

Fabrication of Grass Cutter Machine

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Abstract – Our aim is to design and fabricate a manually pushed lawn mower model of simple mechanism and low cost. A large pulley will be coupled to the driving wheel. A smaller pulley will be joined with the larger pulley through a belt drive. A bevel gear pair will transmit power from the smaller pulley to the cutting blades. In our seminar we fabricate the grass cutting machine for the use of agricultural field, to cut the crops in the field. This is a new innovative concept mainly used in agricultural field. It is simple in construction and its working is easy. The components that are used are motor, gear arrangement, cam, chain and sprocket, lead screw, wheel, control unit. Below the gear arrangement cutting blade is fixed. When the motor starts running by the use of power supply, the shaft also rotates and that rotates the gear arrangement which is coupled with the motor. As the gear arrangement rotates the cam arrangement, it operates the sickle bar which tends to cut the plants or crops. The sickle bar has one is fixed cutter and another one is movable cutter which is placed on it. The whole set up is placed on a movable base which has a wheel arrangement.

Index Terms – Components, Grass Cutting Machine, Power Supply, Sickle Bar.

1. INTRODUCTION

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 every Saturday afternoon instead of going down to the pub and listening to reports of the soccer game come in.

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. It really looked much like our nonpolluting, non-powered, aerobic workout, lawn mowing machine of today—the classic reel mower still available in

many hardware and home improvement stores across the country. In 1870, Elwood McGuire of Richmond, Indiana designed a machine that basically brought push mowing to the masses. It was lighter, easier to push and had fewer moving parts than the old versions. By 1885, America was building 50,000 lawnmowers a year and shipping them to every country on the globe [6].

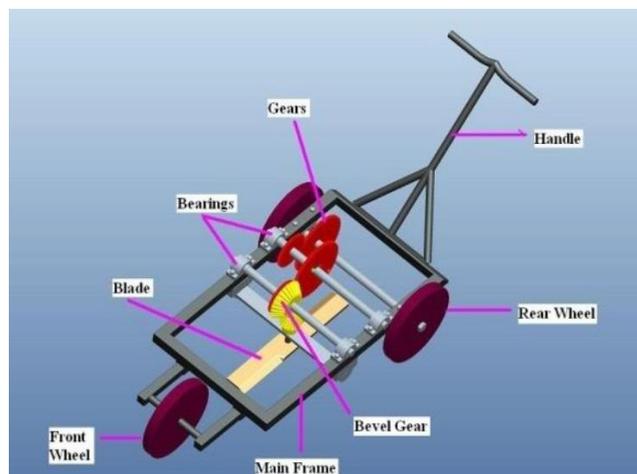


Fig.1 3D model of the grass cutter [2]

A grass cutter is a tool used to make a shallow score in one surface of a piece of grass that is to be broken in two pieces. The scoring makes a split in the surface of the grass which encourages the grass to break along the score. Regular, annealed grass can be broken apart this way but not tempered grass as the latter tends to shatter rather than breaking cleanly into two pieces. A grass cutter may use a diamond to create the split, but more commonly a small cutting

wheel made of hardened steel or tungsten carbide 4–6 mm in diameter with a V-shaped profile called a "hone angle" is used. The greater the hone angles of the wheel, the sharper the angle of the V and the thicker the piece of grass it is designed to cut. The hone angle on most hand-held grass cutters is 120° , though wheels are made as sharp as 154° for cutting grass as thick as 0.5 inches (13 mm).

2. RELATED WORK

2.1 Grass Cutter:

Grass cutters are manufactured with wheels of varying diameters. One of the most popular has a diameter of 5.5 mm ($\frac{7}{32}$ in). The ratio between the arc of the wheel and the pressure applied with the tool has an important bearing on the degree of penetration. Average hand pressure with this size wheel often gives good results. For a duller wheel on soft grass a larger wheel (e.g., 6 mm ($\frac{1}{4}$ in)) will require no change in hand pressure. A smaller wheel (3 mm ($\frac{1}{8}$ in)) is appropriate for cutting patterns and curves since a smaller wheel can follow curved lines without dragging.

2.2 Types of Lawn Mower:

2.2.1 Cylinder or reel mowers:

A cylinder mower or reel mower carries a fixed, horizontal cutting blade at the desired height of cut. Over this is a fast-spinning reel of blades which force the grass past the cutting bar. Each blade in the blade cylinder forms a helix around the reel axis, and the set of spinning blades describes a cylinder. Of all the mowers, a properly adjusted cylinder mower makes the cleanest cut of the grass, and this allows the grass to heal more quickly. The cut of a well-adjusted cylinder mower is straight and definite, as if cut with a pair of scissors. This clean cut promotes healthier, thicker and more resilient lawn growth that is more resistant to disease, weeds and parasites. Lawn cut with a cylinder mower is less likely to result in yellow, white or brown discoloration as a result of leaf shredding.

2.2.2 Rotary mowers:



Fig.2 Rotary Mower

A rotary mower rotates about a vertical axis with the blade spinning at high speed relying on impact to cut the grass. This tends to result in a rougher cut and bruises and shreds the grass leaf resulting in discoloration of the leaf ends as the shredded portion dies. This is particularly prevalent if the blades become clogged or blunt. Most rotary mowers need to be set a little higher than cylinder equivalents to avoid scalping and gouging of slightly uneven lawns, although some modern rotaries are fitted with a rear roller to provide a more formal striped cut. These machines will also tend to cut lower (13 mm) than a standard four-wheeled rotary.

2.2.3 Gasoline (petrol):

Extensive grass trimming was not common before the widespread application of the vertical shaft single cylinder gasoline/petrol engine. In the United States this development paralleled the market penetration of companies such as the Briggs and Stratton company of Wisconsin.

2.2.4 Electricity:

Electric mowers are further subdivided into corded and cordless electric models. Both are relatively quiet, typically producing less than 75 decibels, while a gasoline lawn mower can be 95 decibels or more.



Fig.3 Electricity operated lawn mower

2.2.5 Automated Lawn Mower:

Most people do not associate air pollution with mowing the lawn. Yet emissions from lawn mowers, snow blowers, chain saws, leaf vacuums, and similar outdoor power equipment are a significant source of pollution. Today's small engines emit high levels of carbon monoxide, a colorless, odorless, poisonous gas. They also emit hydrocarbons and nitrogen oxides, pollutants that contribute to the formation of ozone. While ozone occurs naturally in the upper atmosphere and shields the earth from harmful radiation, ozone at ground level is a noxious pollutant.

3. PORPOSED MODELLING

This is a diagram right at the instant that the mower starts moving. This means that the friction force accelerates the mower for just a little bit. The key is that more friction means better. There are two things that must be true for these other forces. First, the vertical forces have to add up to zero Newton's otherwise it would accelerate in the up or down. Second, the sum of the torques about any point must also be zero. If not, the mower would have a rotational acceleration instead of staying level.

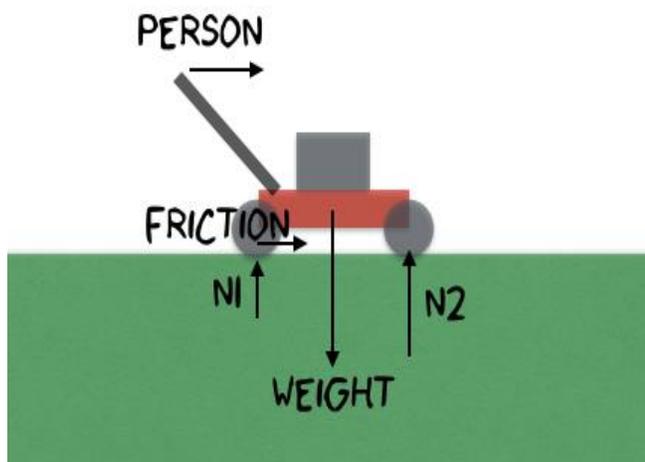


Fig.4 Conceptual diagram of grass cutter

The torque is the important thing to consider here. If you look at torques about the center of mass, the force from the person would create a clockwise torque. There has to be some counterclockwise torque in order for the total torque to be zero. This means that the force from the ground on the front wheel has to be greater than the back wheel. That's not good. The harder you push on the mower (horizontally), the more the front wheels "dig in" the ground without providing any traction.

Now imagine the mower had front wheel drive like the Craftsman. In this case when you push harder on the mower, you get MORE traction. Remember, more traction equals more better. Plus, there is another benefit of front wheel drive. When you want to turn the mower, you push down on the handle and lift the front wheels off the ground. Now it doesn't matter if they are turning or not because they are off the ground.

4. RESULTS AND DISCUSSIONS

4.1 Methodology adopted for assembling of Lawn Mower

- 1) First we are cut the iron pipe whose outer diameter is 1", and then welded together at an angle of 90' between each other. (1.5 x 2.5 feet's, Base of the main frame).
- 2) Then the push Handle (3 feet's) are welded at the rear wheels frame.

- 3) Now, four wheels are attached to the frame. The diameter of the wheels is 8" each.
- 4) Assemble the wheels:-
 - (a) Put the wheels, and the screws on the Mower.
 - (b) Pull the screws using the supplied Screwdriver to tighten.
- 5) A wooden ply are placed and fitted on the base frame of size 1.5 x 2.5 feet's.
- 6) Now, the 24v Electric DC motored are placed and fitted by the supporters, at the center of the wooden ply.
- 7) Assemble the Blade: - Now, Blade are fitted at the bottom side of the lawn mower, to the shaft of the motor.

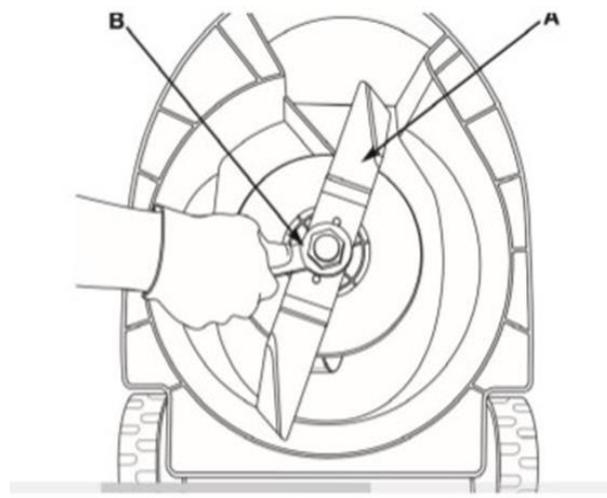


Fig.5 Blade is fitted by the bolts

- 8) Assemble the battery: - The 24v Lithium ion battery is assembled at the rear wheels of the wooden ply.
- 9) Now, the battery and the motor is attached for giving electric power to the motor.
- 10) The switch is attached to the battery for ON/OFF the power supply.
- 11) Now, testing the Lawn Mower on the ground.

4.2 Technical Specification:

Motor Power	250W
Motor Model	24V D.C.
Battery Specification	24V/7M
Battery charge time	10 to 12 hours
Cutting height	3.5"

Wheel Diameter	8 inches
Wheel width	2 inches

Table 4.1 Specifications of model

5. CONCLUSION

We have presented a detailed description of fabrication of grass cutter. In this we concluded that the modern grass cutter machine having better efficiency as compare to old machines because of using the engine and better material of blades and it also reduces the man power. A lawn mower which is simply called as a grass cutter 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 used for various application.

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