

FABRICATION OF SOLAR POWERED SOIL DIGGING MACHINE

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ABSTRACT

This paper discusses about the fabrication of soil digging machine. This machine operate on solar energy and used for making dig in the soil for plantation of smaller saplings .The machine uses the principle of auger drilling machine which is used in during construction of pile foundation. Required size of auger bit is made by scaling down its original size as per the requirement. The machine is made automatic by employing electric D.C. motor which serves rotating power source for soil digging. This machine totally operate on green energy i.e. solar energy which one of the non-conventional sources. This machine is fabricated for a preliminary aim of avoiding use of spade and digging bar in plantation of sapling thereby making it facile by enhancing the plantation process.

Keyword: Soil digging, solar energy, Auger bit, Drilling, Non-conventional sources.

I.INTRODUCTION

Fabrication is the process which used to manufacture material components that will, when assembled and joined together from a complete structure or frame. Fabrication of metal is the creation of metal parts by cutting, welding, bending, forming, grinding, drilling and assembling processes. It is a process of creation of machines, structure and parts from various raw material. The shops specializing in this type of work are called fab shops, and a fabricated product called a fabrication. In this our venture, the whole machine parts are gone through the various processes of fabrication. For the making of frame a mild steel square section pipe goes on cutting process as per the required dimensions and then joined together by means of arc welding process. For the removable joining or for the support a drilling operation is carried out for making bore to installed nut and bolt. A grinding operation is used to material surface finishing.

The fundamental aim of our venture has to build up a solar powered digging machine,

which is sunlight based fuelled. In this system solar panel used to catch and convert solar radiation into electrical energy. Thus is utilised to charge two 12V batteries, which then gives the vital energy to rotate DC motor. Then this rotating power transmitted to the auger bit through chain drive. Thus, in this venture an endeavour is made to make electric and mechanical framework share their forces in a productive way.

II.OBJECTIVES

The objectives of fabrication a system for Solar Powered Soil Digging Machine is:

- To make a portable machine with the use of battery as a power source
- Low cost as compare to existing engine operated machine.
- To make a machine with more efficient and less noise.
- Minimize the time and effort required by arranging simple mechanical and electrical mechanisms.
- To develop machine which will require less labour and which can be operate with unskilled operator.
- It will completely operate on green energy.

III.COMPONENTS

1. FRAME: It is a structure of different shapes like curved or straight. It is a supporting member on which other equipment are mounted.



Fig 1: Photographic view of frame

Material: Mild Steel

2. SOLAR PANEL: Solar panel are made of photovoltaic (PV) cell get connected in series and parallel combination. Solar panel transfer sunlight directly in electricity.



Fig 2. Photographic view of solar panel

Type: monocrystalline

Power: 10W (each)

Quantity: 2

3. BATTERY: An electric battery is a gadget comprising of at least one electrochemical cell that change over stored chemical energy into electrical energy. It is a storing device of energy means.



Fig 3. Photographic view of battery

Battery: lead acid battery

Nominal voltage: 12V, 7.5Ah

Quantity: 2

4. ELECTRIC MOTOR: An electric motor is a device used to convert electric vitality into mechanical vitality. It provide rotating motion required for work creation,



Fig 4: Photographic view of motor

Voltage: 24V DC
 Rated Current: 13.6 Amp.
 Base speed: 2650 RPM.

5.CHARGE CONTROLLER: It is an important component in a battery based solar system. Its primary role is to manage charging the battery, prevent it from overcharging and control the rate of current and voltage.



Fig 5: Photographic view of charge controller

Current: 10A

6. AUGER BIT: The auger drill is usually made out of shaft which has shovel blades surrounding it.



Fig 6: Photographic view of auger bit

Outer Diameter: 4"
 Shaft Diameter: 23 mm
 Depth: 340 mm
 Total Length: 650 mm
 Pitch: 48 mm
 Blade Thickness: 4 mm
 Weight: 3.3 kg

7.CHAIN DRIVE: A mechanism in which power is transmitted from driver to driven part. Chain drive gives more power and higher efficiency than any other types of drives.



Fig 7: Photographic view of chain drive

Chain type: Single Strand
 Chain no: #25 H

Pitch: 6.35 mm

IV.METHODOLOGY

This project is about a fabrication of solar powered soil digging machine which shows capability of drilling in the soil and improve sampling plantation technique. A solar panel with 20W output power used to charge 2 sets of 12V batteries. An electric battery is a used for storing energy means. The battery is used to work DC motor. A DC motor is a device which convert electrical energy into mechanical energy in the form of rotating motion. A motor with 24V is used to providing rotating motion. A solar charge controller with 10A is used to control and regulate the amount of voltage to the battery. Both positive and negative connection bring out from the solar panel, both terminal from the battery also both terminal from the DC motor are connected to the charge controller so, here it act as junction point of the three member. Then for the rotating power transmitting from the motor to shaft a chain drive is installed between them. For the support to vertical shaft a pedestal bearing is used which has a outer layer is fixed and inner layer is rotating with shaft. Then vertical shaft and shaft of auger bit joined together by using universal coupling.

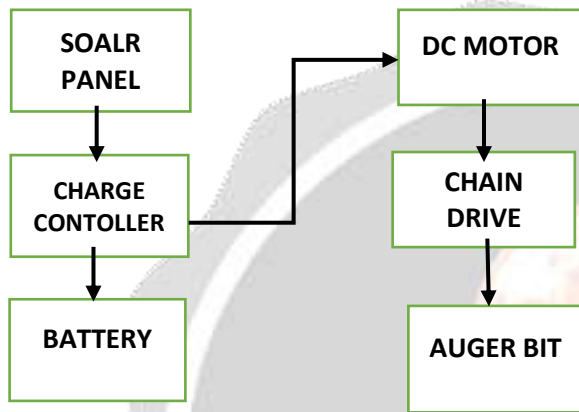


Fig 8: Block diagram of solar powered soil digging machine

V.FABRICATION

For the fabrication of solar powered soil digging machine the following various process is carried out.

1.CUTTING: Cutting is the opening or separation of physical object, into two or more portion, by the application of direct force. Cutting is a phenomenon of shearing and compressive forces.

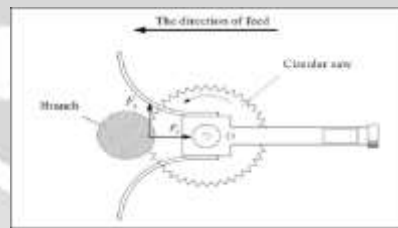


Fig 8: Cutting operation

2.WELDING: It is a fabrication process of joins metal by using application of heat. Heat effect cause metal to be melt the parts together and allow them to cool causing fusion. Here arc welding is used to join metal to metal by using electricity to create heat to melt metal and electrode is used to as a filler rod.

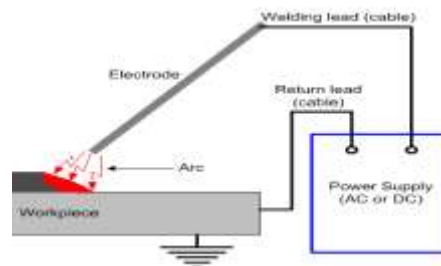


Fig 9: Arc welding

3.DRILLING: It is a process of cut a hole of circular cross-section in solid materials by using drill bit. The bit is a rotary cutting tool which pressed against the work piece, this forces the cutting edge and chips from the hole as it is drilled.

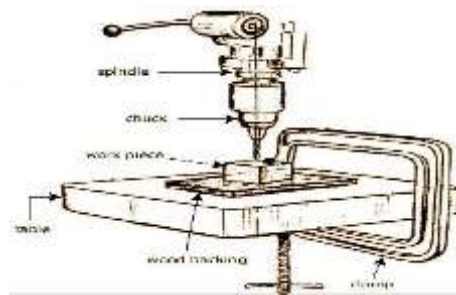


Fig 10: Drilling operation

4.GRINDING: It is an abrasive machining process that uses a grinding wheel as a cutting tool. It is used for to safe and finish component made of metals and others.

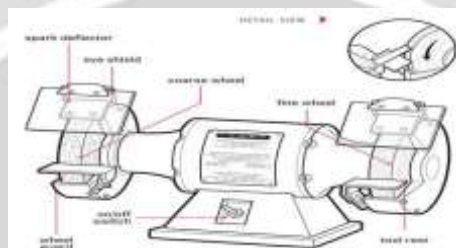


Fig 11: Grinding operation

VI.CONCLUSION

Innovative soil digging equipment's has exceptional influence in agriculture and sapling plantation. By using this innovative project of soil digging machine we can save more time required for digging process and additionally it reduces lot of labour cost. It is very helpful for large tree plantation program and making portable wall compound around the farm. After comparing the distinctive method soil digging and restrictions of the existing machine and from the experimental validation and theoretical analyses it is found that the above project is feasible and can be extensively used in Plantation of Sapling. We identified and fabricated the best auger drill and material for it such that it operates effectively under different types of soils.

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