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Design and Manufacturing of Solar Operated Multi- Equipped Mechanism for Agricultural Operations

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Abstract

This project provides information about various types of innovations done in seed sowing machine available for plantation of seeds. As day by day the farm labour availability becomes the great concern for the farmers and farm labour cost is more, this machine reduces the efforts and total cost of seeds sowing and fertilizers spraying. The new proposed machine which can perform a number of simultaneous operations and has number of advantages is discussed. This paper deals with, how a `Power Sprayer' which is already in use and works with fossil fuel can be converted into solar operated sprayer's works without any fossil fuel. Solar energy plays an important role in dehydrating seeds, vegetables etc. and for pumping the well water for irrigation purpose in remote villages without electricity. This solar energy can be used for operating solar sprayers for spraying fertilizers, pesticides, and fungicides etc.

Keywords- Seed sowing machine, solar sprayer, fertilizer spraying.

I. INTRODUCTION

Indian economy is based on agriculture. Development in agriculture leads to raise economic status of country. In India farmers are facing problems due to unavailability of farm labours, traditional way of farming using non efficient farming equipment's which takes lot of time and also increases labour cost. This project is all about enhancement in seed sowing and pesticides or fertilizers spraying like farming operations by using multi-functional seed sowing machine. The main objective of sowing operation is to place seed at proper position respective of other placed seeds in every row at particular depth and provide a cover of soil on it.

This project is attempt to produce multifunctional and highly efficient seed sowing machine which will reduce time of plantation, cost of labour, and enhances production. As per change in climate farmers are facing one more problem which occurs due to harmful insects and pest. Farmers have to stay alert for fighting this problem by using different pesticides or fertilizers. Pesticide spraying is one of the common operations in agriculture field which requires lots of efforts to carry the pump in farm. It results in shoulder pain so badly. This machine contains pesticide or fertilizer spraying too which makes i t multi-functional. This project addresses improvement in agriculture processes like sowing of seeds on ploughed land and distribution of fertilizer combined by using mechanisms. Primarily this system works manually, but with lesser input energy requirement.

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II. OBJECTIVES

The aim of our project may be complied as follows:
Design and manufacturing of the machine is to be done so as to make easy usage of the machine for the farmer for seed sowing and fertilizer spraying. Improving yield and lessening time used for seed sowing and fertilizer spraying. Ease and comfort for the farmer while seed sowing and fertilizer spraying. For that following objectives should be achieved.
To solve the main problem being faced by the farmer was to carry the entire load of the pesticides or fertilizers on his shoulder and this problem can be very efficiently solved by the adoption of this mechanism.
Improvement in planting seeds.
Multi-cropping should be used to enhance productivity.

III. RELATED WORK

Mahesh R. Pundkar.al. in "A Seed Sowing Machine" 2016 [1] discussed the importance of seed sowing machine in agriculture. Also they have designed a seed drill and planter.

R. Joshua.al. in "Solar Sprayer - An Agriculture Implement" 2010 [2] studied the use of alternate energizing devices for the working of the Fertilizer sprayer instead of using the engine which requires a large amount of fossil fuels which are getting extinct day by day and are getting costlier.

D. Ramesh.al. in "Agriculture Seed Sowing Equipments" 2014 [3] discussed row to row spacing, seed rate, seed to seed spacing and depth of seed placement vary from crop to crop and for different agro-climatic conditions to achieve optimum yields.

Kalash Singhal.al. in "Solar Powered Seed Sowing Machine" 2018 [4] discussed the main work of sowing operation is to sow seeds at required depth with specific spacing between the two sowed seeds. This can be achieved with the help of seed sowing machine which will dig the furrow and sow the seeds.

IV. BLOCK DIAGRAM

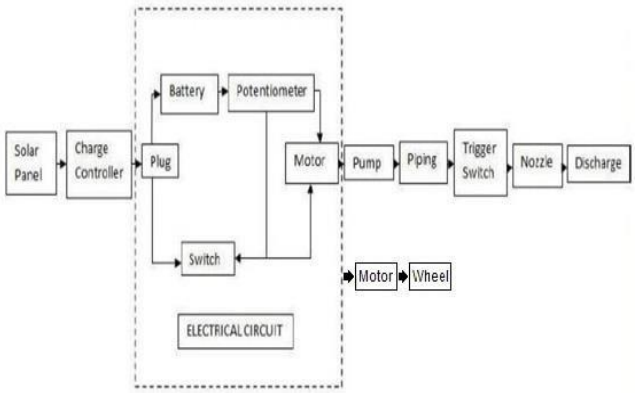

Fig.1. Multi-equipped mechanism block Schematic

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V. SYSTEM DEVELOPMENT

A. Existing System.

The existing system deals with only one or two operations. They have their own limitations like in the autonomous machine for every new field new programming is to be done every time.
While coming to the manually operated machine only one or two operations are done by using them and also free energy source of solar energy is not used.

B. Objectives of Current System.

Our work aims to develop a multi-equipped machine for agriculture purpose. By using this machine the time consumption while seed sowing will be decreased and multi cropping in encouraged. The harmful effects of fertilizer on farmers while spraying fertilizers on the crop is also reduced by using this machine. Due to using the motor for the movement of the machine, the load carried by the farmer is also reduced.

VI. OPERATIONAL METHODOLOGY

A. Power Supply

The power supply is used to supply electric power to the DC Motor, Chain Drive and Pump . We are using sealed lead acid 6DFM8 battery of 12 V supply.

B. Solar Panel

Solar panel is used for free energy source in the form solar energy. Solar panel is used for generating power to store it in the battery. Solar panel GOLDI012PM having 20W output is used.

C. Spray Pump

A centrifugal spray pump is used to spray the fertilizer over the farm field. The pump is of 3.5 W consumption. 12 V supply voltage.

D. Chassis

The chassis is like a tricycle in shape. The chassis dimension is 22 inch x 8 inch x 36 inches.

E. DC Motor

A DC motor is any kind of electrical rotary mechanism which converts electrical energy in to mechanical energy. All dc motors have an internal mechanism that can be electromechanical or electronic. DC motor’s rotation speed can control over a wide range by changing its voltage. In this machine the DC motor has 12V supply.

F. Wheels

Wheels of a cycle are used for the movement of the machine from one place to another. As they a light weight and easy to assemble and disassemble.

G. Chain Drive Mechanism

Chain drive is used for the transmission of power to the wheels to generate torque and move the wheels. Chain drive is easily available and replaceable when its broke compared to belt drive. In this chain and sprocket is used for the transmission of power.

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VII. MODEL DIAGRAM OF SYSTEM

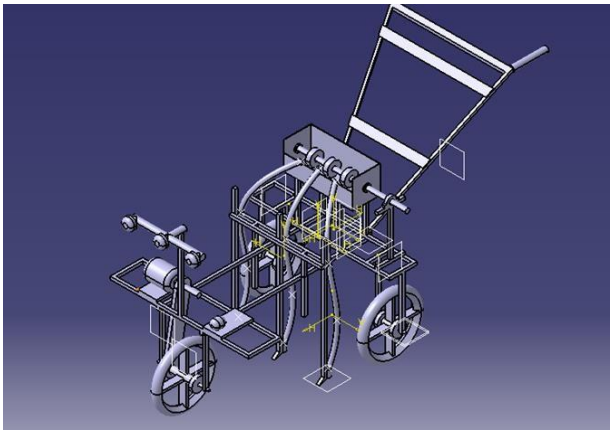

Fig.2. Body Frame Diagram

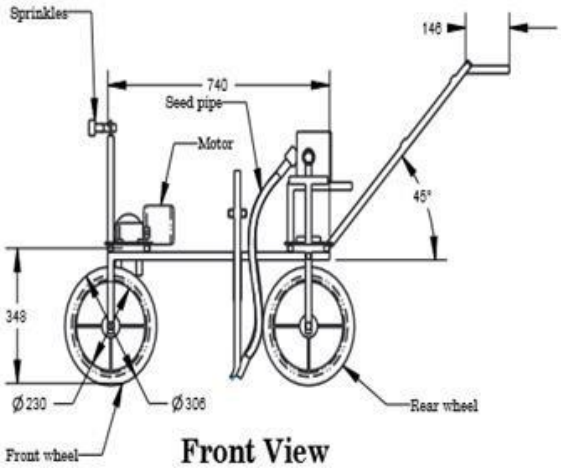

Fig.3. Front view of machine.

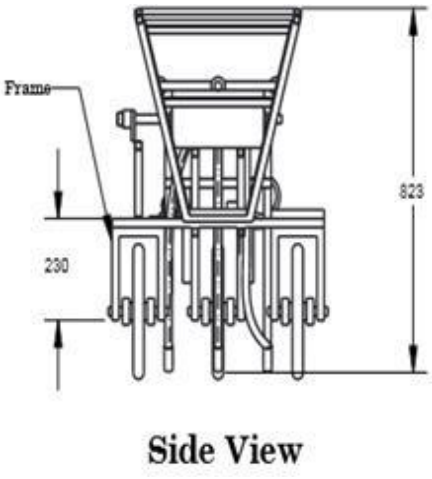

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Fig.4. Side view of machine

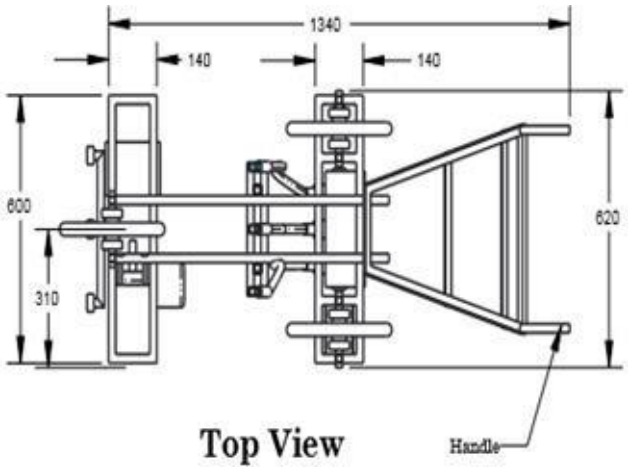

Fig.5. Top view of machine

VIII. CALCULATIONS

A. Body Frame

22 Inch x 8 inch x 36 inches

B. Motor

1. Model = KF-2203
2. Voltage = 12V DC
3. Speed = 0-6,000 rpm
4. Maximum current = 1.8A

C. Pump

1. Type = Centrifugal Pump
2. Discharge = 4 lit/min.
3. Power = 3.5W
4. Voltage = 12V
5. Current = 0.5 - 1.5A

D. Battery

According to the pump operating power, battery is selected.

1. Type = Lead acid battery
2. Current = 8A
3. Voltage = 12V

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When the circuit is short then,

1. Voltage = 12V
2. Current = 2.4A
3. Power = Voltage x Current

= 12 x 2.4
= 28.8 W

E. Solar Panel

According to battery output power the solar panel is selected,

1. Power = 20W
2. Dimensions = 500mm x 340 mm x 22mm
3. Weight = 2kg
4. Open circuit voltage = 21.6V
5. Short circuit current = 1.318A
6. Operating current = 1.179A

F. Charging Time Calculation

i. The current produced by the solar panel (I) was calculated by knowing the maximum power (P) of the solar panel and the voltage rating (V) of the battery that is given by,
I = P/V
Therefore, I =20/12
= 1.66A

ii. Charging time (T) was computed by taking the ratio rating of battery in ampere hour (Ah) to the total current supplied by the solar panel.
T = (battery rating in ampere hour) / (total current consumed by the solar panel) Therefore, T = 8/ 1.66 = 4.79 hr

IX. REFERENCES

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