

MANUALLY OPERATED ROTARY LAWN MOWER

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ABSTRACT:

The main objective of the work is to develop the 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. The bevel gear system is connected to the blade and the blade is a low lift blade used for low speed. This lawn mower is used to minimize the cost and power requirement for domestic purpose. Since heavy machine cannot be introduced in domestic purpose due to the limited space of lawn.

Keywords: Gear train system, bevel gear, cutting blade

INTRODUCTION

A lawn mower is an important equipment to maintain the beauty of the lawn. The mower is with revolving blades to cut a lawn at an even length to make it good-looking. For the domestic purpose and in villages, people cannot spend more money on heavy machineries. In villages there is more power cut problem and in these areas, this manual lawn mower used effectively. In market there are so many lawn mowers are available. But these devices do not meet the above problems or demands. The rotary lawn mowers require more power and fuel. The cost of the mower is also high. The manually operated rotary lawn mower can operate without power and fuel. The cost of the mower is also low [1]. Three types of agriculture machine were investigated: all-terrain vehicles (ATV), simple lawn-mowers (gasoline-powered push mowers), ride-on mowers (tractor type). Today, new technology has brought new improved versions. Low emission gasoline engines with catalytic converters are introduced to help reduce air pollution.

Improved muffling devices are also incorporated to reduce noise. Today, the recent innovation is the rotary hover mower. There are primarily two types of mowers namely (i) the reel mowers, and (ii) the rotary mowers. The reel (cylindrical) mowers seem to be better. Made of blades on a revolving cylinder, they achieve clean cut by scissors action [2]. As the mower moves forward, the rotating blades come in contact with a stationary bar called the bed knife and placed parallel to the ground. Grass is held by the shearing action of the reel blades against the bed knife. The mower is adjusted to various cutting heights. Rotary mowers are often powered either by an internal combustion engine or an electric motor and are generally moved manually, with the engine only spinning the cutting blades [3-4]. The most common types are fitted with wheels, but a newer innovation is the hover model in which the spinning blade also acts as a fan that provides a lift force, lifting the mower body clear of the ground on the same principle with a hover craft. Rotary mowers generally have opening by the side of the housing through which cut grasses are expelled. Some are attached with a grass collector at the exit point. The blade is seldom sharp enough to give a neat cutting. The blade simply tears the grass resulting in brown tips. However, the horizontal blades are easy to remove and sharpen or replace. Existing engine trimmers suffer from high initial cost, high levels of engine noise, high fuel consumption rates and high operator's fatigue in long-run [5]. In the present work, manually operated rotary lawn mower works by using compound gear train and straight bevel gears. The compound gear train increases the gear ratio. The gear ratio increases the blade rpm. The straight bevel gear system converts the foreword motion to 90° vertical motion. The blade is a low lift blade, used for low rpm. The pushing force is applied on rear wheels which connected to the compound gear train. The compound gear train meshes with bevel gears to increase the gear ratio which increases the speed of the cutting blade. The cutting height of the blade is maintained 40mm.

TYPE OF ROTARY LAWN MOWERS

Most of the people use rotary lawn mower for large extends of grass lands. The selection of lawn mower depends on area of the land. In the parks, gardens and in golf courses lawn should be in even height for the game purpose [6].

The mowers are classified as:

1. Gas or fuel lawn mowers
2. Electric mowers (wired or wireless)
3. Manually operated rotary lawn mower

The lawn mowers cutting area rang:

Gas or fuel mower – > 2000m²

Electric mower – 100m² to 2000m²

Manually operated rotary lawn mower – < 100m²

PROBLEM IDENTIFICATION

Gas or fuel mowers do create pollution due to the combustion in the engine, and their engines require periodic maintenance such as cleaning or replacement of the spark plug and air filter and changing the engine oil. Electrical mowers put users at risk of receiving a dangerous electric shock. The cost of these mowers is also high [7-8].

DEVELOPMENT OF THE MODEL

This is a three wheeled lawn mower, two rear wheels and one front wheel. The pushing forces applied on the handle which rotates the rear wheel. The shaft between rear wheels which connected to the compound gear train. The gear train increases the gear ratio. Gear train meshes with straight bevel gear which converts the foreword motion to the vertical motion. The blade is connected to the bevel gear. This gear train increases the speed of the cutting blade. Shafts of the gears are connected to the bearings. The bearings are used for the shaft stability and frictionless rotation. The lubricant is used for bearings is ester oil. Straight bevel gear is used in this lawn mower because of its simple design and low speed. The cutting blade is a low lift blade used for the low speed. The figure 1 shows the 3D model of the lawn mower. The blade rotates around 678 rpm which is sufficient to cut the grass with human walking force.

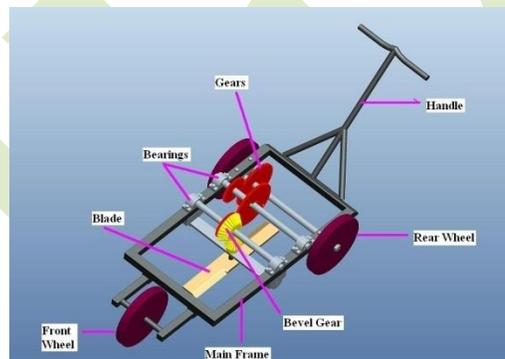


Figure 1: 3D model of the lawn mower

CONCLUSION

Manually operated rotary lawn mower is fabricated with locally available materials. The manually operated rotary lawn mower works without power and fuel. The gear train mechanism and bevel gear system used to rotate the cutting blade. By this lawn mower can cut variety of grass lawns with maximum blade cutting efficiency of 62%. Energy expenditure on operating this model requires fewer calories. It can be operated easily and economically cheaper.

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