

DESIGN AND FABRICATION OF BATTERY OPERATED MULTICROP WEEDER MACHINE

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Abstract - Agriculture performs a critical role in Indian economy. The cause behind reduction in the productiveness of agricultural is weeds. Weed removal is serious problem faced by the farmers that will decrease the farmer pastime to proceed cultivation. The main objective of this paper is to assemble and advance a battery operated weeder to furnish the excellent possibilities for cultivation. The working of this task is relies upon on the battery panel. This is motorized tools pushed through the battery energy which moves blades to cut the weeds by way of chain sprocket mechanism. The plan is simple and convenient to operate. This tools is designed to limit the human effort, to limit the price and provide the efficient work output. This weeder will fulfill the necessities of the marginal farmers.

Key Words: Weeder, Multicrop, Battery, weeder machine. Agriculture.

1.INTRODUCTION

Weed control is one of the most tough tasks in agriculture that debts for a substantial share of the value involved in agriculture production. Farmers usually expressed their subject for the high quality weed manipulate measures to arrest the boom and propagation of weeds. In Indian agriculture, it's a very hard venture to weed out unwanted flowers manually as nicely as using bullock operated gear which may additionally further lead to damage of main crops. More than 33 percent of the value incurred in cultivation is diverted to weeding operations there by decreasing the profit share of farmers. A weed is actually any plant which grows where it is unwanted. A weed can be concept of as any plant growing in the incorrect place at the incorrect time and doing extra damage than accurate (Parish, 1990). It is a plant that competes with plants for water, nutrients and light. This can limit crop production.

Weeding is an necessary however equally labour intensive agricultural unit operation. Today the agricultural sector requires non-chemical weed control that ensures food safety. Consumers demand high first-rate meals products and pay one-of-a-kind interest to food safety. Through the

technical improvement of mechanisms for bodily weed control, it might be feasible to control weeds in a way that meets client and environmental demands. Indian agriculture is reliant on human electricity and also animal power. It is a time eating process. Most of the Indian farmers are having small agricultural land. Farmers nevertheless follow the conventional techniques in the cultivation for weeding purpose. These techniques require excessive labour force to operate the operations. The primary downside of the modern gear is its cost effectiveness due to the fact most of them are mechanized and driven via fuel. So they can infrequently afford such steeply-priced equipment's. The weed manipulate operations are commonly completed with the aid of three methods such as bias operation, hand weeding and using of herbicides. In bias operation, weeds are eliminated via using an indigenous plough after 35-40 DAS. By hand weeding, weeds are removed by hand which is more wonderful but it is expensive, labour intensive as nicely as time consuming. Nowadays herbicide usage is increasing. In view point of labour scarcity circumstances; it is preferred as a speedy and fine weed manage approach besides detrimental the rice plants. But, it has damaging effects on human health and environment.

1.1 Present Study:

The weed manipulate operations are frequently executed with the aid of three techniques such as bias operation, hand weeding and the use of of herbicides. In bias operation, weeds are removed by using using an indigenous plough after 35-40 DAS. By hand weeding, weeds are eliminated by way of hand which is more fine but it is expensive, labour intensive as properly as time consuming. Nowadays herbicide usage is increasing. In view factor of labour shortage circumstances; it is preferred as a speedy and effective weed manage approach barring unfavorable the rice plants. But, it has unfavourable results on human fitness and environment. In order to verify the possibility of mechanization of the weeding operation, the power operated single row active weeder are proposed to be designed and developed thinking about the most excellent shape, size and location of reducing blades, comparison of its overall

performance with other weeding strategies in area conditions, optimization of dimensions of laptop for better performance. The most important goal is to layout and fabrication of a strength weeder, while minimum damages done to rice plants, cost effectiveness, convenient manual, low weight and fabrication through the usage of freely available components and handy preservation are most important elements of this design. Here comes the relevance of mechanized weeding, which is not a big time ingesting and significantly improves weeding efficiency as properly as the satisfactory of weeding. This computer helps to reduce the fees prompted through labour and fuel.

The objective of the present study as:

1. To design and develop the single row active power weeder for rice.
2. To evaluate performance of developed machine.
3. Ergonomical evaluation of the developed machine.

2. METHODOLOGY

The a range of factors worried in format have been operation safety, light weight of machine, overcomes man strength scarcity, saves time and cost, easiness in fabrication are taken into account for its diagram procedure. The operation and adjustment had been made simple so that a village artisan can fabricate, restore the weeder and farmer can function the weeder easily. The substances and techniques about the development and testing of energy weeder are mentioned in this chapter purposes. Such functions can be considered as mechanisms, which may additionally generate some others in a causal sequence, and/or being linked with others at the identical logical level. The foremost parts that are used in the fabrication of battery powered weeder are:

2.1 Frame

The body is the most important phase of this machine shown in Fig. 2.1 The pinnacle section of the frame holds deal with and at the backside end the chassis is organized to fix the Dc motors and batteries on the fame. Arrangements are made on the manage to restore the battery panel and to keep the velocity controller. The chain sprocket mechanism is constant beneath the chassis of the reput with the assist of two pedestal bearings at each the ends of the chassis. Two wheels are linked to the body with the assist of locking pins.

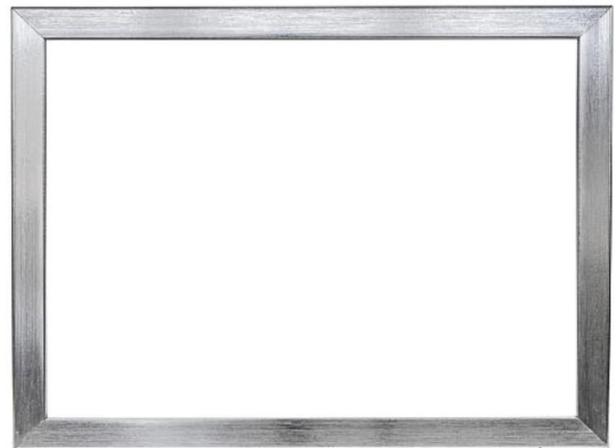


Fig 2.1 Frame

2.2 Geared Dc motor and batteries

This kind of DC motor consists of a gear head meeting which is linked to the electrical motor. The tools head helps in decreasing the velocity with the aid of increasing the torque. This type of motors is used in one of a kind functions such as electrical propulsion, industrial jacks, cranes, paper machines and rolling mills. By altering the operational voltage, motor velocity is varied. Two 12V DC motors are used individually for strength supply. These DC motors are fitted on the body as shown in fig1. Two 12V batteries are used in this project to provide the strength to the motors whilst they are in operational condition. Connections of these batteries made in series and are positioned on the frame as proven in fig 2.2.1.



Fig 2.2.1 Geared Dc motor

The most common kind of battery used these days is the "dry cell" battery. There are many exceptional types of batteries ranging from the extraordinarily large "flashlight" batteries to the miniaturized variations used for wristwatches or calculators. Although they range extensively in composition and form, they all work on the sample principle. A "dry-cell" battery is really comprised of a metal electrode or graphite rod (elemental carbon) surrounded

through a moist electrolyte paste enclosed in a steel cylinder as shown in Fig 2.2.2.

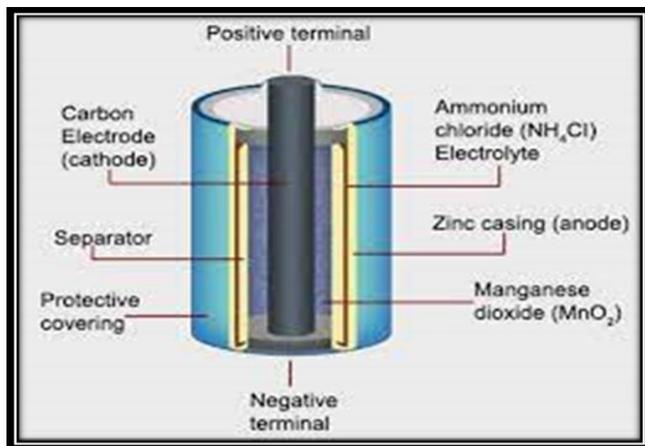


Fig 2.2.2 Battery

2.3 Pillow Block Bearing (Pedestal Bearing)

A pillow block bearing (or Plummer block) is a pedestal used to furnish support for a rotating shaft with the assist of well-matched bearings and quite a number accessories. The meeting consists of a mounting block which homes a bearing. A pillow block commonly refers to a housing with an protected anti-friction bearing, wherein the mounted shaft is in a parallel plane to the mounting surface, and perpendicular to the center line of the mounting holes, as contrasted with quite a number types of flange blocks or flange units. A pillow block can also contain a bearing with one of several sorts of rolling elements, such as ball, cylindrical roller, spherical roller, tapered roller, or steel or artificial bushing. The kind of rolling thing defines the kind of pillow block. These differ from "Plummer blocks" which are bearing housings provided without any bearings and are typically supposed for higher load ratings and a separately set up bearing. Plummer block bearings are designed for greater corrosive environments.

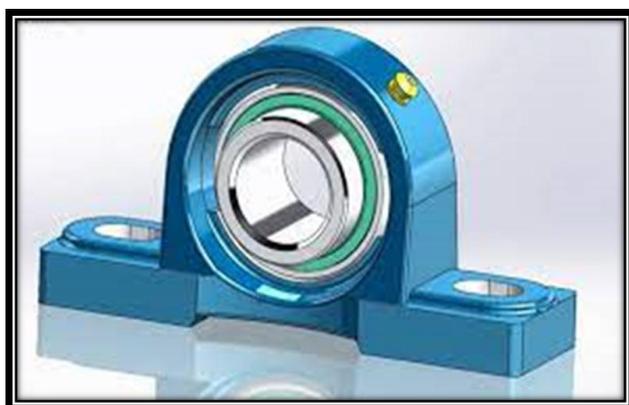


Fig 2.3 Pillow Block Bearing

2.4 Weeder blades

Weeder blades are the parts which are directly having an interaction with the soil and are having high impact on the weeding operation. The weeder blades are made up of mild steel.

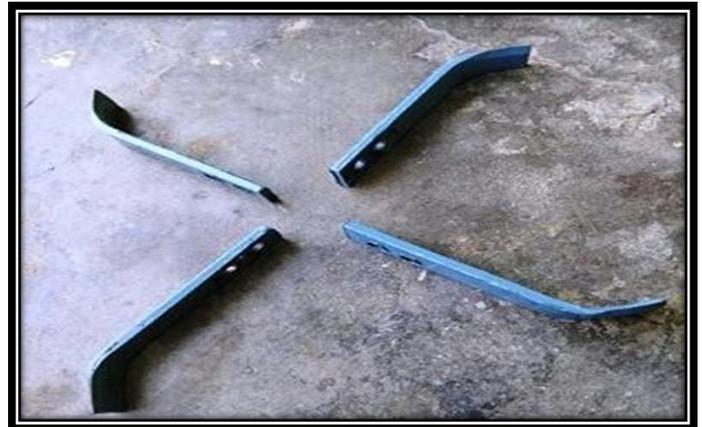


Fig. 2.4 Weeder Blades

2.5 Speed controller and charge controller

Speed manipulate is an electric circuit used to control the speed of the motor. This control is executed by the knobs which are linked to the potentiometer provided in the circuit. Through this the operator can change the motor speed according to the requirements. This offers the required operational speed. The pace can be controlled by using altering the voltage with the help of knobs.

2.6 Design of cutting blades

Blades of the rotor are the aspects which directly have interaction with soil and as such have main impact on the operation of the weeders. The cloth used for manufacturing machines ought to be modified but this will increase the related prices significantly. The way of lowering the strength requirement and to improve the life of machine is to enhance geometry of blade. The interaction between soil and machines takes vicinity at the blades; therefore by means of enhancing their geometry the power required and the dimension of machine will reduce. The blade is designed & developed the use of the popular blades designs used in market on hand weeders as base. The finalized geometry no longer only reduces the power required but also decreases the cost of manufacture. The weight of machine is additionally reduced as smaller power source.

Different parameters used in the find out about and have been in consideration to provide safe strength and bending values for manufactured blades for the duration of weeding operation. The calculation and assumptions are

based on standard instruction manual of machine design were followed (Shigley et al., 2004). Assumption used to be made as follows; Number of blades in one working set = 4; Length of blade = 11.3 cm; Width of blade = 4 cm. To calculate the design strength of blade; revolution per minute of rotor shaft (N) = 176 rpm; radius of engine output rotor (R) = 16cm. Therefore, pace of engine output (u) will be decided above as 2.94 ms-1.

For cutter blade design, variety of blade, cutting width and thickness have been essential parameters. During cutting, blades would be subjected to shearing as nicely as bending stresses. Total working width of the weeder was 300 mm having rotor shaft of size of 250 mm. Total of eight blades had been provided with slicing width of 40 mm. Therefore, 4 blades had been furnished on every flange and two flanges were set up on rotor shaft. The soil pressure acting on the blade (Ke) was calculated via the following equation:

$$K_e = \frac{K_s \times C_p}{i \times Z_e \times n_e} = \frac{55.1 \times 2}{2 \times 4 \times 0.25} = 55.1 \text{ Kg}$$

Where,

Ks = Maximum tangential force, kg,

Cp = Coefficient of tangential force as 0.8,

i = Number of flanges is 2,

Ze = Number of blades on each side of the flanges is 4 and

ne = Number of blades which act jointly on the soil by total number of blades.

By solving eqn. 3, the soil force acting on the blade (Ke) was determined as 55.1 kg. The dimensions of the blades are given in Fig. 2.6.1

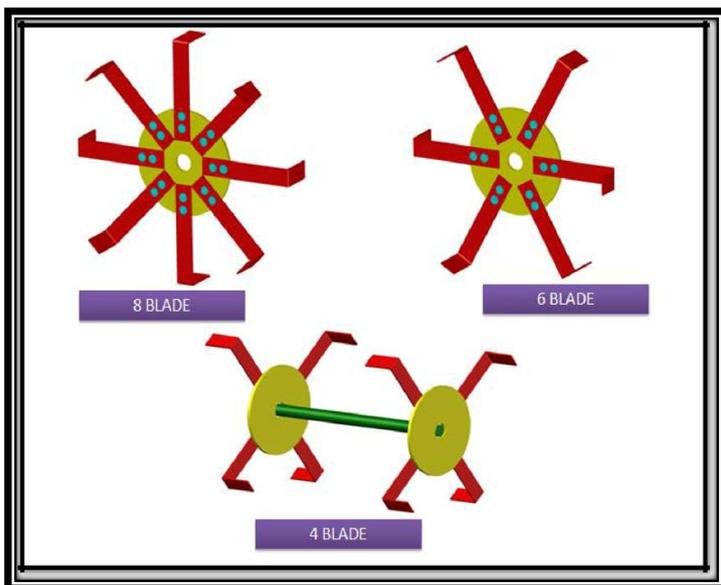


Fig. 2.6.1 Specification of Blade

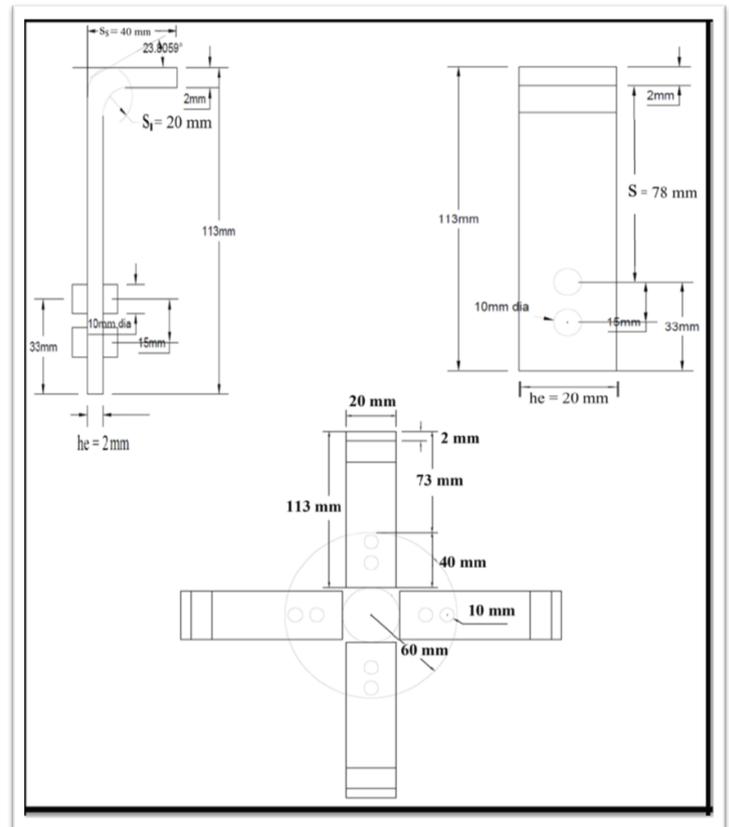


Fig. 2.6.2 Specification of Blade

Handles are made of 20 mm MS rectangular frame of length 40 mm and width 18 mm with plastic grip fitted at the ends. The overall length of handle is 1090mm. With two bends from point of attachment and have a height of 1020 mm from ground level. The length of handle cross bar is 570 mm and diameter of handle grip is 25 mm with a length of 105 mm. The handle is attached on main frame at the rear of the machine with help of four pieces of nut and bolts of having dia. 10 mm. With help of handle, the machine can be steered. A throttle lever is provided on right side of the handle to control the engine speed Fig. 3.12 2-D diagram of the developed machine.

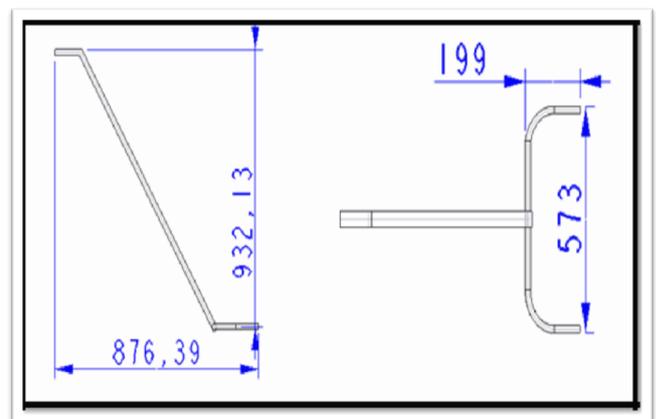


Fig. 2.6.3 Design of Handle

2.7 Mud flap

To avoid throwing of mud and stones towards operator and as a safety, a mud flap is provided covering the upper and rear side of the blades of the rotary cutting units. Upper side is made up of plastic sheet of length 490 mm and width 262 mm and the rear side is covered by rubber sheet of length 270 mm and width 190 mm. Both is connected and supported to the inner end of the handle by means of 10 mm diameter, 20 mm length nut and bolt with the help of MS flat of size of length 232 mm and width 20 mm.

3. WORKING

This equipment is a type of agricultural weeder operated with the utilization of battery power. The drive mechanism of this machine includes one battery panel, two electrical dc motors, two batteries, rotary blades and chain sprocket mechanism. One electrical dc motor is connected to the wheels of the machine with the help of chain sprocket mechanism. These mechanisms transmit the power from the motor to the shafts of the wheels and weeder blades. In this machine J-type rotary blades are used. This shape of blades mainly used for tilling hard soils such as dry lands. These rotary blades are attached to the rear end at the roots of weeds and are driven by another electric dc motor.

The two motors are connected to the two batteries individually in series. Batteries are connected to the battery panel. The battery radiation immersed on battery panel. By this process the generated battery energy is converted into electrical energy. This energy is stored in batteries. This stored energy is supplied to the dc motors when they needed through which the wheels and weeder blades are rotated. The motor speed is varied by altering the operated voltage output through the speed controller.



Fig. 3.1.1 Weeder Machine

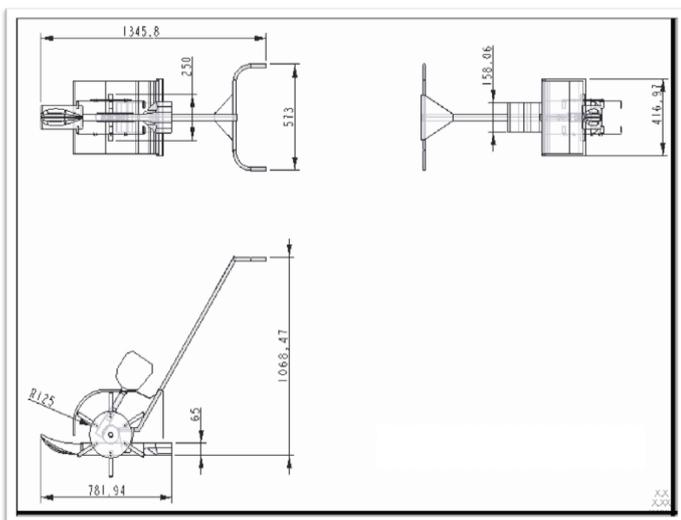


Fig.3.1 D diagram of the developed machine

4. CONCLUSION

An effort is made to Design and fabrication of battery powered multi crop weeder is done. Provisions are made to utilize battery energy was successfully completed. This work is executed with an idea to achieve an effective solution to the weed control. The designed equipment is safe to use and ecofriendly. Single operator can operate this machine to weed out the plants. Labour requirement and fuel charges are greatly reduced by this weeder. which is much efficient while a single person operates the machine. Deeper working depth and a slow travel speed can achieve a good weed control. Weed removing machine add the modernization and advancements in the agricultural field. This machine will make the farmer independent and not rely on the labourers for removing weed.

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