

Design and Fabrication of Mechanical Pest Sprayer

Sanjay.S¹, Sridhar.R², Syed Moinudeen.T³, Harshitha.V⁴

UG Student, Department of Mechanical Engineering, JNN Institute of Engineering, Kannigaipair, Chennai, India^{1,2,3,4}

ABSTRACT: The main aim of our project is design and fabrication of mechanical pest sprayer, we have designed a model running without any fuel and also easy to operate for a user. In this model we find that we have simply used 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. This project is requires less man work for spraying.

I. PROJECT DESCRIPTION



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

International Journal of Innovative Research in Science, Engineering and Technology

An ISO 3297: 2007 Certified Organization

Volume 4, Special Issue 10, August 2015

3rd National Conference in Magna on Recent Trends in Mechanical Engineering 2015 [NCRTE 2015]

On 21st AUGUST, 2015

Organized by

Department of Mechanical Engineering, Magna College of Engineering, Chennai-600055, India.

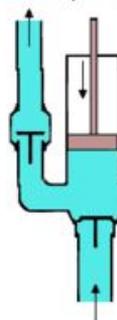


Sprocket chain connection

Connecting rod assembly

inside the cylinder in the tank. This machine which is used to spray pesticides on crops using concepts of hydraulics.

Piston pump



Piston pump mechanism

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 a result it comes out from the sprayer.

II. PARTS LIST

- Knapsack sprayer
- Sprocket
- Eccentric disc
- Bearing with case
- Chain
- Wheel (Fixed & Universal)

International Journal of Innovative Research in Science, Engineering and Technology

An ISO 3297: 2007 Certified Organization

Volume 4, Special Issue 10, August 2015

3rd National Conference in Magna on Recent Trends in Mechanical Engineering 2015 [NCRTE 2015]

On 21st AUGUST, 2015

Organized by

Department of Mechanical Engineering, Magna College of Engineering, Chennai-600055, India.

- Card board, Bolt and Nut.

III. DETAILS OF THE PARTS

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 : 0.2-0.5Mpa
- NET WEIGHT (kg) : 2.3
- G.W (kg) : 2.75
- SIZE : 36*18*51.3 cm

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.

Big sprocket teeth – 25 Small sprocket teeth - 18

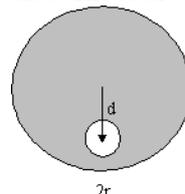
Eccentric Disc

According to the stroke length of the piston the eccentric hole is drilled, from the centre point of the disc.

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.



Eccentric disc

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.

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.

Wheel

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

International Journal of Innovative Research in Science, Engineering and Technology

An ISO 3297: 2007 Certified Organization

Volume 4, Special Issue 10, August 2015

3rd National Conference in Magna on Recent Trends in Mechanical Engineering 2015 [NCRTE 2015]

On 21st AUGUST, 2015

Organized by

Department of Mechanical Engineering, Magna College of Engineering, Chennai-600055, India.



Universal wheel



Fixed wheel

COST ESTIMATION

S.NO	PARTICULARS	QUANTITY	AMOUNT
1.	FRAME	SET	800
2.	CAN	1	550
3.	BOLT & NUT	10	30
4.	FIXED WHEEL	2	250
5.	UNIVERSAL WHEEL	2	200
6.	HOLLOW ROD (1m)	1	100
7.	BEARING CASE	2	300
8.	SPROCKET ,CHAIN& DISC	SET	200
9.	LABOUR COST	----	500
	TOTAL	----	2930

IV. CONCLUSION

Thus the low cost manually operated mechanical pest sprayer machine is going to serve spraying in terms of reduction in work and reduce in using energy. Thus our tool provide a good spraying on pest killing technique

REFERENCES

- [1] **Spray deposition profiles in pome fruit trees: Effects of sprayer design, training system and tree canopy characteristics** Crop Protection, Volume 67, January 2015, Pages 200-213 Ashenafi T. Duga, Kris Ruysen
- [2] **Air-assisted sprayer adapted for precision horticulture: Spray patterns and deposition assessments in small-sized citrus canopies** Biosystems Engineering, Volume 113, Issue 1, September 2012, Pages 76-85 Lav R. Khot, Reza Ehsani
- [3] **Reducing fuel consumption in weed and pest control using robotic tractors** Computers and Electronics in Agriculture, Volume 114, June 2015, Pages 96-113 Mariano Gonzalez-de-Soto, Luis Emmi, Isaias Garcia, Pablo Gonzalez-de-Santos
- [4] **Ergonomics evaluation of a lever-operated knapsack sprayer** Applied Ergonomics, Volume 22, Issue 4, August 1991, Pages 241-250 B.D. Ghugare, S.H. Adhoo, L.P. Gite, A.C. Pandya, S.L. Patel
- [5] **A comparison of the spray distribution obtained from sprayers with converging and diverging airjets with low volume air assisted spraying on citrus and grapevines** Journal of Agricultural Engineering Research, Volume 32, Issue 4, December 1985, Pages 291-310 Geoffrey O. Furness, W. Val Pinczewski