Manual Sprayer for Insecticide and Water

1Prabhu M, 2Ramalingam PL, 3Karthik A, 3C. Logesh, 4Balasubramanian. K

1,2,4Department of Mechanical, Panimalar Institute of Technology, Chennai, India.
3associate professor; Department of Mechanical Engineering, Panimalar Institute of Technology, India.

Received 12 July 2016; Accepted 2 October 2016

Address For Correspondence:
Prabhu M, Department of Mechanical, Panimalar Institute of Technology, Chennai, India.
E-mail: muthuprabhu99@gmail.com

Copyright © 2016 by authors and American-Eurasian Network for Scientific Information.
This work is licensed under the Creative Commons Attribution International License (CC BY).
http://creativecommons.org/licenses/by/4.0/

ABSTRACT
This model uses a sprocket mounted on rear shaft which will actuate piston inside cylinder in the tank. Also the assembly consists of 4 wheels out of which 2 are mounted on front shaft and 2 are mounted as guide wheel at rear end. A sprocket is mounted on front side exactly at the end of shaft. By pushing the trolley, sprocket rotates in its direction so it actuates the piston inside the cylinder, due to this the compression takes place inside the tank. So it leads to spray Pesticides or water inside the tank. By our project, spraying is done using sprocket mechanism. The system is completely manual.

KEY WORDS
Actuates The Piston, Chain Mechanism, Sprocket Mechanism, Sprocket Rotation

INTRODUCTION
Farming is the backbone of Indian economy. In this agriculture sector there is a lot of field work, such as weeding, reaping, sowing etc. Apart from these operations, spraying is also an important operation to be performed by the farmer to protect the cultivated crops from insects, pests, funguses and diseases for which various insecticides, pesticides, fungicides and nutrients are sprayed on crops for protection. Farming has undergone a great evolution in last 50 years. Out of the various reasons involved for this evolution is control of various diseases on crops. During initial days there was only hand spraying people use to do. Then slowly there has been development of various methods to spray out chemicals and dusts. Though these devices were highly efficient, there is a need to have certain changes. Chemicals are widely used for controlling disease, insects and weeds in the crops. They are able to save a crop from pest attack only when applied in time. They need to be applied on plants and soil in the form of spray, dust or mist. The application of pesticide is one of the most frequently used methods to protect crops and trees against diseases and insects in agriculture. In the modern agriculture, the usage of pesticides is still increasing, moreover the 90% of these pesticides are being applied in the form of liquid spray and mostly by using the pressure gained from direct energy sources like electrical energy, chemical energy. Increasing public concern about the potential damage of chemical and electrical inputs in agricultural spraying systems has challenged industry to develop new and effective methods of spraying which will maintain environment friendly approach.

II. Objective:
Our main objective is to design and fabricate a low cost and high efficient sprayer. This system can be used for both water and pesticides. The system will be completely manual without any power source.

III. Working Principle:
The mechanism we used is kinematic link mechanism; according to this the rotating movement is convert into reciprocating movement. For this we setup a link between piston and the rotating disc. The disc is
connected with the bigger sprocket through bearing case with a shaft; the bigger sprocket is connected by the means of chain link to the smallest sprocket, which is welded on the front wheel shaft. When the trolley moves forward, the small sprocket which welded in the wheel shaft get revolve with the wheel, so the rotating motion is transmitted to the bigger sprocket through chain mechanism. This movement leads to rotate the disc which is connected with the big sprocket. By the disc rotation the link moves upward and downward movement this actuate the piston which is placed inside the cylinder in the tank. Hence the machine sprays pesticides on the crops.

Here, when we move cart forward, wheels of cart revolves and push piston in downwards direction. This downward motion of piston push pressure on water and as result pesticides comes out from the sprayer.

**IV. Components Used:**
- Knapsack sprayer
- Sprocket
- Eccentric disc
- Bearing with case
- Chain
- Wheel (Fixed & Universal)
- Card board, Bolt and Nut.

4.1 **Knapsack sprayer:**
A sprayer consisting of a handheld nozzle supplied from a pressurized reservoir that is carried on the back like a knapsack.

**Specifications:**
- CAPACITY: 16 L
- PRESSURE: 0.2-0.5 Mpa
- NET WEIGHT (kg): 2.3 G.W (kg)
- SIZE: 36*18*51.3 cm

4.2 **Sprocket:**
The name sprocket applies generally to any wheel upon which radial projections engage a chain passing over it. It is distinguished from a gear in that sprockets are never meshed together directly, and differs from a pulley in that sprockets have teeth and pulleys are smooth.

**Specifications:**
- Big sprocket teeth – 25
- Small sprocket teeth - 18

4.3 **Eccentric Disc:**
According to the stroke length of the piston the eccentric hole is drilled, from the centre point of the disc.

**Specifications:**
- Diameter of the disc- 16.5cm
- Thickness- 0.2cm
- The eccentric hole is drilled 4cm from centre of the disc. The total stroke length is 8cm.

4.4 **Bearing with case:**
A bearing is a machine element that constrains relative motion to only the desired motion, and reduces friction between moving parts. The design of the bearing may, for example, provide for free linear movement of the moving part or for free rotation around a fixed axis; or, it may prevent a motion by controlling the vectors of normal forces that bear on the moving parts.

4.5 **Chain:**
Chain is kinematic element which is used to transmit the power between two gears without slip and zero energy loss. It is used to connect between bigger and smaller sprocket.
Fig. 1: sprocket chain arrangement

4.6 Wheel:
There are two wheels are used fixed wheel and universal wheel. Both wheels are fixed as shown.

Fig. 2: wheels used

V. Assembly:

Fig. 3: prototype

VI. Cost Estimation:

<table>
<thead>
<tr>
<th>S.NO</th>
<th>PARTICULARS</th>
<th>QUANTITY</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>FRAME</td>
<td>SET</td>
<td>1300</td>
</tr>
<tr>
<td>2.</td>
<td>CAN</td>
<td>1</td>
<td>700</td>
</tr>
<tr>
<td>3.</td>
<td>BOLT &amp; NUT</td>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td>4.</td>
<td>FIXED WHEEL</td>
<td>2</td>
<td>300</td>
</tr>
<tr>
<td>5.</td>
<td>UNIVERSAL WHEEL</td>
<td>2</td>
<td>300</td>
</tr>
<tr>
<td>6.</td>
<td>HOLLOW ROD (1m)</td>
<td>1</td>
<td>250</td>
</tr>
<tr>
<td>7.</td>
<td>BEARING CASE</td>
<td>2</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>SPROCKET ,CHAIN&amp; DISC SET</td>
<td></td>
<td>400</td>
</tr>
<tr>
<td>---</td>
<td>---------------------------</td>
<td>---</td>
<td>----</td>
</tr>
<tr>
<td>9.</td>
<td>LABOUR COST</td>
<td></td>
<td>1000</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td>4580</td>
</tr>
</tbody>
</table>

**VII. Advantages:**

- Low cost
- Completely manual
- Doesn’t require any power source

**Conclusion:**

Thus the low cost manually operated mechanical pest sprayer machine is manufactured and tested successfully. This product is feasible. This can help all the farmers around the world due to its simplicity and affordability.

**REFERENCES**