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International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Multipurpose Spray Pump

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A B S T R A C T

The paper's major goal is to create a low-cost, mechanically powered sprayer pump for Indian small-scale farmers. Farmers have significant challenges while spraying pesticides, such as limited tank capacity, high costs, and longer spraying times. India is claimed to be an agriculturally based country, with 75 percent of the population reliant on farming directly or indirectly. There is a lot of field work in the agriculture industry, such as weeding, reaping, sowing, and so on. Spraying is another crucial operation that the farmer must conduct to protect the farmed crops from insects, pests, fungi, and diseases. Various insecticides, pesticides, fungicides, and fertilizers are sprayed on crops for protection. Many various spraying technologies are used in today's globe, with energies such as electrical energy, solar energy, and chemical energy of fuels. Different types of sprayers have been launched onto the market to alleviate issues, however these devices do not fulfill the specific problems or desires of farmers. This pesticide sprayer uses a wheel to save time and create uniform nozzle pressure; it also uses a crank mechanism with a piston pump that is driven by the wheel. This information demonstrates how much energy is consumed in a location where mechanical energy can be used instead of direct energy sources. To address these issues, a new mechanically operated wheel driven sprayer will be designed. It will be a portable device that does not require any fuel to work, is easy to transport, and sprays the pesticide by moving the wheel.

Keywords: Usability, Functionality, Ergonomics, Wheel Driven, Multi Nozzle.

1. INTRODUCTION

Mechanical sprayers are one of the most frequent ways to apply pesticides, especially in conventional agriculture. The size of the droplets can be changed by employing different nozzles or changing the pressure at which they are blasted out. This is a trolley-operated device that allows us to reduce the amount of work required to spray pesticides while also allowing us to spray pesticides in any direction or around the crops at any height. These can be fitted with a pistol as well. When equipped with a boom, they can perform any task that a low-pressure boom sprayer can. The mixture is sprayed in the form of droplets, which might be large or small. Some may be widely employed in the manufacture of specific goods. There are a variety of additional hand-operated sprayers that aren't extensively utilized in agriculture. This is used for weeding, plugging, and other similar tasks. In most cases, pesticides are blended with water or another liquid chemical carrier, like as fertilizer. Large droplets are beneficial because they reduce spray drift; yet, they require more water per unit area of land covered. For greater efficiency, multiple pesticide sprayer pumps combine a knapsack and a battery-operated pump. The design of a high-pressure sprayer is identical to that of a low-pressure sprayer; the only difference is that high-pressure components are required. They normally work with a dilute mixture and pressures ranging from 250 to several hundred pounds per square inch. Where necessary, motorized sprayers can also spray at a higher pressure to give better coverage. Spraying shade and decorative trees, animals, orchards, buildings, undesired brush, rights-of-way, commercial crops, and so on are all done with handguns. Engine-driven sprayers create more consistent sprayer outputs, cover the spray swath more uniformly, run at a steady speed, and provide considerably more uniform coverage than manual spraying. This research proposes a model of manually controlled multi-nozzle pesticide sprayer pump that sprays at maximum rate in the shortest amount of time.

Pesticide/Fertilizer Sprayer installed on a Cart that is mechanically driven without the use of any external energy source. All of these factors, as well as being cost effective, light in weight, and strong, have been addressed in this session. Farm holding land is distributed as follows: 39.1% for marginal farmers, 22.6 percent for small farmers, 61.7 percent for small and marginal farmers, 19.8% for semi-medium farmers, 14 percent for medium farmers, and 4.5 percent for large farmers. Explain why the small and marginal category received the highest percentage of farm distribution. 20+ kg) pump on his shoulder; second, he must constantly use one hand to pump with the handle; third, spraying time is reduced. The goal of establishing such a concept is to

avoid the three key shortcomings of the pump that is already in use. To begin with, the farmer must bear the whole weight of the pesticide spraying (about. The existing backpack sprayer has many limitations and consumes a lot of energy to operate.

Fig 1.1 Single Wheel Power Spray Pump

2. SPRAY NOZZLES AND THEIR CLASSIFICATION

Pesticide solution is ejected from all types of sprayers in a very fine spray form. A spraying nozzle is a device that emits spray liquid, breaks it up into minute droplets, and throws the droplets away from the mouth of the nozzle. To achieve a suitable droplet size spectrum, various nozzle designs are used. Energy is required to break the liquid into droplets. As a result, spray nozzles are classed as follows:

Hydraulic energy nozzles, gaseous energy nozzles, centrifugal energy nozzles, and thermal energy nozzles are all examples of energy nozzles.

Hydraulic nozzles are used on almost all sprayers used for high-volume spraying. Low volume knapsack sprayers are typically used with an air blast nozzle or a gaseous energy nozzle. The spinning disc type nozzle on hand-held battery-operated sprayers, also known as CDA sprayers, works on centrifugal energy. Fogging machines with thermal energy nozzles, also known as hot tube nozzles, are utilized for ULV applications. Electrical energy has recently been used to create charged spray droplets for ULV pesticide application.

Hydraulic energy nozzle: Hydraulic nozzles are the most often used spray nozzles for the application of insecticides. This nozzle is found on almost all hydraulic sprayers. Pesticides are sprayed with hydraulic nozzles of the following types:

1. Type of hollow cone
2. The sort of fan
3. The type of impact
4. Adjustable Type

1. Nozzles with hollow cones:

This is a common hydraulic nozzle used to spray pesticides and fungicides. It creates a hollow cone pattern of spray with a variety of droplets of various sizes. This type of nozzle is made of brass metal with an aperture hole drilled in it and a rotral with tangential cut grooves that produces swrill motion to spray liquid that breaks down into droplets when it emerges from the nozzle under pressure. A hand lance/boom is fitted with this simple brass nozzle. Hollow cone nozzles come in a variety of shapes and sizes. A stainless steel disc with a center circular hole through which the spray emerges from a swirl chamber behind it is used in other nozzle designs. The disc and swirl plate (core) are properly installed in the nozzle's body, which contains threads for screwing it to the lance/boom. The hollow cone nozzle's normal working pressure is around 40 psi. Hollow cone nozzles are ideal for treating complicated objects because spray particles can move in an infinite number of directions and planes, allowing for better spray penetration. Because of the potential for fine spray particle drift and the difficulties in achieving an equal spray distribution across the swath, these nozzles are generally not advised for herbicide application. The discharge rate, spray angle, and droplet size can all be affected by changes in liquid pressure. Brass, stainless steel, and plastic are used to make the nozzles. Chemical corrosion and abrasive action damage the nozzle tips. Stainless steel or plastic tips are more wear resistant and aid in spray consistency.

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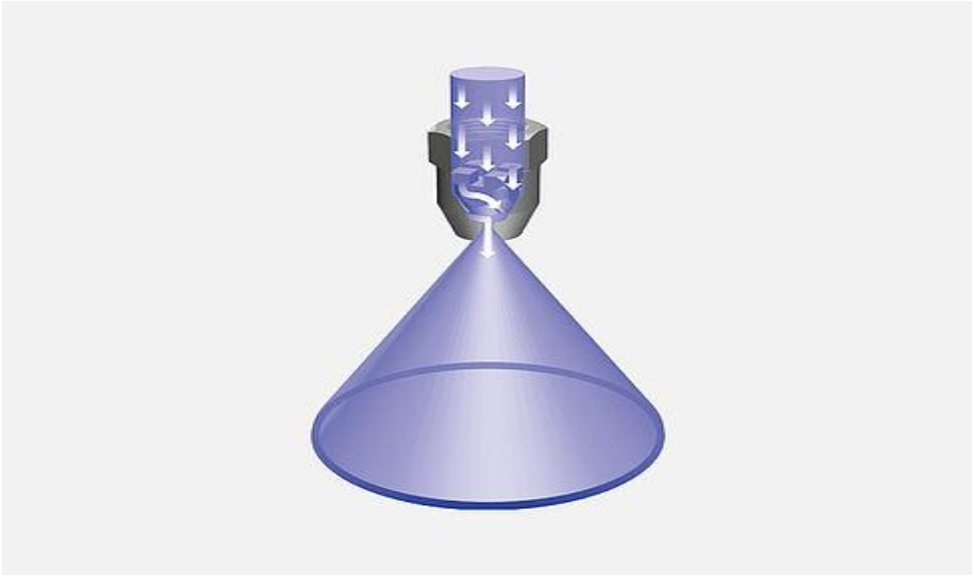

Fig 2.1 hollow cone nozzle

2. Fan nozzle:

Also known as flat fan nozzles. The spray liquid is ejected from an elliptical orifice, resulting in a flat-shaped spray sheet. Band spraying is done using them. These nozzles are typically used on booms with sufficient spacing and overlap to provide equal dispersion. Working pressure is typically around 40 psi. These fan nozzles can also be used for herbicide application, but only at low pressures, such as 15 - 20 psi, to avoid fine droplet drift..

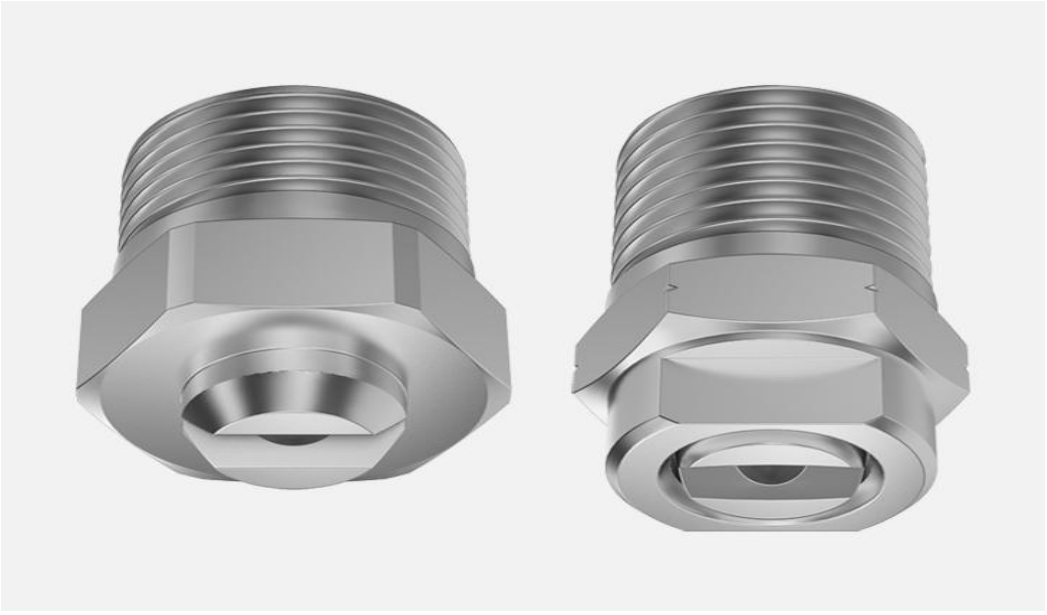

Fig 2.2 fan nozzle

3. Impact nozzle:

Impact nozzles, also known as deflector nozzles, are a type of impact nozzle. The spray liquid exiting a circular hole strikes an inclined smooth face and is deflected at an angle in these nozzles. As a result, the liquid spreads out in a wide angled fan design. These low-pressure nozzles are used for pesticide spraying (15 - 25 psi). The spray pattern consists primarily of coarse droplets.

Fig 2.3 impact nozzle

4. Adjustable nozzle:

This type of nozzle is also known as a tripple action nozzle. They get their name from the different spray patterns that can be created by altering the swirl velocity of the spray liquid in the eddy chamber. Simple changes can produce a hollow cone spray pattern with fine spray particles, a jet spray for orchard/tree spraying, and a medium coarse spray pattern. For spraying trees, these nozzles are typically used with foot-operated sprayers, rocking sprayers, or high-pressure hydraulic sprayers.

Fig 2.4 adjustable nozzle

3. METHODOLOGY

Spraying and seed sowing take a lot more time for them. Although they serve their goal, their scope of operation is insufficient. of nozzles with a change in relative effort

Spraying and seeding take less time than hand-operated systems. of nozzles with a relative change in effort. This fact demonstrates how much energy is being consumed in places where mechanical energy can be used instead of direct energy sources. We now use a variety of spraying and seeding systems that make use of electrical and chemical energy from fuels. If we wish to keep using energy for a long time, we must endeavor to save it as much as possible, whether on a huge or small scale. As a result, in response to current demand, we have developed a mechanically operated spray pump that is entirely mechanical. We developed a mechanically powered multipurpose spray pump and seed sowing equipment to meet today's requirements. This is

why we have put in place mechanical sprayers and seed sowing that is propelled by human labor. If we want to reduce the spraying time even further, we just need to increase the size of our piston. Once started, this equipment has the advantage of taking less time for spraying and seed sowing. As a result, our goal is to build a technology that runs on mechanical power yet takes less time to spray and seed than those that are manually controlled. Once started, this equipment has the advantage of taking less time for spraying and seed sowing. As a result, in response to current demand, we have developed a mechanically operated spray pump that is entirely mechanical. This concept should be implemented in agriculture because it has so many benefits. As of today, the entire world is experiencing an energy crisis. We can reduce the spraying time even more by just increasing the size of our piston.

• Pump: A pump is a piece of machinery that moves liquids, slurries, or gases from one location to another.
• Tank: This is where chemical solutions are stored. It's made of PVC, brass, and other materials.
• Agitator: This is a device that stirs the solution and keeps the contents homogeneous.
• Air chamber: An air chamber is supplied on the release line of a reciprocate type pump to level out the pump's pulsations and so produce an invariable nozzle pressure.
• Pressure gauge: A pressure gauge is a dial gauge that displays the pressure at which liquid is delivered by the pump.

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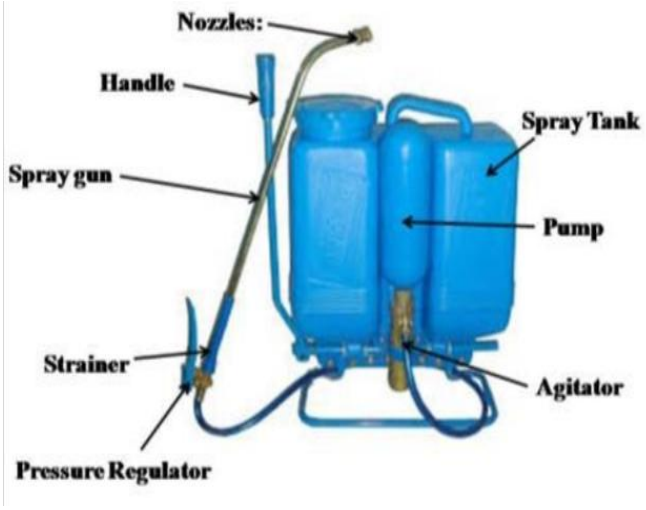

Fig 3.1 Components of sprayer pump

• Pressure regulator: The pressure regulator is used for a variety of purposes. It is the means of adjusting the pressure that is required for every spray job within the pump's pressure range.
• Strainer: -It is a small circular plastic ring with nylon wire mesh that is included in the suction line linking the chemical tank and the check valves to filter any dust element that may be present with the chemical solution.
• Nozzles: This is the component that pulls the fluid into small droplets. Spray fluid is usually mechanized by releasing the liquid under pressure through lips known as nozzles.

Fig 3.2: Multipurpose Pesticides Sprayer System

• Frame: The frame is utilized to support all of the body's sections. It's also known as cheesy, and the frame is made of mild steel. The basic purposes of a frame are to support the chassis components and body, as well as to handle static and dynamic loads without excessive deflection or distortion.
• Connecting link: - M.S. was chosen as the material since it is strong, long-lasting, and inexpensive. The length is determined by the stroke length and

crank radius. By reducing or increasing stroke length, length is increased or decreased.

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4. Conclusion

More nozzles cover a larger area of spray in less time and at a faster rate. The ability to alter the model in relation to the crop helps to avoid overuse of pesticides, resulting in less pollution. Following a trial, we discovered that operating a push type machine is simple. It is a little heavy, but it performs well in farm circumstances. It is cost-effective, making it accessible to all types of farmers. The proposed concept eliminates back pain by eliminating the need to carry the tank on the backbone and solder.

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