

Desing and Fabrication of Multipurpose Agriculture Weeder and Plough

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ABSTRACT:

Agriculture is becoming critical day by day, due to urbanization and modernization availability of land is decreasing. There is need to utilize and increase fertility of available land to increase productivity of crop. So the usual maintenance of soil is required. The main purpose of maintenance is to create a favourable environment for the sustained growth of crop. In our work a compact machinery which is powered by means of engine is fabricated, which is capable of performing sand ploughing operation. In this vehicle the Rotary tiller blades are used to achieve advantages of lower draft requirements, better soil breakup and more efficient inversion and trash mixing. These blades are fabricated in different shapes with standard dimensions in order to reduce the energy requirement for tillage and also to increase the cutting force of the rotary blades.

Keywords: Increased productivity, Cultivation, Ploughing.

1. INTRODUCTION:

Agriculture and farming is about more than just simply planting crops. In many if not most cases, the soil also has to be tended to. Farmers have to pay attention to things like soil moisture, nutrient levels, and drainage in order for their plants to grow. Turning the soil and mixing it up a bit before planting is something most farmers and growers do to help the roots take hold and to loosen debris like rocks or other things that could impede proper root growth or nutrient absorption Tillers, whether manual or powered, are an important part of this process. These tools can prepare the ground for new plantings, which

can help them grow stronger and become more resilient, two qualities essential for optimal growth. A power tiller is basically a set of blade that are mounted within a wheeled housing and are powered by either a gasoline engine or an electric motor. tine consists of four blades curving in alternately Each Blades one and three are curved pointing in toward the tiller; blades two and four are curved pointing away from the tiller. The inward-pointing tines keep the clods of soil and grass from accumulating on the blades, while the outward-pointing tines are the heavy cutters. They all work in conjunction with one another to dig into the soil aggressively, all the while moving soil away from the tines to avoid clogging them.

2. SCOPE AND OBJECTIVE:

2.1 SCOPE OF THE PROJECT

- The multipurpose agriculture vehicle is designed for small farmers in future
- The project will become an example for future works

2.2 OBJECTIVES OF THE PROJECT:

- The reduction of the cost of the ploughing tool
- The life of the ploughing tool is increase

3. METHODOLOGY:

3.1 CHASSIS OF THE VEHICLE:

The choice of material for the vehicle is the first and most important factor for automotive design. There is variety of materials that can be used in automotive body and chassis. The most important

criteria that a material should meet are light weight, economic effectiveness, safety, recyclability, and life cycle consideration. Some of these criteria the result of legislation and regulation. The main factor for selecting material specially for body is wide variety of characteristics such as thermal, chemical and mechanical resistant which are ease for manufacturing and durability. In the frame only the main supporting structures such as engine of the vehicle, the harvester and ploughing tool are mounted. It support the tool static and dynamic load of the vehicle.

4. DIAGRAM:

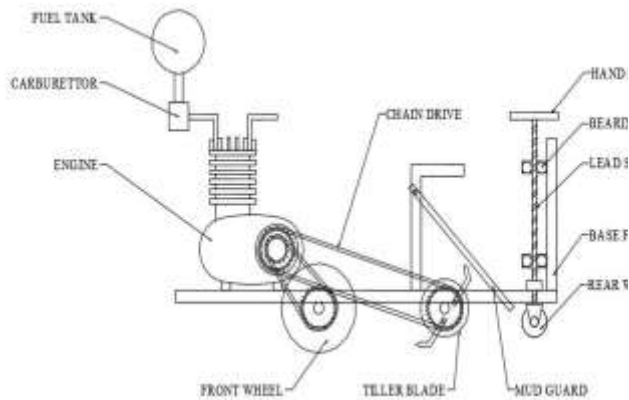


Fig.1

5. WORKING PRINCIPLE:

When the engine gets kick started it starts transmitting its rotation to the rear axle shaft with the help of chain drive. Thus the vehicle moves forward, on the other hand the rotation that gets experienced by the rear axle shaft is transferred to the power tiller shaft by means of another chain drive which connects tiller shaft with rear axle. Since the tiller blades are placed by digging inside the field it starts to mix the soil in a high efficient rate with less time

consumption. The speed of vehicle as well as the tiller is controlled by means of adjusting the throttle by the operator.

6. CONSTRUCTIONAL:

6.1 FOUR STROKE ENGINE:

A four-stroke engine is an internal combustion engine in which the piston completes four separate strokes while turning the crankshaft. A stroke refers to the full travel of the piston along the cylinder, in either direction. The four separate strokes are termed:

Intake: also known as induction or suction. This stroke of the piston begins at top dead center and ends at bottom dead center. In this stroke the intake valve must be in the open position while the piston pulls an air-fuel mixture into the cylinder by producing vacuum pressure into the cylinder through its downward motion. The piston is moving down as air is being sucked in by the downward motion against the piston

Compression: This stroke begins at B.D.C, or just at the end of the suction stroke, and ends at T.D.C. In this stroke the piston compresses the air-fuel mixture in preparation for ignition during the power stroke. Both the intake and exhaust valves are closed during this stage.

This stroke produces mechanical work from the engine to turn the crankshaft.

Exhaust: also known as outlet. During the *exhaust* stroke, the piston once again returns from B.D.C. to T.D.C. while the exhaust valve is open. This action expels the spent air-fuel mixture through the exhaust valve

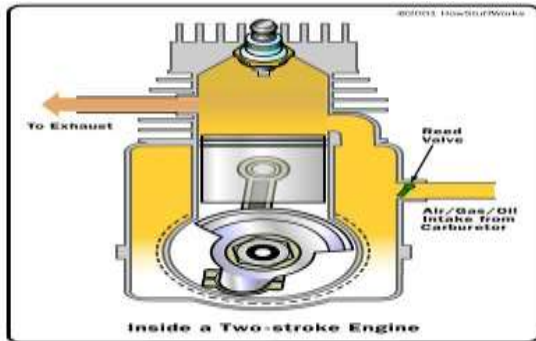


Fig. 2

6.2 CULTIVATOR :

A cultivator is any of several types of farm implement used for secondary tillage. One sense of the name refers to frames with teeth that pierce the soil as they are dragged through it linearly. Another sense refers to machines that use rotary motion of disks or teeth to accomplish a similar result. The rotary tiller is a principal example.

Cultivators stir and pulverize the soil, either before planting or after the crop has begun growing. Unlike a harrow, which disturbs the entire surface of the soil, cultivators are designed to disturb the soil in careful patterns, sparing the crop plants but disrupting the weeds. Cultivators of the toothed type are often similar in form to chisel plows, but their goals are different. Cultivator teeth work near the surface, usually for weed control, whereas chisel plow shanks work deep beneath the surface, breaking up hardpan. Consequently, cultivating also takes much less power per shank than does chisel plowing. The basic idea of soil scratching for weed control is ancient and was done with hoes or mattocks for millennia before cultivators were developed. Cultivators were originally drawn by draft animals or were pushed or drawn by people. In modern commercial agriculture, the amount of cultivating done for weed control has been greatly reduced via use of herbicides instead. However, herbicides are not always desirable for example, in organic farming. The powered rotary hoe was invented by Arthur Clifford Howard who, in

1912, began experimenting with rotary tillage on his father's farm at Gilgandra, New South Wales, Australia. Initially using his father's steam tractor engine as a power source, he found that ground could be mechanically tilled without soil-packing occurring, as was the case with normal Ploughing. With fellow apprentice Everard McCleary, he established a company to make his machine, but plans were interrupted by World War I. In 1919 Howard returned to Australia and resumed his design work, patenting a design with 5 rotary hoe cultivator blades and an internal combustion engine in 1920. In March 1922, Howard formed the company Austral Auto Cultivators Pty Ltd, which later became known as Howard Auto Cultivators of Soroe, Denmark. When herbicidal weed control was first widely commercialized in the 1950s and 1960s, it played into that era's optimistic worldview in which sciences such as chemistry would usher in a new age of modernity that would leave old-fashioned practices in the dustbin of history.



Fig. 3

6.3 FUEL TANK:

A fuel tank is a safe container for flammable fluids. Though any storage tank for fuel may be so called, the term is typically applied to part of an engine system in which the fuel is stored and propelled or released into an engine. Fuel tanks range in size and complexity from the small plastic tank of a butane lighter to the multi-chambered cryogenic Space Shuttle external tank. While most tanks are manufactured, some fuel tanks are still fabricated by metal craftsmen or hand-made in the case of bladder-style tanks. These include custom

and restoration tanks for automotive, aircraft, motorcycles, and even tractors. Construction of fuel tanks follows a series of specific steps.

6.4 CHAIN SPROCKET :

Chain drive is a way of transmitting mechanical power from one place to another. It is often used to convey power to the wheels of a vehicle, particularly bicycles and motorcycles. It is also used in a wide variety of machines besides vehicles.

Most often, the power is conveyed by a roller chain, known as the drive chain or transmission chain, passing over a sprocket gear, with the teeth of the gear meshing with the holes in the links of the chain.

Roller Chain Definition

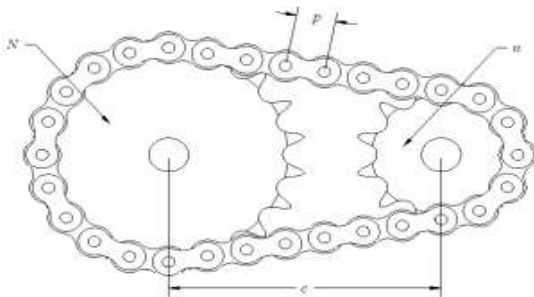


Fig. 4

Sometimes the power is output by simply rotating the chain, which can be used to lift or drag objects. In other situations, a second gear is placed and the power is recovered by attaching shafts or hubs to this gear. Though drive chains are often simple oval loops, they can also go around corners by placing more than two gears along the chain; gears that do not put power into the system or transmit it out are generally known as idler-wheels. By varying the diameter of the input and output gears with respect to each other, the gear ratio can be altered. For example, when the bicycle pedals' gear rotate once, it causes the gear that drives the wheels to rotate more than one revolution.

6.4.1 CHARACTERISTICS:

- High axial stiffness
- Low bending stiffness
- High efficiency
- Relatively cheap



Fig. 5

6.5 BALL BEARING:

A ball bearing is a type of rolling-element bearing that uses balls to maintain the separation between the bearing races. The purpose of a ball bearing is to reduce rotational friction and support radial and axial loads. It achieves this by using at least three races to contain the balls and transmit the loads through the balls. In most applications, one race is stationary and the other is attached to the rotating assembly. As one of the bearing races rotates it causes the balls to rotate as well. Because the balls are rolling they have a much lower coefficient of friction than if two flat surfaces were sliding against each other.

6.5.1 SPECIFICATION:

INNER DIA :12mm

OUTER DIA : 37mm



Fig. 6

7. MATERIALS REQUIRED:

S.NO	DESCRIPTION	QUANTITY
1	WHEEL	3
2	CHAIN DRIVE	2
3	BEARING	12
4	FRAME, METAL STRIP, SHAFT	AS PER REQUIREMENT
5	LEAD SCREW	1
6	SHEET METAL	1
7	FOUR STROKE ENGINE	1
8	FUEL TANK	1
9	CULTIVATOR	1
10	DISC	1

8. ADVANTAGES:

- Easy to maintain
- High efficiency
- Easy to customize
- Adaptability

- The thickness of the blade ensures a long lasting performance and reduces the cost of tilling per hectare.
- The blades have an increased weight, length and weight due to which, soil can be cut much deeper than the plough mouldboard.
- It improves the soil fertility because the fertilizers can be mixed easily and be removed of any weeds and crop residues.

9. APPLICATION:

- Agricultural use
- Ploughing
- Weeds removal
- For softening
- For harvesting small crops

10. CONCLUSION:

- At the power tiller handle position, the vibration
- acceleration peaks were occurred in the frequency of the
- engine rotational speed.
- The vibration acceleration increased with increasing
- engine speed throughout the experiments.
- direction. The experimental results indicated that the
- maximum and minimum values belong to vertical and
- longitudinal directions, respectively
- The amplitude of total vibration acceleration at the
- power tiller handle position was greater than the allowable
- vibration exposure limit in the frequency range of 10-80 Hz
- The vibration acceleration at the trailer seat in the
- frequency ranges of 4-6.3 Hz and 31.5-40 Hz was more
- than the standard limit



- The allowable exposure time in the heavy gears was
- greater than the lighter gears.
- It is necessary to reduce the vibration transmitted to
- the user's hand and body by designing and developing
- adequate insulating systems or isolators

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