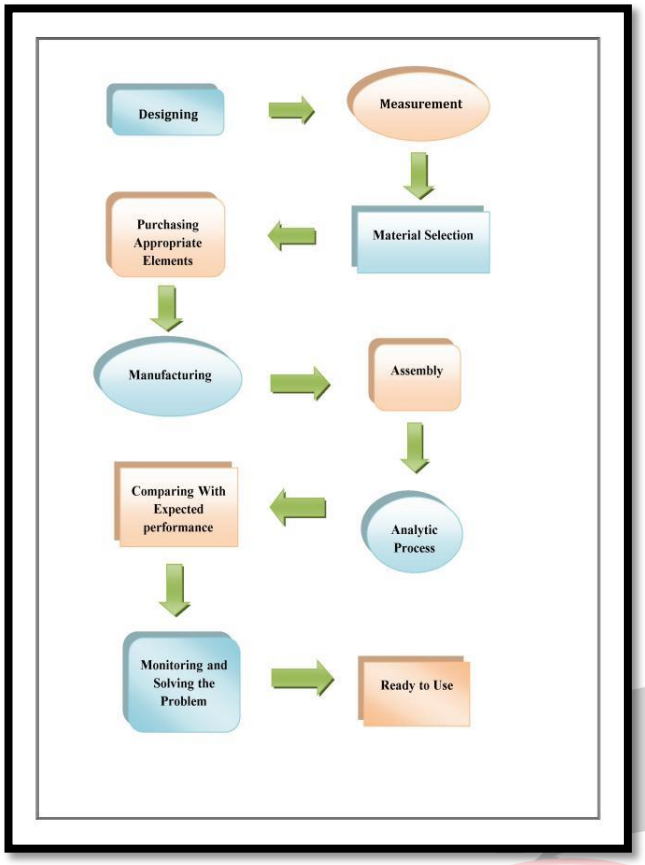

Figure 1 Methodology

IV. DESIGNING OF COMPONENTS

I.1 CHASSIS

The material used for manufacturing chassis is "Mild Steel". The chassis is designed in such a way that it can accommodate the mountings of motors, castor wheels, blade driving assembly, receiver of RF controller and 12V battery.[2]

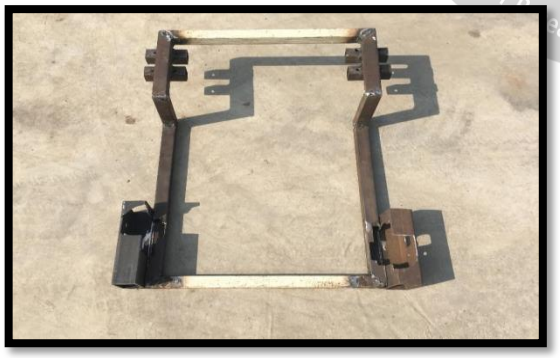

Figure 2 Chassis

I.2 DC AND AC Motor

[A] DC MOTOR

Two DC motors are used to drive the lawn mower which controls the turning movement of the mower. These motors are the one which are used in car wipers, these suits the most for these design. It is 12V DC motor with worm gear mechanism so it has high torque of 3.81 N.m.

$$P = I \times V$$
$$= 2 \times 12 \qquad N = 60rpm$$
$$= 24W$$
$$T = (p \times 60) \div (2\pi N)$$
$$= (24 \times 60) \div (2 \times \pi \times 60)$$
$$= 3.81Nm$$

Where,

P= Power in watt

N=Rpm

T=Torque

Figure 3 12V DC Motor

[B] AC MOTOR

One AC motor is used to drive the blade which results in effortless mowing even in long grass thanks to the powerful 1200W power drive motor with 3450 rpm.[3]

P=1200W

N=3450rpm

$$T = (p \times 60) \div (2\pi N)$$
$$= (1200 \times 60) \div (2 \times \pi \times 60)$$
$$= 3.321Nm$$

Where,

P=Power in watt

N=Rpm

T=Torque

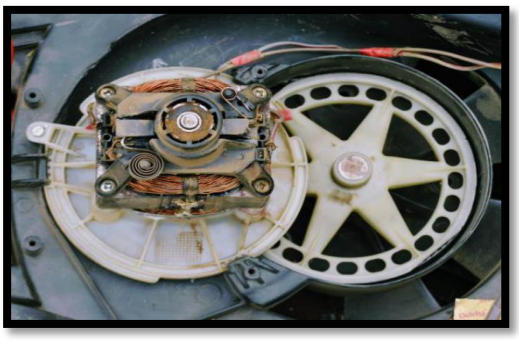

Figure 4 AC 12V Motor

I.3 TIMING GEAR

$$d = 28mm$$
$$p = 5mm$$

Circumference = 2лr

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$$= 2 \times \pi \times 14$$
$$= 87.92mm \approx 88mm$$

No. Of Teeth On Pulley = c÷p

$$= 88 \div 5$$
$$= 17.60 \approx 18$$

Where,

$d = Diameter$

$p = Pitch$

$c = Circumference$

Figure 5 Timing Gear

V. CASTOR WHEELS

Two castor wheels are fixed in front of chassis, these wheels has two degrees of freedom. It helps in making zero degree turn radius.

Figure 6 Castor Wheels

I.4 RADIOFREQUENCY CONTROLLER

The system of wireless controller consist of 433mhz receiver and transmitter which allows to control and steer the lawn mower.[4]

[A] RF Receiver Circuit

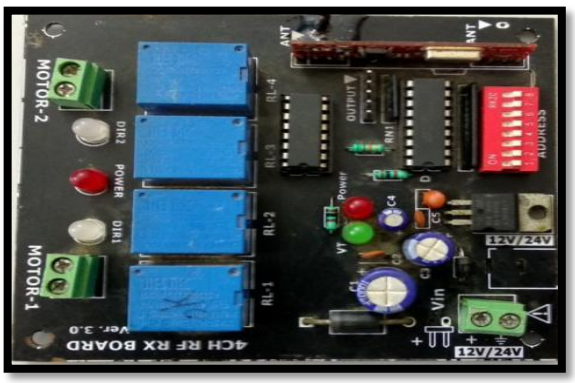

Figure 7 RF Receiver Circuit

[B] RF transmitter Circuit

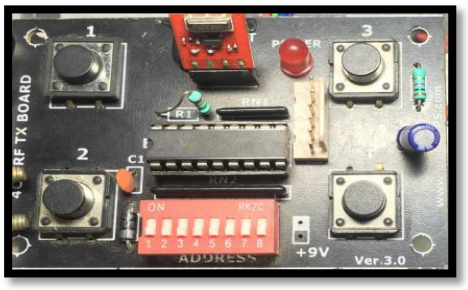

Figure 8 RF Transmitter Circuit

I.5 DISTANCE COVERED PER MINUTE BY LAWN MOWER

$d = 137mm$

$r = 68.5mm$

$N = 60rpm$

Circumference = 2лr

$$= 2 \times \pi \times 68.5$$
$$= 430.39mm$$

Distance travelled/min = c×N

$$= 430.39 \times 60$$
$$= 25{,}823.89mm$$
$$= 25.82m$$

Where,

$d = Diameter$

$r = Radius$

$N = rpm$

$c = circumference$

VI. RESULT

These design aims to eliminate the human effort to follow the mower. The most striking feature of this design is that it can be controlled by hand-held remote control and allows the mower to take left/right turn and 360 degree turn. It is efficient to cut the grass easily and combs to the similar height of 20mm to 30mm. The lawn mower can cover the area up to 0.82m^2 per minute and almost 50m^2 per hour.

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Figure 9 Glimpse of RC Mower

Figure 10 Hardware

VII. CONCLUSION

Our project entitled “Remote Control Lawn Mower” 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 common man as it is having much more advantages i.e., no fuel cost, no pollution, no fuel residue and no human effort. This design will be proved to be very economical for domestic use because of its amazing functions at minimal price.

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