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ELECTRICAL CULTIVATOR OR TILLER BY USING THE SOLAR PANEL

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Abstract: This report details a student's design, manufacture, analysis, control, and testing operations for a motor-powered tiller for agricultural labour. We need to look at non-conventional energy sources to tackle these concerns with fossil fuels. In order to implement this concept, we created a solar-powered electrical tiller. The vehicle is meant to have two-wheel drive and may be utilised for shuttle service as well as short distance travel. All industries, including agriculture, are seeing fast expansion in the modern period. To meet the future food demands, the farmers have to implement the new techniques which will not affect the soil texture but will increase the overall crop production.

Its primary goal is to minimise personnel, which is difficult to come by in today's market, as well as to shorten working hours. Because it has the potential to be significantly superior to the traditional methods of cultivating land using labour or a bull. One of the greatest roadblocks to increasing agricultural output is a lack of mechanisation or automation.

Soil cultivation is one of the most time-consuming tasks in the garden, but it is also one of the most useful. Soil cultivation enhances the structure of the soil by reducing soil compaction and increasing aeration. This increases the amount of oxygen accessible to plant roots while also improving water drainage. It also allows plant roots to act more freely and reach deeper into the soil. I would report on the design, manufacture, analysis, control, and experimental work in this project, which is considered suitable engineering education.

Keywords: *Electric cultivator, Motor-powered tiller, Agricultural business, House gardening,*

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I INTRODUCTION

Agriculture is India's economic backbone. As a growing country, agriculture and businesses based on agricultural products play a critical role in the Indian economy. Agriculture and agriculture-based industries and enterprises support the majority of India's population. One of the many farm mechanisation tools is the soil tiller and weed eater. In comparison to tractors, soil tillers and weeds are nontraditional in terms of labour displacement. In boosting soil tiller and weeds, particularly given that the majority of farmers have limited plots of land. As a result, they can't afford more expensive tractors. Therefore, the soil tiller and weed should become useful machine in the internal cleaning of crops and digging of soil which having small distance between them like groundnuts, sugarcane, soya bin crops, cultivation of paddy, in particularly, and other crops in general for the smaller farmers.

Energy is one of the most important needs for human survival on earth. We are dependent on one form of energy or the other for fulfilling our needs. One such form of energy is the energy from fossil fuels. We use energy from these sources for generating electricity, running automobiles etc. But the main disadvantages of these fossil fuels are that they are not environmental friendly and they are harmful.

We need to look at non-conventional energy sources to tackle these concerns with fossil fuels. In order to implement this concept, we created a solar-powered electrical tiller. The vehicle is meant to have two-wheel drive and may be utilised for shuttle service as well as short distance travel. All industries, including agriculture, are seeing fast expansion in the modern period. Farmers must apply innovative practises that do not alter soil texture while increasing total crop productivity in order to fulfil future food demands.

Its main purpose is to reduce the number of employees, which is tough to come by in today's market, as well as to reduce working hours. Because it has the potential to be far superior to traditional land cultivation methods that rely on labour or a bull. Lack of mechanisation or automation is one of the most significant impediments to boosting agricultural productivity.

Soil cultivation is one of the most time-consuming tasks in the garden, but it is also one of the most useful. Soil cultivation enhances the structure of the soil by reducing soil compaction and increasing aeration. This increases the amount of oxygen accessible to plant roots while also improving water drainage. It also allows plant roots to act more freely and reach deeper into the soil.

A graduate student concerned in environmental issues, ageing society, agricultural business, and design and manufacturing proposed the electric tiller. Year after year, the number of individuals working in agriculture fell, but the number of older people climbed. Despite the fact that labour-saving machines such as tractors and tillers have been used to replace traditional agricultural tasks, human effort is still required. For example,when the work is conducted in a narrow area like the

Fig. 1 Typical tractor (left) and cultivator (right) used in local area for agricultural works

II DESIGN AND MANUFACTURE OF ELECTRICTILLER

2.1 Engineering and design aspects

The design and construction of an electric cultivator is the primary goal, which is based on environmental considerations and ease of use for senior people. The cultivator, which was driven by an electric motor, produced. The student attempted to create one that might be utilised in a real-world setting.

This time, the following items should be considered:

(1) A forward-moving electric tiller powered by a drive motor

(2) The control is carried out using a connected signal.

(3) Lightweight and well-designed frame

2.2 Specification and produced cultivator

The tiller we aimed is forwarding moving rotary-type one by wheel-drive, which is operated by motors and batteries.

GEAR MOTOR

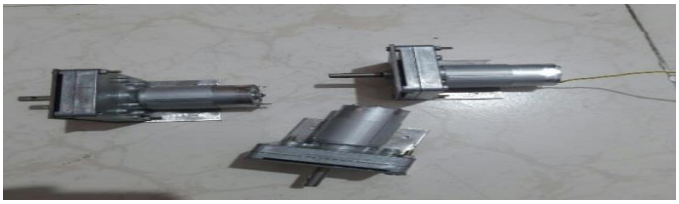


Fig 2.1

12v dc square gear / geared motor 10 rpm - high torque is a motor with a very high torque that should be utilised to build large robots or robotized platforms. The gearbox is designed to accommodate the motor's stall torque. To provide strength, the driving shaft is braced by metal bushes.

FEATURES:

.Heavy Duty Metal Gears.

•Uniformity of parts.

•Capability to absorb shock and vibration as a result of elastic compliance

APPLICATION:

- Robotic purposes.
- Central air – conditioning valve
- Industrial applications

Operating Voltage	12 V DC
No Load Current	≤220 mA
No load Speed	10 RPM (at 12V)
Full Load Current (mA)	≤1300
Rated Current	≤4800 mA
Rated Torque (Kg-cm)	90
Shaft Length (mm)	27
Shaft Diameter (mm)	8
Length (mm)	92
Dimension Overall	70 X 70 (Sq.) X 90 (Length)
Mounting Holes	M5 threading (60 X 60 Square)
Weight (gm)	490

SOLAR PANEL

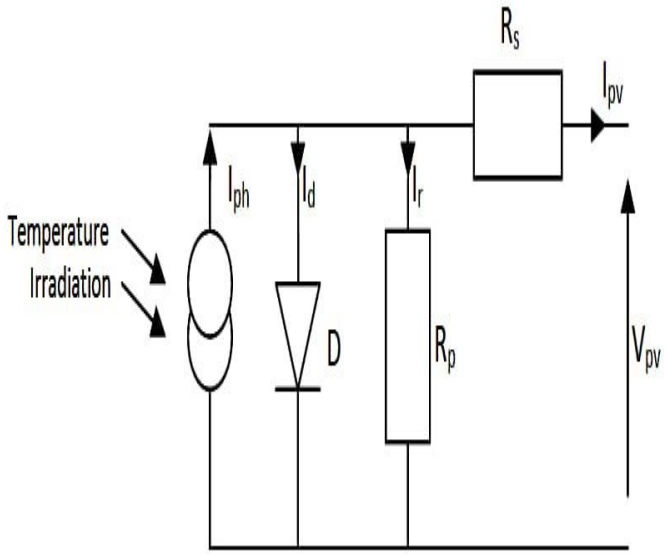


Fig 2.2

In this MPPT based charge controller, the solar panel is so much necessary in this controller because the maximum power point is tracked of this solar panel for charging the battery and power on the output load. Different types of solar panels are available in market which have different characteristics

III . MPPT CHARGE CONTROLLER

An **MPPT**, or maximum power point tracker is an electronic DC to DC converter that optimizes the match

between the solar array (PV panels), and the battery bank or utility grid. ... Check out our MPPT charge controllers.

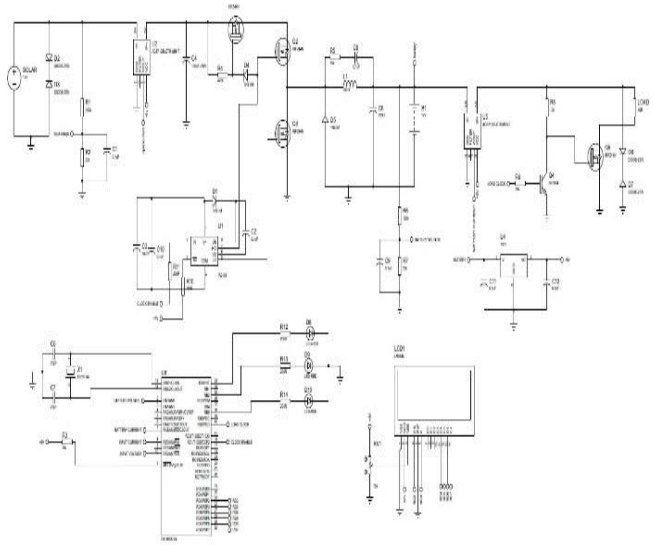


Fig 2.3

MPPT checks output of PV module, compares it to battery voltage then fixes what is the best power that PV module can produce to charge the battery and converts it to the best voltage to get maximum current into battery. It can also supply power to a DC load, which is connected directly to the battery.

For extracting maximum power from the solar panel and transmitting maximum power from the PV module to the load, a maximum power point (MPPT) is utilised. The aim of a dc to dc converter, which connects the load and the PV module, is to transmit the maximum amount of power from the PV module to the load.

4. AUTOCHANGOVER UNIT

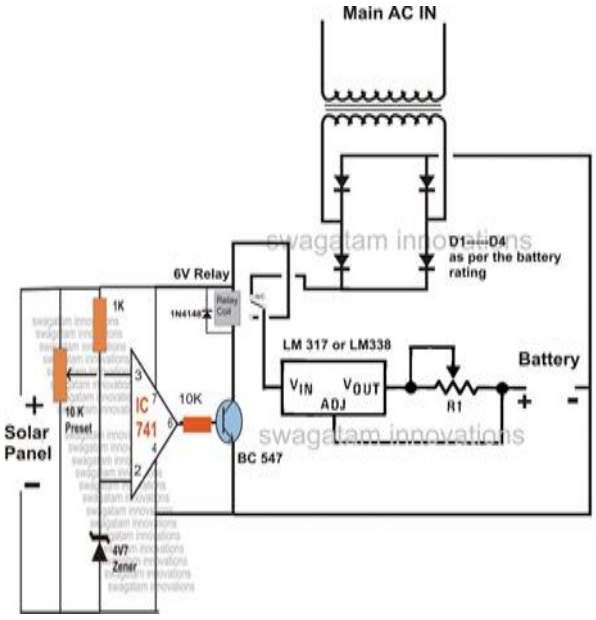


FIG 2.4

Automatic Changeover Switch (Single phase) between Mains and Generator supply. ... When main supply fails the load will shift automatically to Generator supply and as and when Mains Supply restore the load will shift to Mains Supply and Generator will become unloaded.

The fully automated transfer switch continuously analyses incoming power from the utility line. When the automated transfer switch detects that the utility line voltage has stabilised, it re-transfers the electrical load to the utility line and begins monitoring for utility loss.

5. RECTIFIER

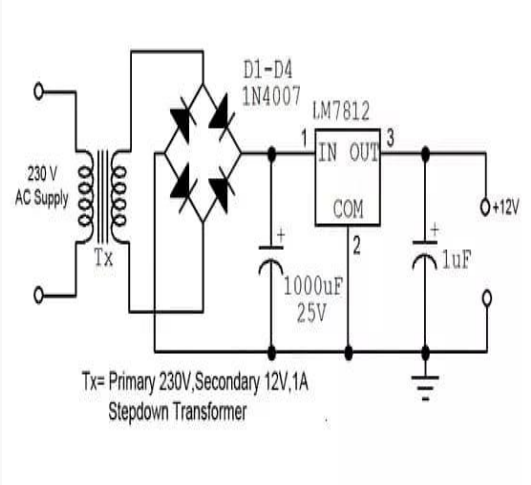


FIG. 2.5

A rectifier is an electrical device that converts alternating current (AC), which periodically reverses direction, to direct current (DC), which flows in only one direction. The reverse operation is performed by the inverter.

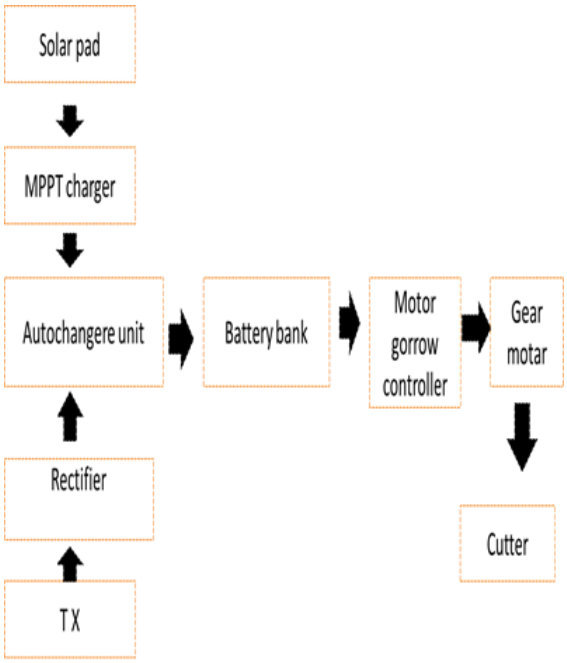
A rectifier is a circuit which converts the Alternating Current (AC) input power into a Direct Current (DC) output power. ... Then this type of circuit is called a “half-wave” rectifier because it passes only half of the incoming AC power supply

6. BATTERY

Fig 2.6

Use two batteries with the voltage of 12V/8AH of the battery

3. Working of electrical cultivator



3.1 Working of block diagram

- There are two types of sources solar panel and main supply 230V for charging purposes.
- The main supply of 230v and solar panel are to be given to rectifier circuit and MPPT charge controller resp.
- The both output of sources is given to autochangover unit and and their output is connected to battery bank.
- Then the motor works on the supply on the supply of the battery by changing electrical into mechanical.
- And then motor start that means shaft of the motor rotates and the cultivator teeth connected to the shaft of the motor.

IV COMPONENTS USED

Components	Specification	Quantity
Charge Controller	12V 10A MPPT based charge controller Inpute voltage 12V-21V DC Opute voltage 10V-16V DC	1
Transformer	Center tap 12-0-12 , 3A 12v 5A	1
Rectifier circuit	12v/10A rectifier unit with under voltage and over voltage protection	1
Autochangover unit	Micro controller based in same 1 and 2 ,12V/10 Autochangover unit Inpute voltage 12V-21V Opute voltage 20V-10V	1
Battery	12V 8AH , lead acid high power battery	2
Gear motor	12v , 7 watt , high starting torque gear motor	3
Solar panel	25 watt , 12V, poly crystline type solar pv cell	1
Driver unit	Pulse controlled IC-based smart motor driver Under voltage-over voltage protection based 12V, 20A capacity	1
Inverter	230V, 15HZ pure sine wave 50 watt inverter	1
Switch	6A, switch Anal mounted switch	1
Holder	6A	1

V DISCUSSION

This study focuses on the design and production of a cultivator for agricultural and domestic gardening. The key problem is the ecological and ageing society's future consideration of agricultural business, especially in local places like India, where agriculture is the primary industry. Although the design and manufacturing in this study seems to have practical utility, there are still difficulties. The battery life is one of them.

The charging experiment was carried out in two different methods. The first is a charging experiment with a constant current and voltage unit. The other is a solar cell and capacitor combo.

VI CONCLUDING REMARKS

A small-sized electric power cultivator was completed, al-though many technical issues still need to be solved.

As a project, a graduate student considered his theme and target. The faculty supported this project fromthe viewpoint of funding and suggestions. He completed the tiller by themselves.

The project theme aimed at design and manufacturing of a tiller, which can be used for house gardening. The consideration of ecology and aging society had been made. The developed tiller still re- mains the issues to be solved such as battery life and

weight. We need to continue to study such is-sues, and hope we can commercialize with some help from industries in the future.

(1)By making modification in increasing the speed of the motor.

(2)By making modification same machine with able to changing the different rotary tool for different purpose example rotary tool for cutting purpose, digging purpose etc.

VII CONCLUSION:

Here in our project we conclude that by using this machine we reduces the manpower, risk, and cost. Our main intention is to help the farmers.

Result:

Torque (N.m) = 9.5488 x Power (kW) / Speed (RPM)

Power (kW) = Torque (N.m) x Speed (RPM) / 9.5488.

Rated torque = 90

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