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DESIGN AND FABRICATION OF BUND AND GRASS CUTTING MACHINE

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Abstract: To fabricate a machine that is used to size the bunds of an agricultural field by removing the grass that grows on the sides of the bund. This is based on the principle that an engine's output is transmitted to the cutter through a universal joint, a propeller shaft and a bevel gear arrangement which removes the grass and sizes the bund. The cutter is rotated by the power produced by the engine and a bevel gear arrangement is setup to transmit the power to the cutter which is held normal to the axis of rotation of the propeller shaft. When the engine is turned on, the power transmitted from the engine is taken to the cutting tool through a universal coupling, propeller shaft and a bevel gear setup. The shaft of the engine is connected to the propeller shaft through constant velocity universal joint and this shaft is used to transmit power to the cutting through the 1:1 bevel gear setup to rotate the cutter and enable the cutting process. This rotation of the cutter is used to resize the bund by removing the grass on the sides of the bunds of the agricultural field. Many types of lawn mowers, bush cutters and lawn tractors exist in the market, which may not fulfill the capital and operational cost criteria. The main concentration of our design is the cost and operational ease. During design, development and fabrication the machine was under field tests like determination of torque and force analysis, after testing we succeed to have a satisfactory performance, though it requires further more improvements which can be done.

Keywords: Cutting Machine, Fabricate

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INTRODUCTION

Agricultural machinery is machinery used in the operation of an agricultural area or farm. Modern agriculture depends heavily on engineering, technology and the biological and physical sciences. Irrigation, drainage, conservation and channeling are all important fields to guarantee success in agriculture and require the expertise of agricultural engineers. Agricultural chemistry deals with other issues vital to agriculture, such as the use of fertilizers, insecticides and fungicides, soil structure, analysis of agricultural products and the nutritional needs of farm animals. Plant breeding and genetics represents an invaluable contribution to agricultural productivity. Genetics has also introduced a scientific basis in animal husbandry. Hydroponics, a method in which plants thrive without soil by chemical nutrient solutions can solve other additional agricultural problems. The packaging, processing and marketing are closely related activities also influenced by the development of science. The methods of rapid freezing and dehydration have increased the markets for agricultural products. Mechanization, the outstanding feature of agriculture in the late nineteenth and twentieth century has relieved much the work of the farmer. Even more significantly, mechanization has increased efficiency and productivity of farms. Planes and helicopters are used for agriculture purposes, such as planting, transportation of perishable goods and fighting forest fires and crop fumigant to control insect pests and diseases. The radio and television transmit vital weather data and other information of interest to farmers.

DESIGN AND FABRICATION PROCEDURE

The grass cutting machine is used to cut the unwanted grass that many places. To removing the grass some sizes clearly. Man cutting the grass manually so the energy will be loss and to take more time. This grass cutting machine is capable of doing the work done by a man in 8 hours in just 30 min. Moreover the equipment is very handy and efficient that the farmer himself can handle it and the equipment is very cheap. Engine, Propeller shaft, Universal joint, Gear arrangement, cutter are the main parts used to fabricate bund and grass cutting machine.

ENGINE:

An engine is a machine designed to convert energy into useful mechanical motion. It used to run the other machinery parts. Engine has internal and external combustion engines.

Internal combustion engines:The internal combustion engine is an engine in which the combustion of a fuel (generally, fossil fuel) occurs with an oxidizer (usually air) in a combustion chamber. In an internal combustion engine the expansion of the high temperature and high

pressure gases, which are produced by the combustion, directly applies force to components of the engine, such as the pistons or turbine blades or a nozzle, and by moving it over a distance, generates useful mechanical energy.

PROPELLER SHAFT:

A drive shaft, driveshaft, driving shaft, propeller shaft (prop shaft), or Cardan shaft is a mechanical component for transmitting torque and rotation, usually used to connect other components of a drive train that cannot be connected directly because of distance or the need to allow for relative movement between them.

Drive shafts are carriers of torque: they are subject to torsion and shear stress, equivalent to the difference between the input torque and the load. They must therefore be strong enough to bear the stress, whilst avoiding too much additional weight as that would in turn increase their inertia.

UNIVERSAL JOINT:

A universal joint, universal coupling, U-joint, Cardan joint, Hardy-Spicer joint, or Hooke's joint is a joint or coupling in a rigid rod that allows the rod to 'bend' in any direction, and is commonly used in shafts that transmit rotary motion. It consists of a pair of hinges located close together, oriented at 90° to each other, connected by a cross shaft.

This project was designed by using CATIA software version V5R20. Using main comments are sketch, features and assembly. In sketch workbench Line, arc and circle comments are used. In features workbench pad comment used to extrude, revolve the solid. In assembly workbench the solids are assembled using mate comment.

DESIGN CALCULATIONS

Calculation of torque:

$$P = (2\pi NT)/60$$

Design for diameter of guide rod:

Using the formula, $T_E = \pi/16 \times D^3 \times t_s$

FABRICATION OF COMPONENTS

Engine: The main component of the machine is responsible for the power production. An engine is chosen as the driver because of the torque and power produced by an engine is very high and electricity problem is overcome. The chosen engine is a 0.90 KW @ 5500 rpm.

Universal joint: The universal joint is made of mild steel. This universal joint is the member of the machine which is directly to the engine shaft. The output from the engine is directly transmitted and hence it should also be capable of transmitting such as high power.

Propeller shaft: The propeller shaft is made of mild steel to transmit such high power from the engine to the bevel gear. It is also chosen such that it can withstand such high torque.

Pipe: Steel pipe was chosen as the pipe material for reduction in weight and stability. A pipe is of 30mm diameter so that it can hold the shaft through bearing. The pipe is the main supporting member of this project. The whole load of this set up acts on the pipe.

Bearing: Single row deep groove ball bearings are particularly versatile. They are simple in design, non-separable, suitable for high and even very high speeds and are robust in operation, requiring little maintenance. Deep raceway grooves and the close conformity between the raceway grooves and the balls enable deep groove ball bearings to accommodate axial loads in both directions, in addition to radial loads, even at high speeds.

Bevel gear: This component of the machine is responsible for the transmission of the power from propeller shaft to the cutting tool. This Component is capable of reducing the speed and increasing the torque or vice versa. The gear ratio is kept 1:1 to maintain the same speed between the input and output.

Cutter: The cutter is rotated by the power produced by the engine and a bevel gear arrangement is setup to transmit the power to the cutter which is held normal to the axis of rotation of the propeller shaft. This rotation of the cutter is used to resize the bund by removing the grass on the sides of the bunds of the agricultural field. Cutter is made by cast iron and size of the cutter is 300mm diameter and 60 teeth.

Belt: A belt is provided to increase the stability and ease of using the machine. The belt is responsible for holding the machine with high stability the belt is made of Rexene due to its high durability

Nuts and Bolt: Standard nuts and bolts of specifications M8 and M10 are chosen and brought which used to fix arms of the pantograph machine.

WORKING PRINCIPLE

When the engine is started to rotate the engine shaft and it connected to the universal joint. Engine power transmits to the universal joint so rotate the universal joint and then propeller shaft connected to universal joint. Propeller shaft is connected to the gear box set up; when propeller shaft rotate, bevel gear is used in gear box setup because of power transmit to the 90 degree angle. The cutter is rotated by the power produced by the engine and a bevel gear arrangement is setup to transmit the power to the cutter which is held normal to the axis of rotation of the propeller shaft. This rotation of the cutter is used to resize the bund by removing the grass on the sides of the bunds of the agricultural field. The cutter is rotated vertically it need high torque because to cut the bund so the high torque engine is used. Change the machine position to cut the grass in garden and agricultural areas.



CONCLUSION

Thus a model bund and grass cutting machine using I.C Engine was designed and fabricated successfully including all the components required. It has been tested and operated successfully. The project helped us realize as to what and how a bund and grass cutting machine works. It has helped us gain thorough knowledge on the working of I.C Engines and power transmission. Also, the project gave an idea about basic of design and fabrication work of various mechanisms and basic operations like turning, welding, facing, grinding, carving and sawing. This mechanism has been used in various other applications like milling, copy lathe, etc.

The ultimate machine has been fabricate was successfully upgraded the mini project done in refer to the grass cutting machine. This machine had required the performing 200 minutes consumed per time and machining 2300 meters bund. Change the machine position to cut the grass in garden and agricultural areas. This is very useful to the former based on the efficient of

this machine. Advantages of Bund Cutting Machine reduce the man power, time consumed, and cost, very small and handy. Advantages of grass cutting machine cutting the extra grass in garden and its process will contained quickly.

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