

Wheel Grounded Agriculture Fertilizer Sprayer

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Abstract: The maturity of the sprayer pumps available in the request are back-mounted, hand pumps that are used to spot fungicides. Fungicide spray pumps have to be pumped manually and also carried on the reverse for scattering in the fields. India is a land of husbandry that comprises small, borderline, medium, and rich growers. Small-scale growers are veritably interested in manually switch-operated backpack sprayers because of their versatility, cost, and design. But this sprayer has certain limitations like it cannot maintain the needed pressure; which leads to the problem of reverse pain. This paper suggests a model of a manually operated multi-nozzle fungicides sprayer pump which will perform scattering at a maximum rate in minimal time. We've designed a model running without any energy and is also easy to operate for a stoner. We try to develop a new mechanical system which will overcome all the below problems and it'll help growers.

Keywords: Toxin pump, Snoots, Slider coil medium, Cost-effective outfit, Medium growers, Wheel operated Trolley, Compression Chamber, Chain and Sprocket, Economic.

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I. Preface:

Husbandry plays a vital part in the Indian frugality. Around 65 of the population in the state is depending on husbandry. Although its donation to GDP is now around one-sixth, it provides 56 of the Indian pool. The share of the borderline and small growers is around 81 and land operated is 44 in 1960-61. As far as the Indian script is concerned, further than 75 percent of growers are belonging to small and borderline land carrying and cotton is alone which provides about 80 of employment to the Indian pool. So any enhancement in the productivity-related task help to increase Indian growers' status and frugality. The current pack sprayer has a lot of limitations and it needed more energy to operate. The chance distribution of ranch holding land for borderline growers is 39.1 percent, for small growers 22.6 chance, for small and borderline growers 61.7 percent, for semi-medium growers 19.8 percent, for medium growers 14 chance and for large growers 4.5 percent in the time 1960-61. Easily explain that the maximum chance of ranch distribution belonged to the small and borderline order.

Problem Summary: The growers who use these types of conventional pack sprayer faces numerous types of problems like fatigue, frazzle, pain in the spinal cord and muscles, etc. Following problems can take place by use of this conventional type of pump.

Common Problems:

1. Heavyweight causes difficulty in lifting manually.
2. Fatigue to the driver due to heavyweight.
3. Due to heavy weight during spraying, the driver feels fatigued which reduces his effectiveness.
4. Big size of the pump cause vexation to the driver.
5. Poor selection and quality of outfit.
6. These problems combined with a lack of mindfulness and specialized knowledge and shy conservation and poor field use of outfit have led to inferior pitfalls to the terrain and mortal health.

Distances (horizontal & Vertical) and height of crop:

Sr. no.	Name of crop	Distance between plants (horizontal/vertical)	Height of crop
1.	Sorghum	15 inch /3-4 inch	5.5-7 feet
2.	Pearl millet	15 inch /3-4 inch	5.5-7 feet
3.	Sugarcane	15 inch /3-4 inch	5.5-7 feet
4.	Soybean	15 inch /2 inch	5.5-7 feet
5.	Corn	15 inch /3 inch	5.5-7 feet

6	Groundnut	15 inch / 3 inch	1.5 feet
7.	Cotton	24-36 inch /24-36 inch	2-5 feet
8.	Pigeon Pea	15 inches / 6 inches	3-4 feet

II. Literature Review

About Pumps: The pump, at its recommended rotational speed, should have sufficient capacity to insure that the sprayer operates efficiently when fitted with the largest recommended size of snoots operating at the maximum rated pressure plus an fresh 20 to regard for snoot forbearance and to give tank agitation. It should be possible to remove the pump from the sprayer without draining the tank(s).

The pump should be permanently pronounced with

1. Maximum inflow rate and operating pressure
2. Recommended and maximum rotational speed
3. Name and address of the manufacturer
4. Model/ type and time of manufacture

Hand-Operated Sprayers: There are colorful types of hand- operated sprayers, but they can be astronomically distributed into two groups

1. Sprayers with hydraulic snoots: Designed with systems to induce pressure at the snoot to achieve correct atomization. With switch- operated sprayers, the main tank isn't pressurized, but spot pressure is generated in a Pressure chamber by constant pumping. With contraction sprayers, the whole tank is pressurized before scattering.

2. Rotary atomizers: These induce spray driblets from a spinning slice or mug. These types generally apply low volumes of spray liquid per hectare. These Low volumes mean that advanced attention of spray liquid are applied; this makes them infelicitous for some products. In particular, they should no way be used for parquet operation as the attention are likely to exceed recommended dilution rates.

1. Sprayer with centrifugal- energy snoots
2. Electrostatic scattering outfit
3. Rope- wick pesticide applicators

Supplementary Points: Hand- operated, hydraulic sprayers or hand- held spinning fragment sprayers are generally used in Asian countries in applying fungicides. Sprayers with centrifugal- energy snoots are also nominated" controlled drop operation(CDA) sprayers" Rope- wick pesticide applicators were developed specifically to apply low volumes of largely concentrated dressings, to weeds that grow high than crops. The pesticide result is rubbed on any weeds that come into contact with the rope wick.

Selection of Sprayer: First of all, it's important that buying agencies should elect the type of sprayer which is most applicable for the purpose intended. The notes below will help in the selection. When opting a sprayer, it's good to identify the range of uses to which it'll be put. Certain types of sprayers are suitable for certain types of fungicides. For illustration, a diaphragm pump- type switch- operated backpack sprayer is immaculately suited for pesticide operation. For safety, it's also veritably important to probe the particular make of the machine. For illustration, pristine sword tanks are better than galvanized essence since they aren't subject to erosion.

1. Switch- operated backpack sprayers: Diaphragm pumps- are suitable and are a durable option where operations are made through a single snoot. They're also suitable formulti-nozzle thunderclaps where fairly low spraying pressures are acceptable(1 bar). Piston pumps- are suitable for single snoot use and are preferred to diaphragm pumps formulti-nozzle use where advanced pressures are needed(to 4 bars). 13 Push Operated Spray Pump. Underarm regulators are preferred toover-arm regulators except where crop conditions stymie the movement of the switch.

2. Motorized hydraulic backpack sprayers: These units can make good sense in high- value crops for use with multi-nozzle thunderclaps where dragged pumping, indeed with a piston machine, isn't practical.

2.1 Compression Sprayers: Compression sprayers are necessary where field conditions make switch- operated machines impracticable, for illustration on steep pitches and in thick crop leafage. They're also used in grain stores to treat wall shells.

2.2 Motorized Mist boosters: Motorized mist boosters are used where the spray pall needs to be projected vertically to treat trees, but may be used to spot horizontally formulti-row and backcountry crop scattering. They can also be acclimated for scrap operation. They aren't recommended for pesticide operation.

2.3 Snoot Choice: The provision of the correct snoot for the job enables safer and more effective spraying. Applicable snoots for the intended task should be supplied with the outfit. A minimum of one snoot type suitable for pesticide operation and one for germicide/ germicide operation shall be supplied with the outfit. Deflector snoot(also called impact, flood tide, or anvil snoots) is used for single snoot operation of soil- applied dressings. Flat suckers are stylish for scattering products onto flat shells for foliar operations, the operation of dressings to the soil, and germicides onto walls for control of stored product pests. Concave cone snoots are used for general spraying of leafage and give good content of the external corridor of a cover(used to apply germicides and pesticides). Solid cone snoots are used for spot and band scattering. malleable multipurpose snoots aren't recommended for crop protection use. The spray quality is delicate to reproduce and this type of snoot encourages drivers to acclimate and touch snoots defiled with fungicides.

2.4 Backpack Sprayers:



Backpack sprayers

1. Any sprayer which is carried on the reverse of the driver is called a backpack sprayer
2. The generally used manually operated backpack sprayer will have one hydraulic pump working inside the vessel
3. The plunger works inside the relief well attached at the bottom of the vessel, for easier conservation
4. The pump can be operated through the applicable liaison by oscillating the handle, with the sprayer carried on the reverse
5. An kindler is also handed with the pressure chamber to agitate the fluid so that the patches in suspense won't be allowed to settle down
6. A delivery tube is attached to the other end of the pump which carries the pressurized fluid to the spray shaft

Slider Crank Medium: Slider- coil medium, arrangement of mechanical corridor designed to convert straight- line stir to rotary stir, as in a repaying piston machine, or to convert rotary stir to straight- line stir, as in a repaying piston pump.



MAIN FACTORS OF THE SYSTEM:

- | | | | | | |
|----------|--------------|----------|-----------------------|------------|-------------|
| 1. Frame | 2. Pump | 3. Tank | 4. Pressure Regulator | 5. Kindler | 6. Strainer |
| 7. Snoot | 8. Sprockets | 9. Chain | 10. Connecting rod | 11. Coil | |

1. Frame: It's the main part of the system which acts as the base to hold the whole setup of the machine. The material of the frame is mild sword.

2. Pump: A pump is used to transfer the liquid from one place to another place by creating a mechanical

energy difference

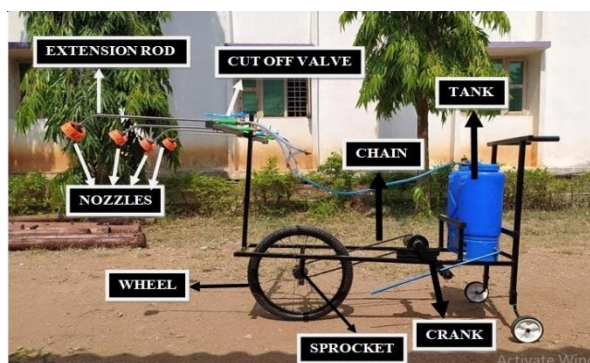
3. Tank: The tank carries further fluid with lower weight. A tank with a 15- liter capacity is taken. The Tank is made up of plastic.

4. Pressure Regulator: A Pressure controller is a control stopcock that reduces the input pressure of a fluid to the asked value at its affair. Controllers are used for feasts and liquids and can be an integral device with an affair pressure setting, a restrictor, and a detector each in one body, or correspond of a separate pressure detector, regulator, and flow stopcock.

5. Kindler: An kindler is a device or medium to put commodity into stir by shaking or stirring. There are several types of agitation machines, including washing machine inciters(which rotate back and forth) and glamorous inciters(which contain a glamorous bar rotating in a glamorous field). inciters can come in numerous sizes and kinds, depending on the operation. In this operation, the device is used to mix the chemical and water homogeneously per every stroke.

6. Strainer: Strainers are bias for mechanically removing unwanted solids from liquid, gas, or brume lines using a perforated or line mesh straining element. They're used in channels to cover pumps, measures, control faucets, brume traps, controllers, and other process outfit. Strainers are important factors of pipeline systems to cover outfit from implicit damage due to dirt and other patches that may be carried by the process fluid.

7. Snoots: A snoot is a device designed to control the direction or characteristics of a fluid inflow(especially to increase haste) as it exits(or enters) an enclosed chamber or pipe. A snoot is frequently a pipe or tube of varying cross-sectional area, and it can be used to direct or modify the inflow of a fluid. snoots are constantly used to control the rate of inflow, speed, direction, mass, shape, and the pressure of the sluice that emerges from them. In a snoot, the haste of fluid increases at the expenditure of its pressure energy.



8. Sprocket: A sprocket or sprocket- wheel is a penciled wheel with teeth, or cogs, that mesh with a chain, track, or other perforated or depressed material. The name 'sprocket' applies generally to any wheel upon which radial protrusions engage a chain passing over it. It's distinguished from a gear in that sprockets are noway enmeshed together directly, and differs from a pulley in that sprockets have teeth and pulleys are smooth. Sprockets are used in bikes, motorcycles, buses , tracked vehicles, and other ministry either to transmit rotary stir between two shafts where gears are infelicitous or to conduct direct stir to a track, tape recording, etc. maybe the most common form of sprocket may be set up in the bike, in which the pedal shaft carries a large sprocket wheel, which drives a chain, which, in turn, drives a small sprocket on the axle of the hinder wheel. Beforehand motorcars were also largely driven by sprocket and chain mechanisms, a practice largely copied from bikes. Sprockets are of colorful designs, a maximum effectiveness being claimed for each by its originator. Sprockets generally don't have a flange. Some sprockets used with timing belts have flanges to keep the timing belt centered. Sprockets and chains are also used for power transmission from one shaft to another where slippage isn't permissible, sprocket chains being used rather of belts or ropes and sprocket bus rather of pulleys. They can be run at high speed and some forms of the chain are so constructed as to be quiet indeed at high speed.

9. Chain: A bike chain is a comber chain that transfers power from the pedals to the drive- wheel of a bike, therefore propelling it. utmost bike chains are made from plain carbon or amalgamation sword, but some are nickel- plated to help rust, or simply for aesthetics. A bike chain can be veritably energy effective, one study reported edge as high as98.6. The study, performed in a clean laboratory terrain, set up that effectiveness wasn't greatly affected by the state of lubrication. A larger sprocket will give a more effective drive because it moves the point of pressure further down from the axle, placing lower stress on the compartments, therefore reducing disunion in the inner wheel. Advanced chain pressure was set up to be more effective." This isn't in the direction you'd anticipate, grounded simply on disunion".

10. Connecting Rod: A connecting rod is a rigid member which connects a piston to a coil or crankshaft in a repaying machine. Together with the coil, it forms a simple medium that converts repaying stir into rotating stir. A connecting rod may also convert rotating stir into repaying stir, its original use. Before mechanisms, similar as the chain, could only conduct pulling stir. Being rigid, a connecting rod may transmit either push or pull, allowing the rod to rotate the coil through both halves of a revolution. In a many two-stroke machines, the connecting rod is only needed to push.

Moment, the connecting rod is best known for its use in internal combustion piston machines, similar as machine machines. These are of a distinctly different design from earlier forms of connecting rods used in brume machines and brume locomotives.

11. Coil: The crankset (in the US) or chainset (in the UK), is the element of a bike drive train that converts the repaying stir of the rider's legs into rotational stir used to drive the chain or belt, which in turn drives the hinder wheel. It consists of one or further sprockets, also called chainrings or chain bus attached to the cranks, arms, or coil arms to which the pedals attach. It's connected to the rider by the pedals, to the bike frame by the bottom type, and to the hinder sprocket, mail, or freewheel via the chain. The two cranks, one on each side and generally mounted 180° piecemeal, connect the nethermost type axle to the pedals.

Cranks are constructed of either an aluminum amalgamation, titanium, carbon fiber, Chromoly sword, or some less precious sword. Tubular sword cranks (similar as Tioga's Revolver) can be light and veritably strong, are generally set up on BMX bikes, and are sluggishly chancing their way to mountain bikes (dirt jumping and civic assault). Aluminum cranks may be cast, hot forged or cold forged ("cold" in this environment means the billet from which the coil is to be made is hotted to a specified temperature well below the melting point, not room temperature). Cold forging gives the essence fresh strength, and the cranks can thus be made lighter without adding the threat of breakage. Shimano's "Hollowtech" aluminum cranks are made by forging the main arms around a hard sword insert which is also withdrawn, leaving an internal void to save weight. They're also welded up before final machining.

WORKING: When we push the system the wheel rotates and the sprockets are strictly mounted on it & there's no relative stir between wheel & sprocket, and this sprocket is connected with another sprocket called a driven sprocket by the breakers, chain, and this sprocket is fixed on the driven shaft by with the help of the backcountry medium. The shaft is connected with a coil, thus the rotary stir of the wheel is converted into repaying stir.

For every one revolution of the wheel, the driven sprocket rotates 2.5 revaluations due to the coil & chain medium. The haste of the driven shaft varies according to the following theorem.

T1 = No. of Tooth on the motorist sprocket

T2 = No. of Tooth on the driven sprocket

N1 = Speed of the driven in rpm

N2 = Speed of the driven in rpm

$N2/N1 = T1/T2$

$N2/N1 = 42/14 = 3$

Due to the below haste rate, for every revolution of the motorist sprocket the driven sprocket rotates 3 times as the motorist sprocket. For every revolution of the driven shaft, the coil makes two recompensed movements like forward & backward, due to this the connecting rod on the coil makes two repaying movements & this coil is connected to the piston of the pump cylinder, so due to this movement the piston move up & down stir & the creates the suction & contraction strokes. In suction stroke, the low pressure is created in the pump cylinder that's below the atmospheric pressure (760 mm of Hg). Due to that low pressure, the liquid is smelled into the pump cylinder through the kindler, where the fluids are mixed homogeneously according to the rate of 11. In contraction stroke, the high pressure is created & bay stopcock closes automatically due to similar high pressure the outlet stopcock is opened, due to mechanical energy (eventuality, kinematic & detail energy) difference the fluid is transferred from the pump outlet to the needed destination through varies intermediate connections, By using sprinklers the water will spot dropwise so spreading of the liquid will reach the needed position.



WHEEL AND Coil TYPE MEDIUM: A coil is an arm attached at a right angle to a rotating shaft by which repaying stir is communicated to or entered from the shaft. It's used to convert indirect stir into repaying stir, or vice versa.

COMPUTATIONS:

Distance covered in one stroke of pump

Periphery of tyre = 650 mm

Distance covered in one revolution of driving side = $650 \times \pi = 2042$ mm

So using rate = driving side/ driven side = 42/ 14

Distance covered in one stroke of piston = 6 cm

Specification of main corridor of drive operated spray pump

Specification of tyre:

Specification of tyre 1 & 2

Periphery = 650 mm

Material = Aluminium & it's amalgamation

Specification of motorist coil :

No. of tooth's = 42

range = 0.5 cm

Material = Stainless sword

Specification of Driven sprocket :

No. of tooth's = 14

range = 0.5 cm

Material = Stainless sword

Specification of shaft :

Periphery = 25.4 mm

Length = 300 mm

Material = Mild sword

Specification of Pipe :

Diameter = 5 mm

Consistence = 3 mm

Material = Plastic

Length = As per demand

Specification of Crank :

Length of the coil = 30 mm

Material = Mild sword

Specification of Bearing :

Inner Periphery = 25.4 mm

external Periphery = 50 mm

Material = Brass & Cast forceful

Specification of tank :

Length = 350 mm

Height = 600 mm

Range = 150 mm

Capacity = 15 Ltr.

Material = Plastic

Specifications of connecting rod :

Length = 370 mm

Periphery = 5 mm

Material = Mild sword

Estimation

SL.NO	FACTORS	QUANTITY	COST
1	PIPES	3 NOS	600
2	SPROCKETS	2NOS	300
3	COMPORMENTS	2 NOS	200
4	SHAFTS	1 NO	1,200
5	TANK	1 NO	1,500
6	CHAIN	1NOS	100
7	SUPPORT WHEELS	3 NOS	500
8	COMBINING ROD	1 NO	100
9	CRANK	1 NO	100
10	NUTS N BOLTS	6 NO	100
11.	SNOOTS	4 NO	200
12.	TWO WAY COUPLING	1 NO	100
13.	MISCELLANEOUS		1,600
		TOTAL	6,600

PRODUCT DESIGN SPECIFICATION TABLE:

SL.NO.	Factors	Specifications
1.	Performance (Specialized specifications)	Tank capacity:15 liters Pump: Piston pump Working pressure: 2 - 3 bar Maximum pressure: 4 bar Snoot type: Multi snoot Power source: Mechanical power
2.	Environment	Easy installation, easy to detach and attach, Lightweight, and cleanable
3.	Life span	5 – 8 years
4.	Conservation	Once in a season
5.	Major accoutrements used	Base frame: Mild sword Tank: HDPE Plastics
6.	Process	Design, Detailing, Fabrication, and confirmation
7.	Weight	20 – 25 kgs
8.	Ergonomics	Gripping, Reach for control and availability
9.	Colour	Ecofriendly
10.	Cost	6,000/-
11.	Transport	Easy to transport
12.	Appearance	Good appearance, easy to use
13.	Type	Movable
14.	Safety	Safe and smooth operation

Operation:

1. For the germicides operation to control nonentity pests on crops and in stores, houses, kitchens, flesh granges, barns,etc.
2. For the pesticides and bactericides operation to control the factory conditions.
3. For the operation of the dressings, to kill the weeds.

4. For the harmony sprays operation to increase the fruit set or to help the unseasonable dropping of fruits.
5. For the operation of factory nutrients as a foliar spray.
6. For applying the fine expression of toxic chemicals on the crops and for any other purposes.
7. Fungicides Sprinkling.

Advantages:

1. Lower original and conservation cost
2. Doesn't bear any External Source of Energy
3. Safe-deposit box for Operation
4. No Fatigue to Operator
5. The pressure of the system is invariant
6. Can work Efficiently during all Seasons
7. Movable & Ergonomic



III. Conclusion:

1. The suggested model has removed the problem of reverse pain since there's no need to carry the tank(fungicides tank) on the reverse.
2. As the suggested model has further number of snoots which will cover the maximum area of scattering in minimal time & at a maximum rate.
3. The c.f. faucets can also be applied which help in reducing the change of pressure change and c.f. faucets help to maintain pressure.
4. Proper adaptation installation in the model concerning crop helps to avoid inordinate use of fungicides which affect in lower pollution.
5. Imported concave cone snoots should be used in the field for better performance.
6. Muscular problems are removed and there's no need to operate the switch.

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