

Design And Fabrication Of Mechanical Cutter For Agriculture Purpose

B. Satish Kumar¹, Dr. Smt. G. Prasanthi²

¹ PG Research Scholar, Product design, Mechanical Engineering, JNTUA College of Engineering, Ananthapuramu-515002, Andhra Pradesh, India² Professor of Mechanical Engineering, Director, Faculty Development & IQAC, JNTUA, Ananthapuramu-515002, Andhra Pradesh, India
Corresponding Author: B. Satish Kumar

ABSTRACT

Agriculture is one of the oldest professions but the development and use of machinery has made the job title of farmer a rarity. Instead of every person having to work to provide food for themselves, smaller portion of our population today works in agriculture, the smaller portion provides considerably more food than the other can eat. The basic technology of agricultural machines has changed little in the last century with the coming of the Industrial Revolution and the development of more complicated machines. In this work it is proposed to design and fabricate the automatic mechanical cutter by using crank and slotted lever mechanism, for cutting agricultural products like sugarcane for cultivation and also used to cut wooden pieces of required size for boilers. The equipment makes the use of crank and slotted lever mechanism with one slider to couple with an electric motor.

Keywords: Mechanical cutter; four bar mechanism; crank; slotted lever; Electric motor.

Date Of Submission:02-11-2018

Date Of Acceptance:16-11-2018

I. INTRODUCTION

The foremost aim of the work is design and fabrication of mechanical cutter for agriculture purpose. This plan is to develop the machine to reduce the working cost and also to reduce the time for grass cutting operation. The equipment makes the use of crank and slotted lever mechanism with one slider to couple with an electric motor. Today's era is streaming in the direction of the rapid development of all segments comprising the agricultural sector. To meet the upcoming foodstuff demands, the agriculturalists require implementing the new skills and to aware about the new agro forming. As day by day the labor availability becomes the great concern for the farmers and labor cost is more, this machine reduces effort of the human assistance. This work contains of Motor, four bar mechanism, crank, slotted lever, and mechanical cutter. The operational principle behind the process of simple mechanical cutting mechanism is four bar chain mechanism mainly crank and slotted lever mechanisms. The crank wheel is revolved by the motor-power. Therefore, the rotating motion of the crank is changed into reciprocating motion to the knife-edge through the join link. Then after the thing to be cut is place on the stand.

1.1 Methodology

The purpose of methodology is to allow for controlling the entire process through effective

decision making and problem solving, while ensuring the success of specific processes, approaches, techniques, methods and technologies.

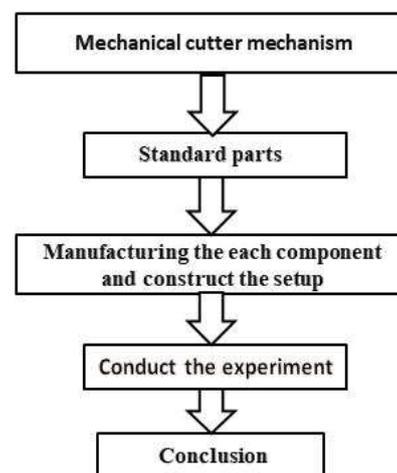


Figure 1.1 : Methodology

This process is made possible by Engineering mechanism which is combination of rigid or restraining bodies so shaped and connected that they move upon each other with a definite relative motion. A simple example of this is the slider crank mechanism used in reciprocating air compressor. In today's world smaller portion of population works in agriculture, the smaller portion

provides considerably more food than the other can eat. This basic technology of agriculture machines changed and developed the new innovative techniques. In this present work it is proposed a new method of mechanical cutting mechanism. Here the four bar mechanism is used. The four bar mechanism is used to cut the agriculture products with the help of motor. When the electrical power is given to the motor, it runs the mechanism and the mechanical cutter to cut the agriculture products.

1.2 Objective

The objective of the proposed system is to design and fabrication of mechanical cutter for agriculture purpose in order to minimize the human assistance. It is used to cut the agriculture products like sugarcane and wooden pieces for required sizes. The equipment makes the use of crank slotted lever mechanism with one slider couple with an electric motor.

II. PROPOSED SYSTEM

Table 1 : Material used

S.no	Name of the component	Quantity	Specification
1	Square shaped Rectangle shaped & L-shaped Mild steel rods	12 feet & 4 feet	NA
2	Electric motor	1	12 V, 65 N-M
3	Welding cost	NA	NA
4	Shaft rod	1	Mild steel
5	Nut and Bolts	10	Steel
6	Clamps	4	Steel

Generally dc current motors are used in all industrial and any current application because it gives better result to ac current. So in this dc current motor is used. Dc motor produce continuous movement and whose speed of revolution can easily be control it makes them ideal. The system is run by a DC motor. This motor rotates the chain drive which is used to collect the sewage waste materials in the sewage water. The specifications of the DC motor used are power 60 rpm. Dc motor consists of two parts. Dc motor one is stator and another is

rotor. Stator is stationary part and rotor is rotating part.

Table 2 : DC motor specification

Parameters	Specifications
Nominal voltage	12 V
Nominal power	50W
Nominal current	1.0-1.5 A
High speed	75-76 rpm
Low speed	50 rpm
Noise	No gear noise
Rational output	CW/CCW

Machines are a means of converting energy. Motors take electrical energy and produce mechanical energy. Electric motors are used to power hundreds of devices we use in everyday life. Motors come in various sizes. Huge motors that can take loads of 1000's of Horsepower are typically used in the industry. Some examples of large motor applications include elevators, electric trains, hoists, and heavy metal rolling mills.

III. WORKING PRINCIPLE

The working principle behind the process of simple mechanical cutting mechanism is four bar chain mechanism mainly crank and slotted lever mechanisms. In the crank and slotted lever mechanism, the single crank slider mechanism is used to fabricating the mechanical cutter for agriculture purpose. The crank is revolved by the rotor. The revolving indication of the crank is changed into reciprocating motion by the coupling link by using the slider. The reciprocating motion at the other end of the coupler link is transformed into returning motion to the knife-edge by using guide hole. The thing to be cut is place on the stand.

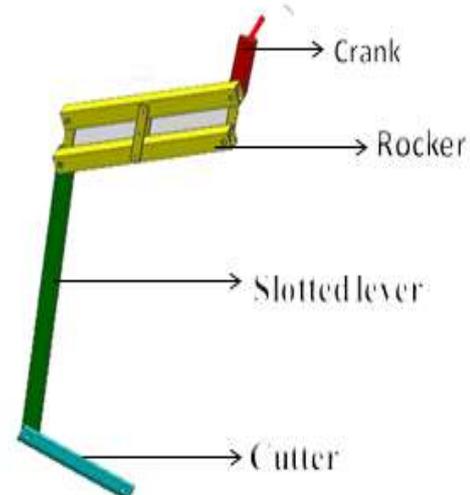


Figure 3.1 : Crank and Slotted lever mechanism

IV. EXPERIMENTAL SETUP

All the components of the fabrication of mechanical cutter such as rotor, crank, cutter, slotted lever, four bar mechanism are placed very carefully set on the frame stand as shown in figure 4.1. The existing model presents an Integrating feature of all the hardware components which has been used and developed in it. The presence of each and every module has been reasoned out and placed very carefully.



Fig 4.1 : Experimental setup of mechanical cutter.

Experimental setup represents the fabrication of mechanical cutter for agriculture purpose. For doing experiment or to check the ability of the work is created with the crank and slotted lever mechanism and all the required components are carefully connected. In the four bar mechanism having four bars called four bar linkage. As same in the four bar linkage, present work is setup in the same order wise. The electrical motor clamped on the frame. Firstly the rotor shaft is connected with the crank. The first edge of the rocker is connected with crank and the second edge of the rocker is pinned with the slotted lever, it moves along the parallel motion. Finally the slotted lever is joined with the working blade. The working blade is fixed at the bottom side of the stand.

4.1 working procedure

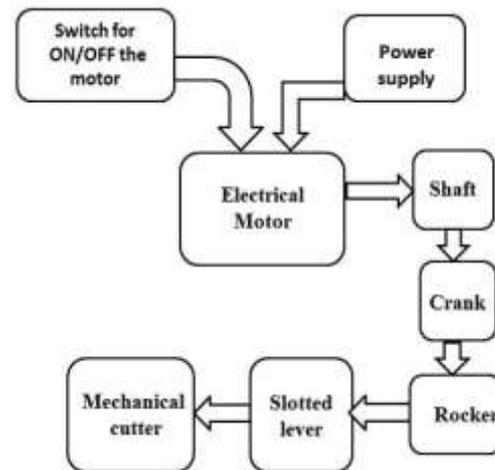


Fig 4.1.1 : Working flow chart.

The working procedure of design and fabrication of mechanical cutter is to check the ability of the work, an experimental setup is created with four bar mechanism and all required components are carefully connected. In the four bar mechanism having four bar called four bar linkage. As same in the four bar linkage, the present work is setup in the order wise. The parts or linkages of four bar linkage are crank, rocker, slotted lever, frame. The whole setup of the work is placed on a frame. The motor is working with the help of electric power supply, on the motor shaft fixing the arrangement of crank. When switch ON power button, the motor start to rotate and the total arrangements which is shown in the figure 4.1.1. Here the rotary motion is converted in to the reciprocating motion by using simple mechanisms. The reciprocating motion ram is connected to the cutters as shown in figure 4.1, so that the cutter moves upward and downward direction the cutting process is carrying out through this machine. At that situation the work means sugar cane or required size of boiler sticks is placed under the knife-edge cutter after that it will be separated and obtain require size. The separated work will fall down under the frame. Then sugarcane pieces will be collected and the process of work will be continuously repeated.

V. APPLICATIONS

This machine can be used to cut the sugarcane, kappa and wooden pieces of required size for boilers.

VI. CONCLUSION

The existing model presents an Integrating feature of all the hardware components used have been developed in it. The mechanical cutter system helps to the agriculture products cutting and also

used to decrease human assistance. The presence of each and every module has been reasoned out and placed very carefully. Hence the contributing to the best working unit for "Design and development of mechanical cutter" has been designed and fabricated perfectly. Thus, the work has been successfully fabricated and tested.

REFERENCES

- [1]. N. Nagarajan, N.S. Siva Kumar and R. Savanna "Design and Fabrication of Lawn Mower" in *Asian Journal of Applied Science and Technology*, Volume 1, Issue4, Pages50-54, May2017
<http://ajast.net/data/uploads/4ajast-13.pdf>.
- [2]. Bidgar Pravin Dilip, Nikhil Babu Pagar, Vickey S. Ugale, Sandip Wani, Sharmila "Design and Implementation of Automatic Solar Grass Cutter" in *International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering*, Vol.6, Issue4, April2017, http://www.ijareeie.com/upload/2017/april/37_Design.pdf.
- [3]. G.Manoj Kumar, G. Sravanthi, J. Ankamma Chowdary, D. Aparna, V. Ajay Kumar "Solar Grass Cutter Robot with Obstacle Avoidance" in *International Journal of Engineering Science and Computing* Volume 7, Issue No.4,
<http://ijesc.org/upload/80f06c7ba794e5eea579464954c9758d.Solar%20Grass%20Cutter%20Robot%20with%20Obstacle%20Avoidance.pdf>
- [4]. Mahesh Pande, Pratik Kuduse, Milind Pethkar, Lukesh Manusmare "Design and Fabrication of Grass Cutter" in *International Journal for Research in Applied Science & Engineering Technology (IJRASET)*, Volume 6 Issue I, January2018
<https://www.ijraset.com/files/serve.php?FID=13104>
- [5]. Hajrachoudhury S.K., Hajrachoudhury, A.K. Nirjharroy, *Elements of workshop technology volume II –twelfth edition* Media promoters and publishers pvt .Ltd, 2007.
- [6]. Rattan .S.S *Theory of machines* third edition. Tata McGraw Hill publications, New Delhi ,1988.
- [7]. Roa .J.S. and Dukkipatti T.V, *Mechanism and machine theory*" Wiley eastern ltd, New Delhi 1992.
- [8]. Bansal, R.K. *Strength of materials*". Lakshmi Publishers. Joseph Edward Shigley and Charles R. Mischke *Mechanical Engineering Design* " McGraw Hill Publications, 1989.
- [9]. Wen-Hsiang Hsieh and Chia-Heng Tsai, *A Study On A Novel Quick Return Mechanism*, Vol. No. 08-CSME-13, E.I.C. Accession 3051, September 2009.
- [10]. Prof. N.M. Pachkhande, Dhiraj V. Rade and Vikas G. Nagapure, "Small Scale Sugarcane Cutter Machine", *International Journal For Engineering Applications And Technology*, 2015.
- [11]. Mr. Rohit J.Masute, Dr. Sharad S.Chaudhari and Prof .S. S. Khedkar, "Design And Fabrication Of Small Scale Sugarcane Harvester", *IJRDO-Journal Of Mechanical And Civil Engineering*, 2015.
- [12]. R.Balaiah, Dr.Smt.G.Prasanthi, "Fabrication of solar powered Lawnmower " *International Journal of Scientific Research in Science and Technology*/<http://ijsrt.com>, Print ISSN: 23956011, Online ISSN:2395-602X, UGC Approved Journal No:64011, vol:3, Issue 8 November-December-2017, pp.477-480.

B. Satish Kumar "Design And Fabrication Of Mechanical Cutter For Agriculture Purpose"
"*International Journal of Engineering Research and Applications (IJERA)* , vol. 8, no.11,
2018, pp 27-30