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Design and Fabrication of Solar Grass Cutter

R.Satyamahipal Reddy[1], J.Ashok Babu[2], B.Bhavsingh[3]

1,2,3 Assistant Professor, Department of Mechanical Engineering Geethanjali College of Engineering and Technology, Hyderabad, T.S, India

Abstract

A Solar grass cutter is a machine that uses Rotating 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, college's etc. Our main aim in pollution control is attained through this. Unskilled operation can operate easily and maintain the lawn very fine and uniform surface look. In our project, solar grass cutter is used to cut the different grasses for the different application. Due to the continuous increase in the cost of fuel and the effect of emission of gases from the burnt fuel into the atmosphere, this necessitated the use of the abundant solar energy from the sun as a source of power to drive a lawn cutter.

Keywords: Lawncutter, Sophisticated devices, Maintain, Cut.

1. Introduction

The use of solar power as an alternative source of energy has been in existence longbefore now but has not had diverse application methods due to other frequently used sources of energy. Solar energy involves the process of harnessing radiant light and heat from the sun using a range of ever evolving technologies such as solar thermal energy and photovoltaics. These technologies are broadly characterized as either passive solar or active solar depending on how the energy is converted to solar power.The effectiveness of these technologies have made solar energy a very important sourceof renewable energy and thereby giving room for new developments in its wide range application processes. In the world today, world's power consumption is taking a shift from the use of common sources of energy such as fossil fuel and wood fuels to solar energy. The change in energy consumption trend was due to the awareness of fossil fuel pollution and its contribution to global warming, and also the fact that fuel energyis non-renewable and unsustainable. In Nigeria today, like most other developing countries, fossil fuel has been a basic source of non-renewable energy. Pending the fact that we import fuel there is always a tendency of a hike in the cost of fuel as a result of the country economic instability. Lawn maintenance is the art and vocation of keepinga lawn healthy, clean, safe and attractive, typically in a garden, park, institutional setting or estate. Man is constantly trying to adapt to his environment by creating a habitat suitable for his survival

The first lawn cutter was invented by Edwin Budding in 1830 in Thrupp Glouchestershire, England. His mower was designed primarily to cut the grass on sports grounds and extensive gardens as superior to scythe. The scythe was the first device ever used to cut grass to a desirable height. It has a simple design, containing a long wooden handle with a curved blade attached perpendicularly to the end. Until the 19th century, the scythe was the only option for cutting grass, which proved to be a long tedious process. Budding's idea of a lawn cutter came after watching a machine in a local cloth mill which used a cutting cylinder mounted on a bench to trim clothes for a smooth finish after weaving (Ramalingeswara, 2015). Budding assumed that similar concept could be used to cut grass if the mechanism is mounted on a wheel frame to enable the blades rotate close to the lawns surface. These early machines were made of cast iron and featured a large rear roller with a cutting cylinder (reel) in front. The cutting cylinder

Fig: 1 concept of the first lawn cutter

contained several blades connected in series around the cylinder (Sheikh & Ahmad, 2018). The cast iron gear wheel transmitted power from the rear roller to the cutting cylinder blade. After the development of buddings lawn cutter, he made an agreement with John Ferebee, a fellow English engineer. After obtaining a patent in 1830, Ferebee had license to manufacture and sell the product. During the production of his product, he licensed other companies, allowing them to produce the mower as well. Other companies were finally able to produce their own mowers in the 1850s when the patent was terminated. Thomas Green innovated the first ever chain driven lawn cutter in 1859. Since Green used chains to transmit power from the roller rather than gears, it reduced the noise of the mower. Amariah Hills was the first American to obtain a patent for a mower design and innovated the Archimedean lawn cutter Co. in 1871 (Venkatesh, 2015). In 1870, Elwood McGuire of Richmond, Indiana designed a human pushed lawn cutter, which had a very lightweight and became a commercial success (Venkatesh, 2015). This design made it possible for the operator to easily move the mower rather than exerting as much energy as the older push mower designs required. Although a lighter push mower had been designed, mowing grass proved to be an inconvenient and long task. Therefore, a non-man powered mower was desired. Resorting back to horse drawn mowers was not an option in order to keep a pristine lawn and resulted in the next big innovation of motorized mowers. In the 1890s, steam powered engines were commonly used, but the time it took to fire it up became even more of an issue which created the desire

for an engine that utilizes a different source of energy. In 1900, Ransome's, Sims, and Jefferies produced one of the best ever English machines, the first internal combustion gasoline engines available in chain or gear driven models. In 1919, Colonel Edwin George helped the United States in manufacturing gasoline powered mowers. Although this engine powered mowers were available, they were rarely used in households due to the economic problems of the time. In the 1920s and 1930s the electric powered mower, along with rotary cutting, were created but did not become popular until considerably later. Throughout the 1940s the only innovations were developing smaller, lighter weight designs along with more powerful engines. In the 1960s, the designs were now being produced in plastic materials to further reduce the weight and cost.

A lawn cutter is a machine that uses single or multiple rotational blades to cut a grass surface to a uniform level. The mower is easy to operate and consists of a rotating blade and roller. The blade removes the extra grass growth on the lawn and the roller gives minimal pressure to the top surface of the lawn. The blades may be powered either by pushing the mower forward to operate the mechanical blades, or by an electric motor, by solar power or by a small internal combustion engine to spin the blades. Mowers employing a blade that rotates about a vertical axis are known as cutters, while those employing a blade assembly that rotates about a horizontal axis are known as cylinder reels. Many different designs have been produced for their various purposes. The smallest types which are pushed by man are suitable for small residential lawns and gardens, while more complex mowers are suitable for large lawns, and the largest multi-gang mowers which are

2. SOLAR PANEL SELECTION

As per Material Using given below table Prepare Solar Panel Table: 1 MATERIAL SELECTION

S/N	COMPONENTS	MATERIAL SUITABLE	REASON FOR SELECTION
1	Blade	Mild Steel	Strength, Resistance to corrosion

2	Motor	DC Motor	Easily accessible and economical
3	Battery	12Volts,7Amps	Rechargeable, durability and economical
4	Solar Panel	10Watts	Functionality
5	Frame	Mild Steel	Strength

2.1 FABRICATION

The mechanical aspect comprises several parts which are coupled together to form a frame for the solar panel, seat for the battery, and the blade design. A square pipe with a width of 20mm and a thickness of 2mm has been taken for a specific purpose as shown in figure (4.1.1). Square pipes are often used in various industries, such as construction, engineering, and manufacturing, due to their strong and durable nature. The width of mm provides a good balance between strength and size, making it suitable for many applications. The thickness of 2mm indicates that the pipe is relatively thin, which can be important for weight reduction and ease of handling.However, it is important to note that the strength and suitability of
a square pipe for a specific application depends on various a square pipe for a specific application depends on

Fig: 3 square pipe

Fig: 4 Frame Cutting Pipe

various

2.2 Total Expenditure Cost Analysis

As per Material Using given below table Prepare Solar grass Cutter Table: 2

SNO	SPECIFICATIONS	QUANTITY
1	DC MOTOR	4
2	BLUETOOTH MODULE HC 05	1
3	BATTERY	1
4	SOLAR PANELS	1
5	BLADES	1
6	CABLES	8
7	FRAME RODS	4
8	WELDING WORKS	
9	DC BUSHLESS MOTOR	1

2.3 Model of Solar grass Cutter

Fig: 5 Model of Solar Gras Cutter

3. Result And Discussion

Solar Panel is connected to battery. Battery provides 5 V DC supply to the system which can be minimized to 5V DC voltage using voltage regulator. The Arduino is operated with 5V DC voltage. The LCD module, Bluetooth module, DC motors, buzzer are connected with output pins of ATmega328P microcontroller. Figure 9 below shows the flowchart of the system. Figure 9: - Flowchart of the system As shown in figure 9 above, initially the 12 V battery supply needed to start. This supply will be converted into 5V DC supply using voltage regulator. This 5V supply will be provided to microcontroller. The Bluetooth module needed to be started and connected to the android smart phone. Once the connection is established between the smart phone and the system, user can move this system in vertical and horizontal direction using android application in smart phone. User will start the grass cutter to cut the grass of desired location. After completing grass cutting task, user will switch OFF the grass cutter using android smart phone. Then the main system can be switched OFF by disconnecting the 12V battery supply to the system.

4. Conclusion

This research shows the implementation of smart phone operated grass cutter. This grass cutter can be operated using android smart phone within a 10 meter range. The user can perform horizontal and vertical movement of grass cutter using android application in smart phone. This system uses 5V 1.5AH lead acid battery. This battery can be charge by solar energy. To charge this battery the 5v, 2Watt solar panel is connected with this system. This system is cheaper, rugged and durable. With the use of this system human efforts for grass cutting are highly minimized. Also, manual grass cutting can create non-uniform grass size. But with the use of this system the grass cutting is uniform, and one can use this system to cut the grass of any playground.

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