

# PNEUMATICALLY HEIGHT ADJUSTABLE SOLAR GRASS CUTTER

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## ABSTRACT

*A Solar grass cutter is a machine that uses sliding blades to cut a lawn at an even length. Even more sophisticated devices are there in every field. Power consumption becomes essential for future. Solar grass cutter is a very useful device which is very simple in construction. It is used to maintain and upkeep lawns in gardens, schools, colleges etc. We have made some changes in the existing machine to make its application easier at reduced cost. Our main aim in pollution control is attained through this. Unskilled operator can operate easily and maintain the lawn very fine and uniform surface look. For cutting of grass at different height whole grass cutting machine is lifted using manual effect and skilled labor. Pneumatic actuator is used for lifting the blade to cut the grass at different height using unskilled labor too.*

## 1. INTRODUCTION

Now a day's pollution is a major issue for whole world. Pollution is manmade and can be seen in own homes. In case gas powered lawn movers due to the emission of the gases it is responsible for pollution. Also, the cost of the fuel is increasing. Hence it is not efficient. So the solar powered lawn cutters are introduced. Solar powered lawn mower can be described as the application of solar energy to power an electric motor which in turn rotates a blade which does the moving of a lawn.

Solar energy is the renewable energy. Motor power push lawn mowers create noise pollution due to the sound of engine, And local air pollution due to the combustion in the engine. Also, a motor-powered engine requires periodic maintenance such as changing the engine oil even though electric lawn mowers are environmentally friendly, they too can be an in convenience. Along with motor powered lawn mowers, electric lawn mowers also hazardous and cannot be used by all. The project is an autonomous solar grass cutter that will allow the user to the ability to their grass with minimal effort. Hence, we design to make a grass cutter without any power source due to reduce the power consumption.

The lawn mower or grass cutter is made up of an induction motor, a battery, an alternator, three collapsible blades, and a link mechanism. The power and charging system comprise of an alternator which charges the battery while in operation. The D.C. motor forms the heart of the machine and provides the driving force for the collapsible blades. This is achieved by the combined effect of mechanical action of the cutting blades and the forward thrust of the mower. The system is powered by an electrical switch which completes the circuit comprising the induction motor and the battery. The shaft fitting mechanism with which the height of cut is altered.

### 1.1 SOLAR GRASS CUTTER

The grass cutter is made up of an electrical motor, a battery, an alternator, linear blade, and a link mechanism the power and charging system comprise of an alternator which charges the battery while in operation. The electric motor forms the heart of machine and provides the driving force for the driving blades. This is achieved by the combined effect of mechanical action of the cutting blades and the forward thrust of the mower. The system is powered by an electrical switch which completes the circuit comprise the electrical motor and the battery. Solar power as an energy source will address a number of issues that slandered internal combustion engines do not. An electric grass cutter with a solar charger will be easier to use. There is no messy dangerous gasoline to deal with most importantly it eliminates the emissions of an internal combustion mower.

A grass cutter is a device which by mean of one or more revolving blades issued to grass cut or other plants. Grass cutter employing a blade that rotates about a vertical axis are rotary mowers. While employing blade assembly that rotates about a horizontal axis are known as cylinder or reel mowers.

### 1.2 HISTORY

The lawn mower was invented by Edwin Beard Budding in 1830 in Brim's combe and Thrupp, just outside Stroud, in Gloucestershire, England. Budding's mower was designed primarily to cut the grass on sports grounds and extensive gardens, as a superior alternative to the scythe, and was granted a British patent on August 31, 1830. Budding's first machine was 19 inches (480 mm) wide with a frame made of wrought iron. The mower was pushed from behind. Cast-iron gear wheels transmitted power from the rear roller to the cutting cylinder, allowing the rear roller to drive the knives on the cutting cylinder; the ratio was 16:1. Another roller placed between the cutting cylinder and the main or land roller could be raised or lowered to alter the height of cut. The grass clippings were hurled forward into a tray-like box. It was soon realized, however, that an extra handle was needed in front to help pull the machine along. Overall, these machines were remarkably similar to modern mowers.



Fig – 1: Grass Cutter

## 2. EXPERIMENTAL COMPONENTS

### 2.1 Solar Panel

A solar panel is a set of solar photovoltaic module electrically connected. A photovoltaic module is packaged, connected assembly of solar cells. The solar panel can be used as component of a larger photovoltaic system to generate and supply electricity in commercial and residential applications. Each module is rated by its dc

output power under standard test conditions etc and typically ranges from 100 to 320 watts. The efficiency of a module determines the area of a module.

A single solar module can produce only a limited amount of power, most installations contain multiple modules. A photovoltaic system typically includes a panel or an array of solar modules, an inverter, and sometimes a battery and/or solar track and sometimes a battery and solar tracked and interconnection wiring.



**Fig -2 : Solar Panel**

## 2.2 Air Compressor

An air compressor, as the name indicates, is a machine to compresses the air and raises its pressure. The air compressor absorbs air from the atmosphere and compresses it. Then it sends to a storage vessel under high pressure. From the storage vessel, it can be carried by pipeline to a location where a supply of compressed air is needed. Since air compression needs some work to be done on it, hence a compressor should be driven by some prime mover. Compressed air is applied for various purposes such as pneumatic drills, riveters, road drills, paint spraying, starting plants, [jet engines](#) and air motors, and more. It is also used in the operation of lifts, rams, [pumps](#), and much other equipment. In industry, compressed air is used for producing blasts of air in blast furnaces and Bessemer converters.



**Fig – 3: Air Compressor**

### 2.3 Motor

The magnetic field in a brush DC motor is produced by current sent through a commutator and brush that are connected to the rotor. Brushes are made of carbon and can be separately excited or self-excited. The stator is the enclosure that contains the components of the motor and contains the magnetic field. The winding of the coil on the rotor can be in a series or parallel to form either a series-wound DC motor or shunt wound DC motor. The commutator is an electrical switch that reverses the current between the rotor and the external power source. It is a method of applying electrical current to the windings and produces a steady rotating torque by reversing the current direction. The sections of the commutator are attached to the windings on the rotor through a set of contact bars that are set in the shaft of the Motor.

**Fig – 4: DC Motor**

### 2.4 Pneumatic Cylinder

Pneumatic cylinders are mechanical devices that produce force by using energy from pressurized air. These devices consist of a piston, piston rod, and cylinder. The pressure inside the cylinder rises as air enters on one side of the cylinder. The rise in internal pressure causes the piston to move in a specific direction. The piston rod transmits the developed force to the object to be moved. The working fluid in pneumatic cylinders is compressed air. Hence, pneumatic cylinders are desirable for environments requiring a high level of cleanliness, as the fluid will not contaminate the surroundings in case of leakage. Pneumatic cylinders operate quietly and do not require large storage tanks for the working fluid.

Pneumatic cylinders are used in the automation of machines and industrial processes. The force and motion produced by pneumatic cylinders can be used in mechanisms such as clamping, ejecting, blocking, and lifting. In factories, they are used in repetitive pick-up and placement of objects into a machine or equipment. In piping systems, they are used in operating valve.



**Fig – 5: Pneumatic Cylinder**

## 2.5 Battery

Solar cell module produces electricity only when the sun is shining. They do not store energy. It is necessary to store some of the energy produced. The most obvious solution is to use batteries. The batteries are used as a storage device for solar energy which can be further converted into electrical energy.

The only exceptions are isolated sunshine load such as irrigation pumps or drinking water supplies for storage, for small units with output less than one kilowatt. Batteries seem to be only technically and batteries are high in capital costs. It is necessary that the overall system must be optimized with respect to available energy and local demand pattern The solar energy was saved in the battery. Batteries that are re-chargeable are called secondary or accumulator batteries. As the battery is being charged, electric energy stored as chemical energy in the cells. When being discharged the stored chemical energy is being removed from the battery and converted to electrical energy. The battery is 12 volts.



**Fig – 6 : Battery****2.6 Blade**

The blades are mounted according to the need. After the blade mount was finished being fabricated. It is inserted on the shaft. Then to make sure the mount was supported vertically drilled a small hole completely through the mount and shaft. This allowed me to insert a bolt as an added safety measure. It is easy to cut the grass and the moving the blades will be freely. The blades move with the help of dc motor which is connected with the blades, due to dc motor blades moves very fast which uses to move the shaft. Motor capacity is 12 watts and there is a blade arrangement in front of the frame.

**Fig - 7: Blade****3. WORKING PRINCIPLE****3.1 WORKING PRINCIPLE OF SOLAR GRASS CUTTER**

Coming to the working of solar powered grass cutter, it has panels mounted in a particular arrangement at an angle of 45 degrees in such a way that it can receive solar radiation with high intensity easily from the sun. These solar panels convert solar energy into electrical energy. Now this electrical energy is stored in batteries by using a solar charger. The main function of the solar charger is to increase the current from the panels while batteries are charging, it also disconnects the solar panels from the batteries when they are fully charged and also connects to the panels when the charging in batteries is low. The motor is connected to the batteries through connecting wires. Between these two mechanical circuit breaker switches is provided. It starts and stops the working of the motor. From this motor, the power transmits to the fixed blade and this makes to cut the grass.



### 3.2 PNEUMATIC MECHANISM

Pneumatics is a simple and reliable way to make things move, just by using clean, dry air. Pneumatic systems use this compressed air to create mechanical motion and power applications to ‘do work’ in factory automation systems. Pneumatics are seen in a range of other applications too, from fairground rides and trucks, medical applications and food preparation through to air tools and blow moulding. Pneumatics makes use of an air compressor to reduce the volume of the air in order to increase its pressure. This then moves through a filter into pneumatic tubing, where it’s controlled by valves before reaching an actuator which does the work at the end of the process. That could be a cylinder, or a device that performs a function, for example, lifting, moving or gripping.

### 4. DESIGN



**Fig – 8 :** Front view



**Fig – 9:** Top view



**Fig – 10:** Left view



**Fig – 11:** Right view

## 5. CONCLUSION

It will be easier for the people who are going to take the project for the further modifications. The project is more suitable for common man as it is having much more advantages i.e., no fuel cost, no pollution, and no fuel residue. Less wear and tear because of a smaller number of moving components and this can be operated by using solar energy. This will give much more physical exercise to the people and can be easily handled. This system is having facility of charging the batteries while the solar powered grass cutter is in motion. So it is much more suitable for grass cutting also. The same thing can be operated in night time also, as there is a facility to charge these batteries in day light. The frame which we use doesn't have height adjustment. This can be overcome by keeping wheels arrangement near the blades. The project which we have done surely reaches the average families because the grass can be trimmed with minimum cost and with minimum time. Finally the project may give an inspiration to the people who can obtain better results.

## 6. REFERENCES

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