



Electric Power Tiller Machine

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ABSTRACT

The "Electrical Power Tiller Machine" is an innovative solution designed to enhance agricultural practices through the integration of modern electrical engineering technologies. This project focuses on the development of a tiller machine powered by a 48V Brushless DC (BLDC) motor and accompanying BLDC converter. The machine aims to revolutionize traditional tilling processes by providing efficient and eco-friendly means of preparing soil for planting, thereby creating favorable conditions for optimal plant growth and yield.

The utilization of BLDC technology offers numerous advantages, including higher efficiency, lower maintenance requirements, and improved control over the tilling process. By harnessing the power of electricity, the tiller machine can operate with reduced environmental impact compared to traditional gasoline-powered alternatives. Additionally, the integration of advanced control systems allows for precise adjustment of tilling depth and speed, enabling farmers to tailor the process to specific soil conditions and crop requirements. Overall, the Electrical Power Tiller Machine represents a significant advancement in agricultural machinery, offering sustainable solutions for modern farming practices.

The portable battery charged electric power tiller machine. The conventional agriculture methods of farming, as it reduces the human effort, at a very low cost using motorized tilling mechanism. The electric power tiller helps to reduce the time and cost involved in tilling using a new portable design thereby increasing the productivity and efficiency in agriculture. The machine is use of a wheel with welded angles to provide maximum gripping on soil. The wheel design is developed, to provide a firm grip on soil strong enough to drag the cultivator forks while tilling process. The machine is driven by an electric motor which uses a sprocket chain arrangement to drive the pulling wheel.

INTRODUCTION

The introduction of the "Electrical Power Tiller Machine" heralds a new era in agricultural machinery, bridging the gap between traditional farming practices and modern electrical engineering innovations. With a weight of 25 kg and a working capacity of 6 to 7 hours on a single charge, this innovative tiller machine is powered by a 48V battery and driven by a robust 48V, 750-watt Brushless DC (BLDC) motor. Accompanied by a sophisticated 48V BLDC controller with a power rating of 1000 watts, the machine embodies efficiency, durability, and eco-friendliness at its core.

Key components of the Electrical Power Tiller Machine include chain and sprocket mechanisms, sturdy wheels for maneuverability, adjustable wheel angles for precision control, and specialized tiller blades designed to create optimal soil conditions for plant growth. Supported by robust frames, these components work in harmony to deliver superior tilling performance while minimizing environmental impact. Through the integration of cutting-edge electrical engineering technologies, this project aims to revolutionize agricultural practices, offering farmers a sustainable and efficient solution for soil preparation and cultivation. As a result, the Electrical Power Tiller Machine represents a significant advancement in agricultural machinery, poised to enhance productivity and yield for farmers around the world.

The motor is powered by a battery and has enough force to draw the forks through the soil. The three cultivator forks allow for precise and easy tilling, which is ideal for farming. The machine's direction can be easily controlled while in use because to its portable, lightweight construction. For carrying the machine, it can also be simply carried around in vehicles or by hand. As a result, the electric power tiller offers a smart, fuel-free mechanism for farm and garden tilling.

PROBLEM STATEMENT

➤ **Environmental Impact of Gasoline:**

Powered Machinery: Conventional gasoline-powered tiller machines contribute to environmental pollution and greenhouse gas emissions, exacerbating climate change and environmental degradation. Farmers face mounting pressure to adopt sustainable practices and reduce their carbon footprint, necessitating the transition to cleaner and more eco-friendly alternatives.

➤ **Limited Access to Modern Agricultural Technologies:**

Small-scale and resource-constrained farmers often lack access to modern agricultural technologies and machinery, hindering their ability to improve productivity and livelihoods. There is a need for affordable and accessible solutions that can empower farmers to adopt sustainable farming practices and enhance crop production.

➤ **Inefficient Use of Resources:**

Conventional tiller machines often lack precision and control, resulting in inefficient use of resources such as water and fertilizer. Improper soil preparation can lead to suboptimal plant growth and reduced crop yields, posing economic challenges for farmers and contributing to food insecurity.

➤ **Labor Intensive Tilling Process:**

Traditional tilling methods require significant manual labor, leading to inefficiencies and increased labor costs for farmers. With a growing shortage of skilled agricultural workers, there is a pressing need for mechanized solutions that can streamline the tilling process and reduce dependency on manual labor.

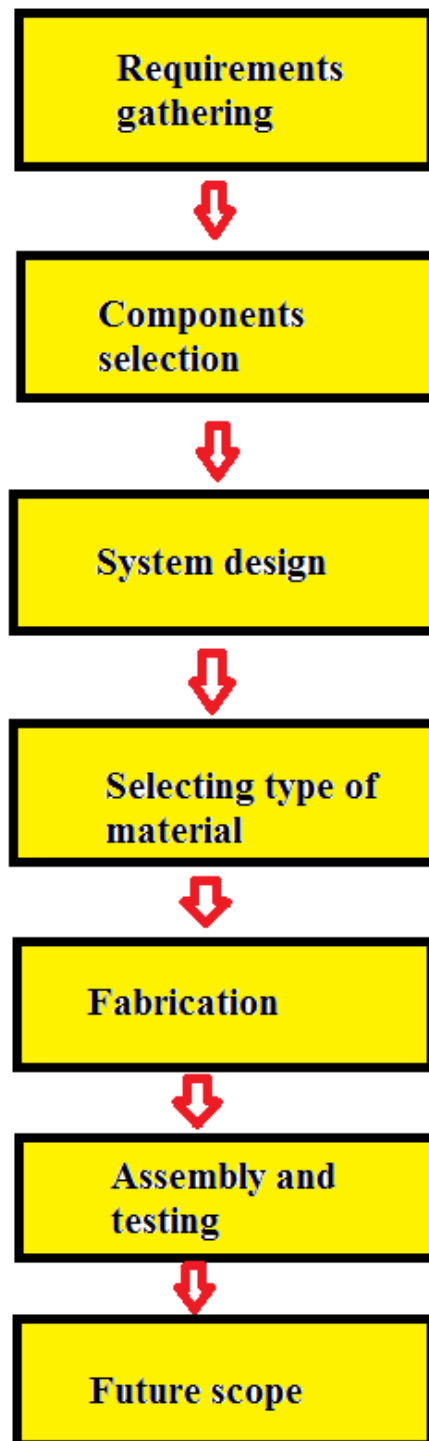
➤ This working model of power tiller is reducing man power & Rescuing the risk. This machine is reduces the cost, improve the soil properties.

LETRATURE REVIEW

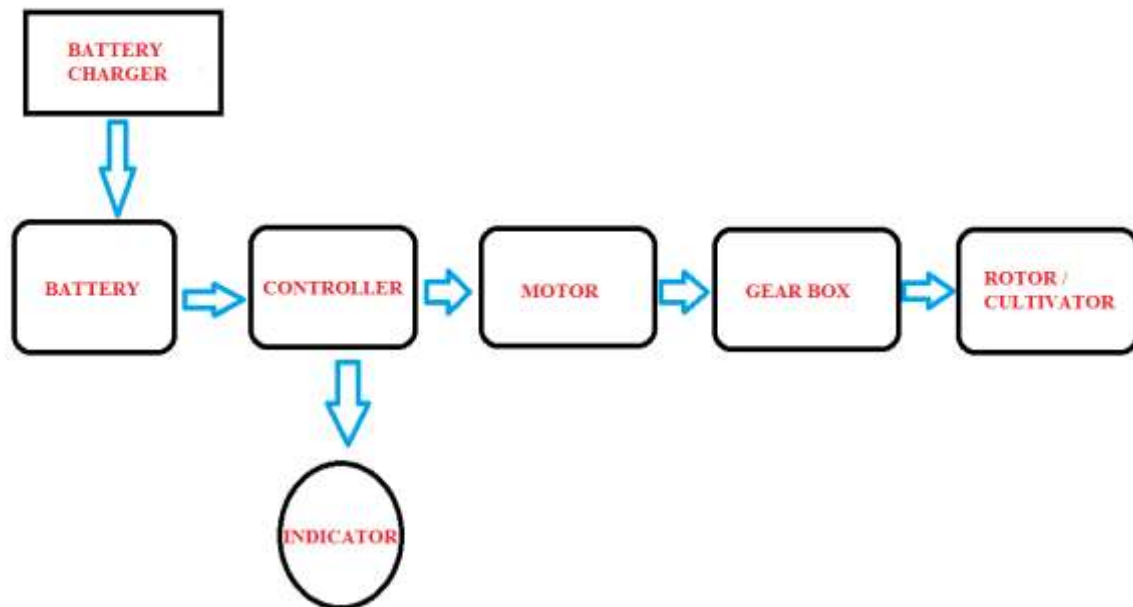
In this project studied the portable battery charged electric power tiller machine. techniques employed in traditional agriculture farming. The equipment features a wheel with welded angles to maximise soil grip. In order to provide a firm grip on the soil and enable the cultivator prongs to drag during the tilling operation, the wheel design was developed. The pulling wheel is powered by an electric motor using a sprocket chain system.. By adopting a motorised tilling system, it minimizes human effort at a very low cost. Using a unique portable design, the electric power tiller reduces the time and cost of tilling, enhancing agricultural output and efficiency. Design development and fabrication of mini cultivator and tiller. In this paper researcher studies Farmers used to use traditional farming methods, which are time-consuming, labour - intensive, and expensive, therefore they introduced new technologies. Machines are commonly employed for farming purposes in India, which is at a higher level. They are creating this model in order to solve this challenge.

This paper discusses the operating machinery that would be used to till one and a half hectares. With this new technology, the plough will be able to go ahead and the base wheel will rotate with blades that provide traction. Portable Power Tiller for Small Scale Weeding Operation. After preliminary study, it was found out that power tiller could be adopted for weeding. As a result, the study sought to improve its performance by altering some essential components, such as weeding blades and depth blades.

PROPOSED METHODOLOGY & OPERATING PRINCIPLE



BLOCK DIAGRAM



WORKING PRINCIPLE

The Electrical Power Tiller Machine operates on the principles of electrical engineering and agricultural science to provide efficient and eco-friendly soil preparation for planting. Powered by a high-performance 48V Brushless DC (BLDC) motor and accompanying controller, the machine is designed to deliver precise and controlled tilling operations. Upon activation, the BLDC motor drives the tiller blades through a system of gears and chains, enabling the machine to penetrate the soil with ease. The motor's variable speed control allows farmers to adjust the tilling depth and speed according to soil conditions and crop requirements, ensuring optimal soil preparation while minimizing energy consumption.

As the Electrical Power Tiller Machine moves across the field, the tiller blades break up and aerate the soil, creating a favorable environment for seed germination and root growth. The machine's lightweight yet sturdy construction, coupled with its ergonomic design, ensures ease of maneuverability and operator comfort during operation. Equipped with a robust 48V battery pack, the machine offers extended working hours, allowing farmers to cover large areas of land without the need for frequent recharging. Overall, the Electrical Power Tiller Machine represents a modern and sustainable solution for soil preparation in agriculture, empowering farmers to improve productivity and crop yields while minimizing environmental impact.

Fabricating the machine according to the following step

- The critical study of various research paper
- Gather all the information about the project
- Collect all the components
- Fabricate the actual machine by using the machine components
- Checking the working of machine
- Presenting the report and research paper

Power Tiller is a mainly design for tiling of small farms and in hill farming. The adoption of Power Tiller by the farmers for carrying out farming operation is low cost as compared to the tractors. Power Tiller is a walking type tractor the operator trials a back The Power Tiller holding two handles of tiller in his hands Power Tiller is also called as a single human walking type tractor.

1. Battery 48 volt
2. Motor 48 volt
3. Welded wheel
4. Frame

5. Chain sprocket mechanism etc.

Working diagram and performance of machine



48 volt 750 watt brushless DC motor and BLDC controller -

Features of motor -

- Voltage: 48 Volt DC
- Power: 750 Watt .
- RPM (after Reduction) – 400.
- Efficiency : 87 % maximum
- Air cooling
- Rated Torque : 15.65 N.m Peak torque : 31.29 N.m
- Half speed in reverse mode
- Weight : 7.5 kg

Features of controller -

- Rated power 1000W, peak 2KW
- Current limit 40 AMP.
- Air cooling design
- Efficiency 87% maximum
- Direction change options
- 3 speed function
- High quality MOSFET used
- Smooth and silent operation
- Weight approx. 750

CONCLUSION

The development of the Electrical Power Tiller Machine represents a significant advancement in agricultural machinery, bridging the gap between traditional farming practices and modern electrical engineering innovations. By harnessing the power of a high-performance 48V Brushless DC (BLDC) motor and sophisticated controller, this machine offers farmers a sustainable and efficient solution for soil preparation and cultivation. With its precise tilling operations, extended working hours, and eco-friendly design, the Electrical Power Tiller Machine holds immense potential to revolutionize agricultural practices, empowering farmers to enhance productivity, crop yields, and livelihoods while minimizing environmental impact. As the

agricultural sector continues to evolve, the adoption of innovative technologies like the Electrical Power Tiller Machine will play a pivotal role in driving agricultural sustainability and food security for future generations.

FUTURE SCOPE

- 1) By adding more attachments, it is possible to perform additional tasks in addition to ploughing, such as seeding and automated spraying.
- 2) Additional functions, such as a tiller and pesticide sprayer, can be added to the machine to perform a variety of tasks.
- 3) The same machine can be modified so that it can be used to change a new rotary tool for a different purpose, such as digging or cutting.
- 4) By utilising large power solar panels to make more modifications.
- 5) By altering the motor's speed to increase its speed.

REFERANCE

- 1] Ashvi Patel and Dhanashree Ingle “Design & Fabrication of Power Tiller by Using Scooter Engine”. International Journal of Disaster Recovery & Business Continuity: journal. vol. 11, No. 3 May 2020.
- [2] R.magesh Kumar and M.Mayakannan, “Design and Fabrication of Battery Operated Weeder Machine” International Research Journal of Engineering and Technology, vol. 07, no. 05, IRJET-2020, May-2020.
- [3] A.Zakariyah and A. M. EI-Okene, “Modification of portable power tiller for small scale weeding operation,” Journal of Engineering Research and Report, JERR- vol.20, no. 08, June202