

Multi-Nozzle Pesticides Spraying Pump & Grass Cutter

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Abstract- *The Multipurpose machine is used to fertilizer spray into land and grass cutting for making lots of plant production in agricultural field. It is a mechanical device here no electrical or other power source is not required. The cost of this machine is very low and easy to operate simple in construction. As there is tremendous development in the field of engineering the current scenario makes us to find solution for major problems faced by the agricultural field. Lot of equipment was inverted to sophisticate the work of labour in the farms. The main objective of this project is to improve the current way of farming by introducing multipurpose equipment. It helps farmers by grass cutting and sowing the seeds and fertilizers. We have fabricated a device called "MULTI-NOZZLE PESTICIDES SPRAYING PUMP & GRASS CUTTER". To sow the seeds first land should be cleaned and after sprayed the seeds the land should be filled. This equipment which we build will do the mentioned functions automatically. It will be very useful for agricultural purpose and very simple in construction and economical.*

Keywords- underwater vehicle, marine research, thrusters, embedded systems.

I. INTRODUCTION

India is a land of agriculture most of the population in India is dependent on farming for its livelihood. The economy conditions of average Indian farmers are poor and hence they cannot afford large automatic effortless mechanization for their farms. Spraying is an essential component of farming as it is important to spray the pesticides to improve the efficiency of yields and meet to growing food requirements of India. The average Indian farmer is using conventional methods for spraying of crops, these methods includes the knapsack sprayer which has to be mounted on back and requires the lever to be operated manually in order to spray. Continuous weight on back of farmer leads to back pain and manual pumping leads to wastage of efforts of farmers. There is need to reduce this efforts, and speed of the spraying applications in the fields.

The study of practices of farming in India is important for the effective design of a new kind of sprayer. These includes practices followed by the farmers for seeding in different condition with different kind of crops. Bicycle is commonly available means for transportation in villages. It is cheap and portable. Hence, we have used wheel to carry and drive the proposed spray pump assembly effectively. One can walk with the wheel assembly on the side.

II. LITERATURE REVIEW

The economic contribution of agriculture in India's GDP is continuously decreasing with the country's broad-based economic growth. Still, agricultural research and development (R&D) in India has made impressive contribution in the past. But the system is under significant stress today due to lack of clarity on focus and inefficient use of financial resources. Links among sister institutions have weakened and accountability has declined over time. Ramesh D; This research paper present "Agriculture Seed Sowing Equipment: A Review". The present review provides brief information about the various types of innovations in seed sowing equipment. The basic objective of sowing operation is to put the seed and the fertilizer in rows at desired depth and seed to seed spacing, cover the seeds with soil and provide proper compaction over the seed. Kannan A: This research paper presents design modification in multipurpose sowing machine which describes the sowing purpose and the import of the machinery, which are bulk in size having more cost. To prevent this they design multipurpose sowing machine which consists of hopper, seed metering mechanism, ground wheel, power transmission system, seed distributor, and tiller Backpack sprayer which can be carried on the operator back, having tank capacity as large as 20 liters. A hand lever is continuously operated to maintain the pressure which makes the backpack sprayers output more uniform than that of a handheld sprayers. Basic low cost backpack sprayer will generate only low pressure and lack feature such as high-pressure pumps, pressure adjustment control (regulator) and pressure gauge found on commercial grade units. The engine operated sprayers typically produce more consistent sprayer's outputs, covers the sprays swath more uniformly, operate at constant speed and results in much more uniform coverage

than the hand spraying. Motorized sprayers are also capable of higher pressure spray useful to provide a better coverage. There are many other types of hand operated sprayer that are not widely used throughout the agriculture. Some may be used wide extensively for the productions of specific commodities. Jeremy, in 2005 designed and fabricated solar charged cutter machine. The machine was dependent on weather since the battery would be charged using solar panel. The common drawback was that the engine runs slowly and the production cost was high for an average individual to purchase. Victor and Vern's, (2003) designed and developed a power operated rotary weedier for wet land paddy. The complex nature of the machine makes its maintenance and operation difficult for the peasant farmers

III. OBJECTIVES

- ❖ The suggested model can remove the problems of back pain, since there is no need to carry the tank (pesticides tank) on the back.
- ❖ We can add more number of nozzles which will cover maximum area in minimum time and at maximum rate.
- ❖ Work reliability under different working conditions.
- ❖ Decrease the cost of machine.
- ❖ Decrease labor cost by advancing the spraying method.
- ❖ Machine can be used in small as well as in large crop area.

IV. DESIGN OF WHEEL BASED SPRAYING PUMP

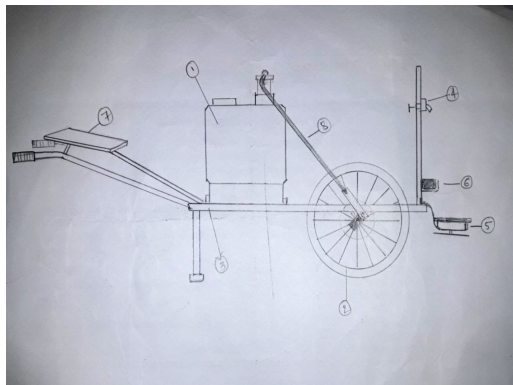


Fig 4.1: Design of spraying pump

- 1) Pesticide carrying tank
- 2) Wheel
- 3) Frame
- 4) Nozzle
- 5) DC motor
- 6) Battery
- 7) Solar panel
- 8) Connecting rod

Wheel based multi nozzle pesticide spraying pump mainly consist of a Wheel, Spraying pump, connecting rod, Frame, Flexible pipe, Nozzles, and DC motor, cutter, solar panel for grass cutting etc.

The cycle wheel is fixed to the frame. A connecting rod from tank is fitted to the axle of wheel. The connecting rod is connected between piston of pump and driven shaft. A driven shaft is supported by two pedestal bearings. Spraying pump is mounted on the frame. A pipe consist number of nozzles which is mounted on nozzle holding equipment. And for grass cutting mechanism the cutter is fixed front position of the frame which is rotated by dc motor, energy for dc motor is given by the battery which is charged by solar panel mounted on handle of the frame.

V. FABRICATION PROCESS

These are secondary manufacturing processes where the starting raw materials are produced by any one of the previous manufacturing processes desired. Its assembly involve joining pieces either temporary or permanent. So that they would be perform the necessary function. The joining can be achieved by either or both of heat and pressure joining materials. Many of the steel structure construction, we see are first rolled and then joined together by a fabrication process are

- Gas welding
- Electric arc welding
- Electrical resistance welding
- Thermo welding
- Brazing welding
- Soldering welding
- Cold welding

VI. COMPONENTS AND DESCRIPTION

The main components of MULTI-UTILITY SOLAR AUTOMATIC AGRICULTURE VEHICLE are given below

- Pesticide carrying tank
- Wheel
- Frame
- Nozzles
- D C Motor
- Battery
- Solar panel

PESTICIDE CARRYING TANK



Fig 6.1: Pesticide pump

The pesticide carrying tank is made up of pure plastic and can easily carry 15-16 liter mixture of pesticide and the water. The tank is fixed to the frame rigidly and their one outlet pipe connected to the nozzle pipe, also providing a handle at the top of the tank to pick up and for the cleaning purpose. To protect it from corrosion and for long life and to reduce weight it is made up of plastic.

WHEEL

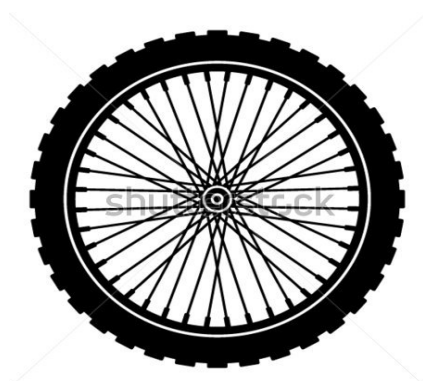


Fig 6.2: Wheel

The wheel selection was based on economy factor as well as performance factor. The wheels we have selected are not designed but chosen from market best suited to our purpose. They are formed of mild steel and are then fitted with self prepared bush through steel rods. Wheel diameter is 50 cm.

FRAME

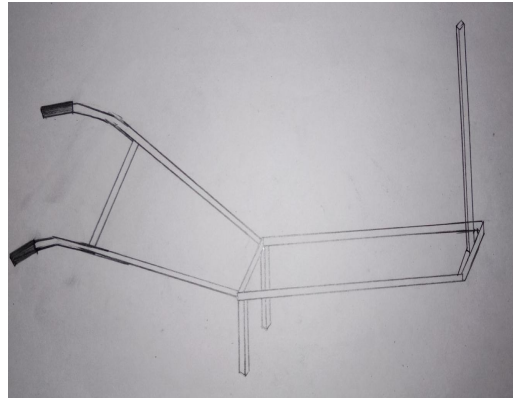


Fig 6.3: Frame

The main function of frame is to carry whole assembly on it so it has to be strong enough to hold it. It is formed out of mild steel by using welding operation.

NOZZLES



Fig 6.4: Nozzle

The nozzles we have selected are same as that are used in agricultural sprayers which are already available. The nozzles are made from brass and are non-corrosive. The nozzles are not designed specially and they are standard flat pan nozzles. A nozzle is a often a pipe or tube of varying cross sectional area, and it can used to direct or modify the flow of a fluid. Nozzles are frequently used to control the flow rate, speed direction, mass, shape or pressure of stream that emerges from them. In a nozzle velocity of fluid increases at the expense of its pressure energy

D.C MOTOR



Fig 6.5: D C Motor

An electric motor is a machine which converts electrical energy to mechanical energy. Its action is based on the principle that when a current-carrying conductor is placed in a magnetic field, it experiences a magnetic force whose direction is given by Fleming’s left hand rule.

When a motor is in operation, it develops torque. This torque can produce mechanical rotation. DC motors are also like generators classified into shunt wound or series wound or compound wound motors.

FLEMING’S LEFT HAND RULE

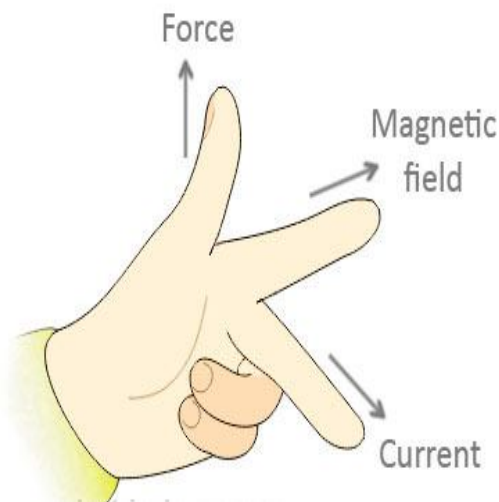


Fig 6.6: shows fleming’s left hand rule

Keep the force finger, middle finger and thumb of the left hand mutually perpendicular to one another. If the fore finger indicates the direction of magnetic field and middle finger indicates direction of current in the conductor, then the thumb indicates the direction of the motion of conductor.

PRINCIPLE OF OPERATION OF DC MOTOR

A uniform magnetic field in which a straight conductor carrying no current is placed. The conductor is perpendicular to the direction of the magnetic field.

The conductor is shown as carrying a current away from the viewer, but the field due to the N and S poles has been removed. There is no movement of the conductor during the above two conditions. In figure the current carrying conductor is placed in the magnetic field. The field due to the current in the conductor supports the main field above the conductor, but opposes the main field below the conductor.

The result is to increase the flux density in to the region directly above the conductor and to reduce the flux density in the region directly below the conductor. It is found that a force acts on the conductor, trying to push the conductor downwards as shown by the arrow. If the current in the conductor is reversed, the strengthening of flux lines occurs below the conductor, and the conductor will be pushed upwards

Now consider a single turn coil carrying a current as shown in the above figure. In view of the reasons given above, the coil side A will be forced to move downwards, whereas the coil side B will be forced to move upwards. The forces acting on the coil sides A and B will be of same magnitude. But their direction is opposite to one another. As the coil is wound on the armature core which is supported by the bearings, the armature will now rotate. The commutator periodically reverses the direction of current flow through the armature. Therefore the armature will have a continuous rotation.

SPECIFICATION OF D.C MOTOR

- ✓ VOLT: 12V D.C
- ✓ WATTS: 90W
- ✓ RPM: 60 RPM

BATTERY



Fig 6.7: Battery

A battery is a self-contained, chemical power pack that can produce a limited amount of electrical energy wherever it's needed. The basic power unit inside a battery is called a cell, and it consists of three main bits. There are two electrodes (electrical terminals) and a chemical called an electrolyte in between them. For our convenience and safety, these things are usually packed inside a metal or plastic outer case. There are two more handy electrical terminals, marked with a plus (positive) and minus (negative), on the outside connected to the electrodes that are inside. The difference between a battery and a cell is simply that a battery consists of two or more cells hooked up so their power adds together

SPECIFICATIONS

- Material :Lead-Acid Free maintenance Battery
- Output Voltage :12 V D.C
- Output Power :40 Ampere-Hour

SOLAR PANEL



Fig 6.8: solar panel

Solar panels absorb sunlight as a source of energy to generate electricity.

SPECIFICATIONS

- Array Size : 12 x 6
- Size : 16 x 14"
- Output Voltage : 12V (Normal Condition)
- Output Voltage : 22V (peak Hours)
- Type : D.C Voltage
- Material : Silicon
- Watts : 10W
- Per Hour : 500 mA
- 8 hour Ampere : 4 Amps

VII. FINAL SETUP OF PROJECT



Fig7.1: Final setup of project

WORKING PRINCIPLE

The frame is manually handling equipment which connected to the wheel. This system works on the link slot mechanism that is rotary motion is converted into linear motion. In this rotating motion of the wheel system is converted into rotary motion through connecting rod which is connects to the pump piston of the tank; This will develop high pressure in pump and sprays the pesticide with high pressure in all the nozzles.

The cutter is operated by the motor in front of the setup, consists of set of blades, which is also operated by a motor which cut the grass. The pump delivers the water from tank to the nozzles then nozzles sprays the pesticide and also the cutter cuts the grass two mechanisms that are spraying and cutting works at a time.

VIII. CALCULATIONS

1) NORMAL SPEED IN RPM

6 revolution in 10 seconds Then for 1 second
 $10 - 6$
 $1 - x$
 $10x = 6$
 $x = 0.6$
For 1 minute
 $x = 0.6 * 60$
 $x = 36 \text{ rpm}$
Normal speed in rpm = 36 rpm

2) DISCHARGE IN M³/SEC

$Q = \pi/4 * (d^2) * L * rps$
 $Q = \pi/4 * (0.5^2) * 0.5 * 0.6$

$Q=0.059 \text{ mm}^3/\text{sec}$

Discharge (Q) = $0.000059 \text{ m}^3/\text{sec}$

IX. ADVANTAGES, DISADVANTAGES & APPLICATIONS

Advantages

- Low cost.
- Easy construction.
- Easy to operate.
- No power is required.
- Solar energy is a renewable energy and the battery is charged continuously.
- Highly reliable.
- High efficiency.
- No need of skilled operators to operate this system
- It does not require any kind of non-renewable energy is mechanical, electrical and pressure energy.
- It reduces the fatigue of operator during the operation.
- It increases the efficiency of operator.
- It can cover more area of land during spray.
- It can adjust the height of spray by using adjustable
- Its cost is less than convention manually operated pump.
- Its noise is less

Disadvantages

- In irregular area of land it can difficult to operate.
- In rainy days in muddy environment it is difficult to operate

Applications

- It major use in agriculture to spray fertilizer.
- Use from spray chemical Pesticide in plants in farm.
- It is use for spray painting in industry.
- It is use for spray water in garden on the plants.
- It is use for transfer water from one place to its nearer place.

X. CONCLUSION

- The suggested model has removed the problem of back pain, since there is no need to carry the tank on the back.
- More no of nozzle which cover maximum area of spray in minimum time at maxrate.
- Proper adjustment facility in the model with respect to crop helps to avoid excessive use of pesticides which result into less pollution.

- Imported hollow cone nozzle should be used in the field for the better performance.
- Muscular problem are remove and there is no need to operate lever.
- This alone pump can use for multiple crops.
- After having a trial we have found that one finds it easy to operate push type machine.
- The pump can deliver the liquid at sufficient pressure where output of the nozzle in 1min is 0.3 and spray width 0.4m from calculation so that it reaches all the foliage and spreads entirely over the spray surface.
- It is little heavy but efficiently working in rough conditions of farm. It is economical therefore affordable for all kind of farmers.
- It requires comparatively less time for spraying so we can get more fields spraying per day. It is cost effective than the existing spraying pumps available in the market as no direct fuel cost or cost for maintenance is needed for this.
- Also it can be used for any crop as its maximum width is not more than one foot. Its nozzles can be adjusted to any height

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