

Multi Nozzle Sprayer By Hand Operated Vehicle

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ABSTRACT

In the agricultural sector generally, a farmer uses a traditional way that is spray carried on a backpack and spraying crop. This becomes time consuming, costly and human fatigue is a major concern, these problems can be overcome by using an agricultural reciprocating multi sprayer. It facilitates the uniform spread of the chemicals, capable of throwing chemicals at the desired level, precision made nozzle tip for adjustable stream and capable of throwing foggy spray depending on the requirement.

1. INTRODUCTION

Farming is the backbone of Indian economy. About 60 to 70 percent of the Indian population based on the field of agriculture and by a recent report they contribute 15 to 16 percent to GDP. Agriculture is developed up to a higher level in the last 40 to 50 year. Out of the various reasons involved for this development is controlled in the form of spraying which will plants. In modern farming, the usage of pesticides is still increasing up to 80-85% of these pesticides are being applied on crops in the form of spraying which will maintain eco friendly approach. In the agricultural sector use of cheap and beneficial equipment for effective spraying for increase productivity which is very important for better contribution to India's GDP. The problem with using existing convention equipment is that farmers will face economic difficulties in case of chemical and electrical powered pumps as well as they will face a number of diseases and problem due to these spraying types of equipment.

2. PROPOSED SYSTEM

First, bring the spray pump at the field where you want to use then fill the pesticides or water as you need. Then connect the chain drive to freewheel. When we start applying/running the machine remembers to adjust the nozzle direction and height as per requirement. By holding the handle when we start pushing the spray pump the wheels start to revolve due to its motion. The sprocket/freewheel transfers its motion to crank by chain drives the chain drive is connected to sprocket and crank. The crankshaft provides its motion to piston pump it. The pump works vertically reciprocating, through pipe the pesticides or water sprays on crop.

3. CONSTRUCTION

Manually operated spray pump has the simple structure it consists of a single wheel, piston pump, bearings, nozzle, shafts, trolley, pipe, crankshaft, handle chain drive, etc. There is trolley like structure containing a pump on it and space for fitting the number of the nozzle at certain height as per requirement. The rear wheels are connected by a shaft. Bearings are provided at both sides for smooth motion. The wheel is connected to the crankshaft by chain drive. The crankshaft is connected to the piston pump with a connecting rod. The piston pump has placed in the middle of the frame which has a reciprocating moment. The nozzle is mounted on the upper side of the tank. Nozzle having a flexible pipe which is moved or turn any direction. We can also adjust the height of the flexible pipe. We use 2 nozzles in our sprayer.

COMPONENTS

- ❖ Frame piston pump
- ❖ Piston pump
- ❖ Sprayer tan
- ❖ Connecting rod
- ❖ Chain
- ❖ Drive sprocket
- ❖ Driven sprocket
- ❖ Nozzle

4.DESIGN CALCULATION**Selection of wheel**

Distance between two plants = 1.25 feet = 38 cm.

Line covered by one rotation of wheel = 4

$$= 38 \times 4$$

$$= 152 \text{ cm}$$

$$152 = 2 \pi r$$

$$r = 152 / 2\pi$$

$$r = 25 \text{ cm}$$

the diameter of wheel = 50 cm

STRESS CALCULATION

Length of = centre distance between two sprockets + width of tank + excess

$$= 45 + 13 + 24$$

$$L = 82 \text{ cm}$$

Height of frame = 75 Cm Width Of Frame = 50 cm

Total length of pipe = 575 cm

Cross section area of square pipe = $25.2 \times 2 = 51 \times 4$ sides = 20.4 cm²

Volume of frame = $204 \times 575 = 1173000 \text{ cm}^3$

Density of m. s material = $7.7 \times 10^{-6} \text{ kg/mcm}^3$

Density = mass = density x volume

= 9.03 kg

Total weight of assembly = $15+2+1+9 = 27 \text{ kg} \times 9.81 = 264.87 \text{ N}$

Yield stress of material = 247 N/Cm^2

Area = $5750 \times 25.4 = 146050 \text{ cm}^2$

Stress = Load/Area

= $264.87/146050 = 0.0181 \text{ N/mm}^2$

Therefore, $0.0181 < 247 \text{ N/mm}^2$, hence the design is safe

SPRAYER TANK

A sprayer is a device used to spray a liquid, where sprayers are commonly used for projection of water, weed killers, crop performance materials, pest maintenance chemicals. In agriculture, a sprayer is a piece of equipment that is used to apply herbicides, pesticides, and fertilizers on agricultural crops. Sprayers range in size from man-portable units (typical backpacks with spray guns) to trailed sprayers that are connected to a tractor, to self-propelled units. With boom mounts of 4-30 feet up to 60-151 feet in length. The sprayer capacity is 12-16 liters

SPROCKET AND CHAIN

This is a cycle chain sprocket. The chain sprocket is coupled with another generator shaft. The chain converts rotational power to pulling power, or pulling power to rotational power, by engaging with the sprocket.

The sprocket looks like a gear but differs in three important ways:

- Sprockets have many engaging teeth; gears usually have only one or two.
- The teeth of a gear touch and slip against each other; there is basically no slippage in a sprocket.
- The shape of the teeth is different in gears and sprockets.

ADVANTAGES

- It can cover more area of land during spray.
- It reduces the fatigue of the operator during the operation.
- It can cover 3 acres in a day.
- It does not require any kind of non-renewable energy is mechanical, electrical and pressure energy.
- It has is less air pollution.
- Its cost is less than the electrical and solar operated pump.

DISADVANTAGES

- The farm should be in setup to use this sprayer due to the trail made by the wheels.
- The sprayer is limitation edition not suitable for all the field

APPLICATION

- It can be used on the farm which especially maintained for this sprayer.
- It can only be used in small crops like tree farming, nuts, plants like brinjal, potatoes, tomatoes, coriander, carrot.
- It can't be used large crops like paddy, sugarcane, melons, wheat, etc,

5. CONCLUSION

It is an upgraded design of manually operated multiple sprayers which will be helpful for small land farmers. It consumes less time and saves money as compared with conventional spraying and weeding. This machine does not require any fuel or power so maintenance is less. This model removes the problem of back pain, vibrations, and noise. This alone pump can be used for multiple crops. The model has provided multiple nozzles, which has continuous spray over the crop and this process takes less time than other sprayers for spaying.

6. CONCLUSION

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