

Design and Fabrication of engine powered mechanical sickle

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Abstract

In my seminar I design 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 engine, gear, cam, chain and sprocket, lead screw, wheel, control unit. Below the gear arrangement cutting blade is fixed. When the engine starts running 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 grass 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.

Keywords: Grass Cutting Machine, Components, Power Supply, Sickle Bar.

1. Introduction

Grass cutter machines have become very popular today. Most common machines are used for soft grass furnishing. In our project Grass cutter machine we are aimed to develop for operation and construction. Agriculture is the most important sector in the Indian economy. In India there is a great scope of grass cutter machine. In our country as well as other countries has also it is used in various fields for cutting the grass. The machine may consist of two, three or four blades depending upon the machine. The grass cutting machine is known as lawn mower. The grass cutting machine is available in the various types like reel mower, rotary and mulching mower, hover mower, riding mower, professional mower etc. but these are very costly and unaffordable also. Also, it requires a skilled person to operate it. Hence, it was found necessary to have a grass cutter with minimum initial cost and can be operated by unskilled labour the machines required for manufacturing includes welding machine, grinding machine etc. Working principle of the grass cutter is providing a high speed rotation to the blade, which helps to cut the grass. The blade will get kinetic energy while increasing the rpm. The cutting edges are very smooth and accurate. Also Electric Grass Cutting Machines are much easier to be used in garden, lawn and grass fields. In order to enhance the beauty of home-lawns and gardens, Grass cutting machines are the best available option in the industry. A vertical mounted electrical motor operated grass cutter was found to be an alternative to common rotor mower. The grass cutters do the better job of cutting grass or lawn grass. The vertical rotor shaft has many pairs of swinging knives that cut the grass at equal height. If the blade cannot cut the grass by the first blade, then it can be cut by the other three remaining blades. The commercially available units for mowing or grass cutting are casting heavily. The grass was cut above the ground surface without damaging the blades when it strikes on immovable object such as rock, stone. The grass cutting takes place due to impact and shearing action

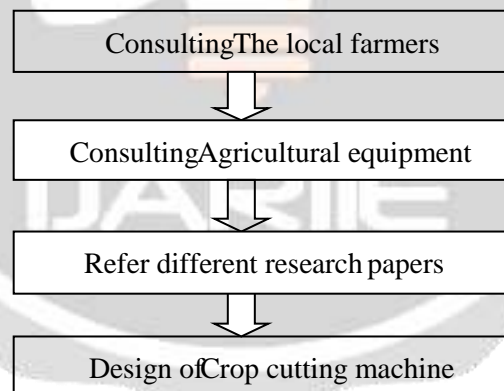
2. Literature review

The first lawn mower was invented by Edwin Budding in 1827 in Stroud, Gloucestershire. Budding's mower was designed primarily to cut the lawn on sports grounds and expensive gardens, as a superior alternative to the scythe, and was patented in 1830. It took ten more years and further innovations to create a machine that could be worked by animals, and sixty years before a steam-powered lawn mower was built. In an agreement between John Ferrabee and Edwin Budding dated May 18, 1830, Ferrabee paid the costs of development, obtained letters of patent and acquired rights to manufacture, sell and license other manufacturers in the production of lawn mowers. Thomas Green produced the first chain-driven mower in 1859. Manufacture of lawn mowers began in the 1860s. By 1862,

Farrabee's company was making eight models in various roller sizes. He manufactured over 5000 machines until production ceased in 1863. In 1870, Elwood McGuire of Richmond, Indiana designed a human-pushed lawn mower, which was very lightweight and a commercial success. John Burr patented an improved rotary-blade lawn mower in 1899, with the wheel placement altered for better performance. Amariah Hills went on to found the Archimedean Lawn Mower Co. in 1871. Around 1900, one of the best known English machines was the Ransomes' Automaton, available in chain- or gear-driven models. JP Engineering of Leicester, founded after World War I, produced a range of very popular chain driven mowers. About this time, an operator could ride behind animals that pulled the large machines. These were the first riding mowers. The rise in popularity of lawn sports helped prompt the spread of the invention. Lawn mowers became a more efficient alternative to the scythe and domesticated grazing animals. James Sumner of Lancashire patented the first steam-powered lawn mower in 1893. His machine burned petrol and/or kerosene as fuel. After numerous advances, the machines were sold by the Stott Fertilizer and Insecticide Company of Manchester and later, the Sumner's took over sales. The company they controlled was called the Leyland Steam Motor Company. Numerous manufacturers entered the field with gasoline-driven mowers after the turn of the century. The first grass boxes were flat trays but took their present shape in the 1860s. The roller-drive lawn mower has changed very little since around 1930. Gang mowers, those with multiple sets of blades, were built in the United States in 1919 by a Mister Worthington. His company was taken over by the Jacobsen Corporation, but his name is still cast on the frames of their gang units.

3 .METHODOLOGY

Need of low cost crop cutter for a farmers Most of the Indian farmers facing the problem of lack of labours, higher cost consumed for a harvesting, manpower and time in harvesting system. Some of the conventional methods require more cost for cutting crops due to its heavy construction as well as more advanced features, and it is have a prices in lakhs which is not suitable for small land owners in India, and due to small area of land farmers are moved towards a conventional method that is more time and cost consuming method In order to solve the problems of cost of harvesting, time for harvesting should be minimized by using a new machine that increase the profit of the farmers , also overcome the situation of lack of labours. Conventional method result into back pain and blisters on hand. Our aim is to provide the low cost machine that solves these problems.



4. WORKING

Machine performs mainly three operations cutting, collecting and bunching of the crops. The engine is mounted on the frame using nut and bolts. With the help of chain drive, Engine and input shaft of bevel gear box is connected. The output shaft of the bevel gearbox is connected to collecting mechanism using belt pulley system and the other end connected to the cutting mechanism using crank shaft system. We are using a single knife reciprocating cutter whose one blade is moving and other is stationary. The slider crank used to convert rotary to reciprocating motion for cutter. Scissoring action is obtained due to reciprocating movement

5. MAIN COMPONENTS

- Engine
- Chain and sprocket
- Cam
- Gear
- Wheel
- Sickle

Engine:

Petrol engine of 0.73Kw, 3000 rpm is used. Petrol engine is used because of it has good efficiency and easily available in rural area

Sickle:

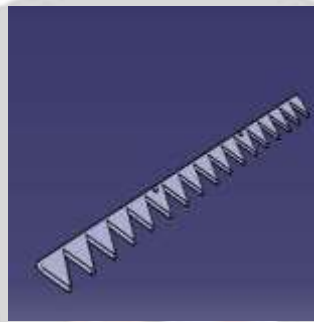


Fig: 3D model for sickle

Sickle assembly consist of a sliding cutter plate and a stationery cutter plate. The cutters used are of triangular shape. In sliding cutter plate, cutter blade is riveted on 3 mm plate and in stationery cutter plate. The stationary cutter plate can be directly bolted and fixed on frame. Sliding cutter blade is provided with 2 slots of 80 mm on its ends; it allows sliding motion to be in straight line.

Bevel gear:

It is a type of gear which is used as a differential.



Fig: bevel gear

Chain drive:

It is used to supply power one flywheel to another wheel.



Fig: 3D model for chain drive

6 .STUDIES AND FINDINGS

- To study about design component of grass cutter.
- To design field grass cutter machine that will use a less effort to cutting the grass.
- To improve efficiency of grass cutter by using various component of grass cutter.
- To study load carrying capability, strength of component of grass cutter
- To improve cutting rate.
- To improve the physical conditions of soil.
- To destroy weeds and to prepare a suitable seedbed.
- Its effect on productivity and motivation of employee.
- To improve the performance and efficiency.
- There are number of uses of grass cutting in college campus, garden etc.

7. RESEARCH ON PAPER

A. Ashish Kumar Chaudhari

In this paper they have prepared manually handle device which is capable to cut the grass. This device consists of linear blades and it does not affected by climatic conditions. The main objective of this paper is to move the grass cutter in different directions to prepare various designs as per requirements. By using link mechanism the height of the cut can be adjusted. The unskilled labour can easily operate this device [1].

B. Praful P. Ulhe

In this paper they have prepared manually operated grass cutter with spiral roller blades due to spiral blades increases the efficiency of cutting. For adjusting the height reel cutter is component placed on grass cutter. This grass cutter used to cut the grass uniformly and also it can cut the different types grasses [1].

C. Ms. Lanka Priyanka

In this paper they have fabricated grass cutting machine with tempered blades are attached to this grass cutter. This grass cutter is manually operated as well as automatic operated. The materials commonly used GI sheet, motor, wheel, Al sheet, switch, wire, square pipe and insulating material [1].

D. Edwin Beard Budding

Budding obtained the idea of the lawn mower after seeing a machine in a local cloth mill which used a cutting cylinder mounted on a bench to trim cloth to make a smooth finish after weaving. Budding realized that a similar concept would enable the cutting of grass if the mechanism could be mounted in a wheeled frame to make the blades rotate close to the lawn's surface [3].

8. FUTURE SCOPE

- By replacing the motor we can use wheel operated cutter rotation by using the sprocket, chain.
- This machine can also be used for cutting other crops such as cotton stalks and maize.
- As the field is uneven, the cutter height varies from mode to node, so a slider mechanism can be used to vary the height of cutter from time to time.

9. RESULTS AND CONCLUSION:

From this work the following result were drawn for the work to be in 1 acre area without a multi crop cutter or manually, whereas by using a multi crop cutter we can complete the same work in the same area with only one labour. The same throughout the day, as man get strained, whereas a machine cannot. Therefore, time can also be saved by using the multi crop cutter. It is concluded that the device is most economical.

It can be concluded that the machine is comparatively compact and easy to handle. This machine is able to run of field effortlessly and the efforts of farmers are reduced. The cost of harvesting using this machine is considerably less as compare to manual harvesting. The harvesters available in market are suitable for large farms, so this can be the best machine for the farmers with small land. The success of this machine depends on how the farmers receive this machine as their manually.

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