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Fabrication of Multipurpose Agricultural Machine

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Abstract: ***This article based enhancement forming process. This machine is basically electrical charge with manually operated machine to accomplish to task first one is fertilizer, spreading and pesticide spraying. Both of these work at a same time.***
Aim: The main objective of this agro machine is to place a fertilizer at proper place and the pesticides at proper distance from each other with appropriate soil compaction. Among these operations first one is mechanically driven which consist of intermittent mechanism. Increase in population demand also increase to meet the requirement new techniques or cropping have to be implemented in forming sector. The performance of this manually operated machine is measure of area covered uniformly and effectively. The basic requirements of fertilizer machine are, it should be simple in design and construction affordable for low budget farmers. Easy to handle and repair by formers. The main intention of this is reducing the cost of the machine and get the optimum yield.
Keywords: Spreading of Fertilizer and pesticide spraying.

I. INTRODUCTION

India is predominantly an agricultural based country with approximately 75% of population of India is very much dependent on farming either directly or indirectly. The farmers have been using the same methods and equipment for ages for example the seed sowing, spraying, weeding etc. operations are carried out by same techniques. There is need for development of an effective spraying machine for increasing productivity levels. Most of the late developing countries of Asia have the problem of higher population and low levels of land productivity as of compared to the developed nations. One the main reasons for lower productivity is insufficient power availability for the farms and very low levels of farm mechanization. This is especially true for India.
It is now accepted all over the world that in order to meet the food requirements of growing populations and rapid industrialization, the modernization of agriculture is indispensable. It is said that at many farms, production suffers due to no use of farm fertilizers or correct time pesticides and insecticides or improper application of these at required destination Agriculture is the backbone of Indian's economy. Over58% of rural households depends on agriculture for their livelihood. Mechanization enables conservation of inputs by precision in metering and ensuring better distribution, reducing the level of quantity required for the best response and prevention of loss or wastage of inputs applied. The Mechanization reduces the unit costs for the production by the high level of productivity and by input conservation.

II. LITERATURE SURVEY

A. Hand Operated Sprayers (Backpack with Spray Pump)



Fig. 1 Backpack sprayer



Fig 2 Engine driven sprayer

Fig 1. shows the backpack sprayer machine. Backpack sprayer is fitted with a harness so the sprayers can be carried on the operator back. Tank capacity may be large as 20 liters. A hand lever is continuously operated for to maintain the pressure which makes the backpack sprayers output more uniform than that of a handheld sprayers. Basic low cost backpack sprayer will generate only low pressure and lack feature such as high-pressure pumps, pressure adjustment control (regulator) and pressure gauge found on commercial grade units.

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B. Engine Driven Sprayers

Fig 2. shows the engine driven sprayer machine. The engine operated sprayers typically produce more consistent sprayer's outputs, cover the sprays swath more uniformly, operate at constant speed and results in much more uniform coverage than the hand spraying. Motorized sprayer are also capable of higher pressure spray where required to provide a better coverage. There are many other type of hand operated sprayer that are not widely used throughout the agriculture. Some may be used wide extensively for the productions of specific commodities.

III. METHODOLOGY

A. Problem Statement

Agricultural sprayer vehicle should be able to work with help of appropriate controls in order to spray effectively along the path as required to perform the required functions. Based on this factor, the basic mechanical designs of agricultural sprayers vehicle will be designed and implemented for 3 liters of payloads by combining the entire factor such as stated above with goal of achieving a better functionality.

B. Objectives

1) Decrease the operational costs by using new mechanisms.
2) Work reliably as under different working condition.
3) Decrease the costs of machine.
4) Decrease labor costs by advancing the spraying methods.
5) Machine should be operated is small farming land with the standard spacing.

C. Methods and Materials

1) System designs as to and theoretical derivation of dimension of the kinematic linkage mechanisms.
2) Selection of pumps and drive for spraying applications.
3) Selection & designs of pinion and gear drive system for the wheel shafts to pump driver linkage mechanisms.
4) Design validation of the stress produced in the parts like input shafts, crank, connecting links, output links.

IV. MANUFACTURING PROCESS

Manufacturing processes are the steps through which raw materials are transformed into a final product. The manufacturing process begins with the creation of the materials from which the design is made. These materials are then modified through manufacturing processes to become the required part. Manufacturing processes can include treating (such as heat treating or coating), machining, or reshaping the material. The manufacturing process also includes tests and checks for quality assurance during or after the manufacturing, and planning the production process prior to manufacturing.

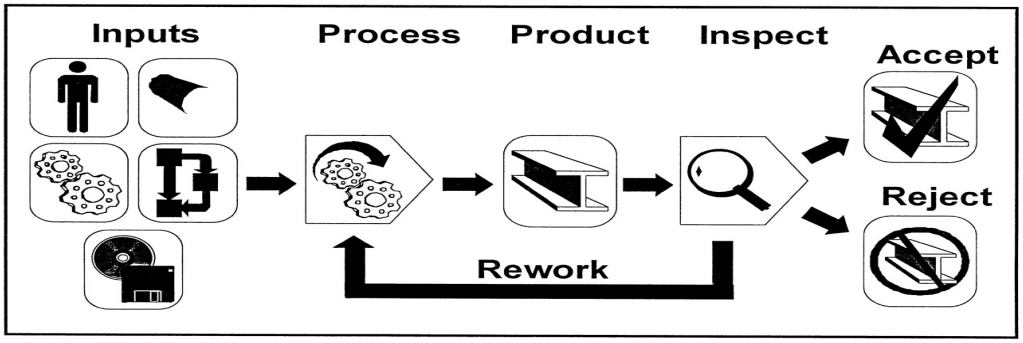


Fig. 3 Manufacturing Process

A. Metal Cutting

Metal cutting or machining is the process of by removing unwanted material from a block of metal in the form of chips.
Cutting processes work by causing fracture of the material that is processed. Usually, the portion that is fractured away is in small sized pieces, called chips. Common cutting processes include sawing, shaping (or planning), broaching, drilling, grinding, turning and milling. Although the actual machines, tools and processes for cutting look very different from each other, the basic mechanism for causing the fracture can be understood by just a simple model called for orthogonal cutting.

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Therefore, setup changes are time-consuming and expensive, and so we should try to do the entire cutting process in a minimum number of setups; the task of determining the sequence of the individual operations, grouping them into (a minimum number of) setups, and determination of the fixture used for each setup, is called process planning.
These notes will be organized in three sections:

1) Introduction to the processes,
2) The orthogonal cutting model and tool life optimization and
3) Process planning and machining planning for milling.

B. Sawing

Cold saws are saws that make use of a circular saw blade to cut through various types of metal, including sheet metal. The name of the saw has to do with the action that takes place during the cutting process, which manages to keep both the metal and the blade from becoming too hot. A cold saw is powered with electricity and is usually a stationary type of saw machine rather than a portable type of saw.
The circular saw blades used with a cold saw are often constructed of high speed steel. Steel blades of this type are resistant to wear even under daily usage. The end result is that it is possible to complete a number of cutting projects before there is a need to replace the blade. High speed steel blades are especially useful when the saws are used for cutting through thicker sections of metal.

C. Welding

Welding is a process for joining similar metals. Welding joins metals by melting and fusing 1, the base metals being joined and 2, the filler metal applied. Welding employs pinpointed, localized heat input. Most welding involves ferrous-based metals such as steel and stainless steel. Weld joints are usually stronger than or as strong as the base metals being joined.
Welding is used for making permanent joints. It is used in the manufacture of automobile bodies, aircraft frames, railway wagons, machine frames, structural works, tanks, furniture, boilers, general repair work and ship building.

D. Drillng

Drilling is a cutting process that uses a drill bit to cut or enlarge a hole of circular cross-section in solid materials. The drill bit is a rotary cutting tool, often multipoint. The bit is pressed against the work piece and rotated at rates from hundreds to thousands of revolutions per minute. This forces the cutting edge against the workpiece, cutting off chips (swarf) from the hole as it is drilled.

E. Assembly

An assembly line is a manufacturing process (most of the time called a progressive assembly) in which parts (usually interchangeable parts) are added as the semi-finished assembly moves from work station to mechanically moving the parts to the assembly work and moving the semi-finished assembly from work station to work station, a finished product can be assembled much faster and with much less labor than by having workers work station where the parts are added in sequence until the final assembly is produced. By carry stationary piece for assembly.

V. COMPONENTS AND DESCRIPTION

The major components involved in the fabrication of the manually operated automatic pesticide spraying and fertilizing spreading machine are as follows.

1) Frame
2) Wheel
3) Spray tank
4) Nozzle
5) Connecting rod (link)
6) Fertilizing box
7) Supporting stand

A. Frame

This is made of mild steel material. The whole parts are mounted on this frame structure with the suitable arrangement. Boring of bearing sizes and open bores done in one setting so as to align the bearings properly while assembling. Provisions are made to cover the bearings with grea

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B. Wheel

Wheel is designed to fit into the frame and fork via drop outs, and hold bicycle tyre. A typical modern wheel has a metal hub, wire tension spokes and a Wheel is used to carry the whole assembly and move the machine from one place to another by rotary motion of it.

C. Spray Tank

We want out tank to carry as much fluid as it can be along with its self weight as less as possible. We have taken a tank which is almost 15 liter capacity. A material for tank used is plastic fiber. Plastic fiber is very low in weight as compare to other materials. It also has very low cost.

D. Nozzle

It is a device which converts the pressure energy of fluid into kinetic energy, spray nozzle is precision device that facilitates dispersion of liquid into spray. Nozzle is used for purpose to distribute a liquid over an area.

E. Connecting Rod

The main function of connecting rod is to convert rotary motion into reciprocating /linear motion. Here connecting rod converts rotary motion of crank to reciprocating motion of pump and extension rod.

F. Fertilizing box

It is made up of 20 gauge MS sheet, the capacity of this box is up to 10 kg of fertilizer. The box consist number of blenders which are connecting with a MS rod. It is situated inside the box which helps to split the fertilizer from bigger size to smaller size. The box has four holes which are connected with flexible pipes using these pipes the fertilizer spreading properly.

VI. WORKING PRINCIPLE

A. A sprayer and fertilize spreader is a device used to spray a liquid. and solid material In agriculture, a sprayer and fertilize spreader is a piece of equipment that nozzles to apply herbicides, pesticides, and fertilizers to agricultural crop.
B. A Sprayer is basically a very simple machine.
C. It is working based on the principle of slider crank mechanism.
D. The rotary motion is converted into reciprocating motion.
E. The motion is transmission by wheel and connecting rod arrangement.
F. This machine is operated by using a motion of ground wheel through the gear transmission arrangement.



Fig 4 pesticide spraying and fertilizer spreading machine

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VII. ADVANTAGES, DISADVANTAGES AND APPLICATIONS

A. *Advantages*

1) Easy construction.
2) Easy to operate.
3) No power is required.
4) High efficiency.
5) No need of skilled operators to operate this system.
6) It is good alternative for engine sprayer.
7) Maintenance cost is less.
8) Their is no vibration comparing with petrol operated sprayers.
9) It is noiseless.
10) It does not create any pollution.
11) The construction is simple and not so difficult as other fertilizer and sprayer.
12) Simple to use and it has long durability.

B. *Disadvantages*

1) Maintenance is needed.
2) Repairing and replacing is not an easy task.

C. *Applications*

1) It is applicable in agricultural for seed sowing.
2) It can be used to swore the seeds like Ground nut seeds, Lady's finger seeds, maize, sunflower.
3) It can be used to spray the fertilizers Sugar cane plants, Turmeric plants, Tapiocas plants etc..

VIII. COST ESTIMATION

SL. NO.	NAME OF THE PARTS	MATERIAL	QUANTITY	AMOUNT (Rs)
1	Frame	MS	1	1000
2	Single wheel	MS	1	500
3	Fertilize box	MS	1	900
4	spray tank	ABS plastic	1	1800
5	Handle	MS	1	200
6	Spray Bushes	MS	4	150
7	Shaft with connecting rod	MS	1	100
8	Nozzels	Plastic	3	100
	Total			4750

IX. TOTAL EXPENDITURE

SI NO	Expenditure	Cost(Rs)
1	Material cost	4750
2	Machining cost	900
3	Painting cost	150
4	Miscellaneous cost	200
5	Other cost	500
	Total	6500

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X. CONCLUSION

The motive behind developing this equipment is to create mechanizations which will help to minimize effort of farming. It is suitable for the spraying at minimum costs for the farmers so that he can afford it, of the many product available.

It is most important to select the most efficient and easy type for your particular needs, whether if it is for applying insecticide fungicides, weed killer, liquid fertilizers or wettings agents. For example, lawn sprayers is made especially for the applications of liquids material to the lawn area.

The sprayer is are metered to allow quick mixing and the coarse sprays, so it does not takes as long to apply weeds killers, insecticides etc. Also, there is also not as much chances of drifting of the liquids into nearby flowers and shrub bed. The old saying You get for what you pay for does apply to the sprayer.

Efficiency and accuracy vary very much considerably, especially with the types that attaches to garden hose. Sprayer that are used for weeds killing or for applying any types of soil sterility should not be utilized for any other purposes. In fact, you will find it a very good practices to set sprayer to side just for the lawn areas. Use separate one for flowers and shrubs. It's a good practice to clean out your sprayers immediately after you used it for any type of the spraying. A little soapy water form, swished around and through sprayers, then flushed out with warm the water, does a good job.

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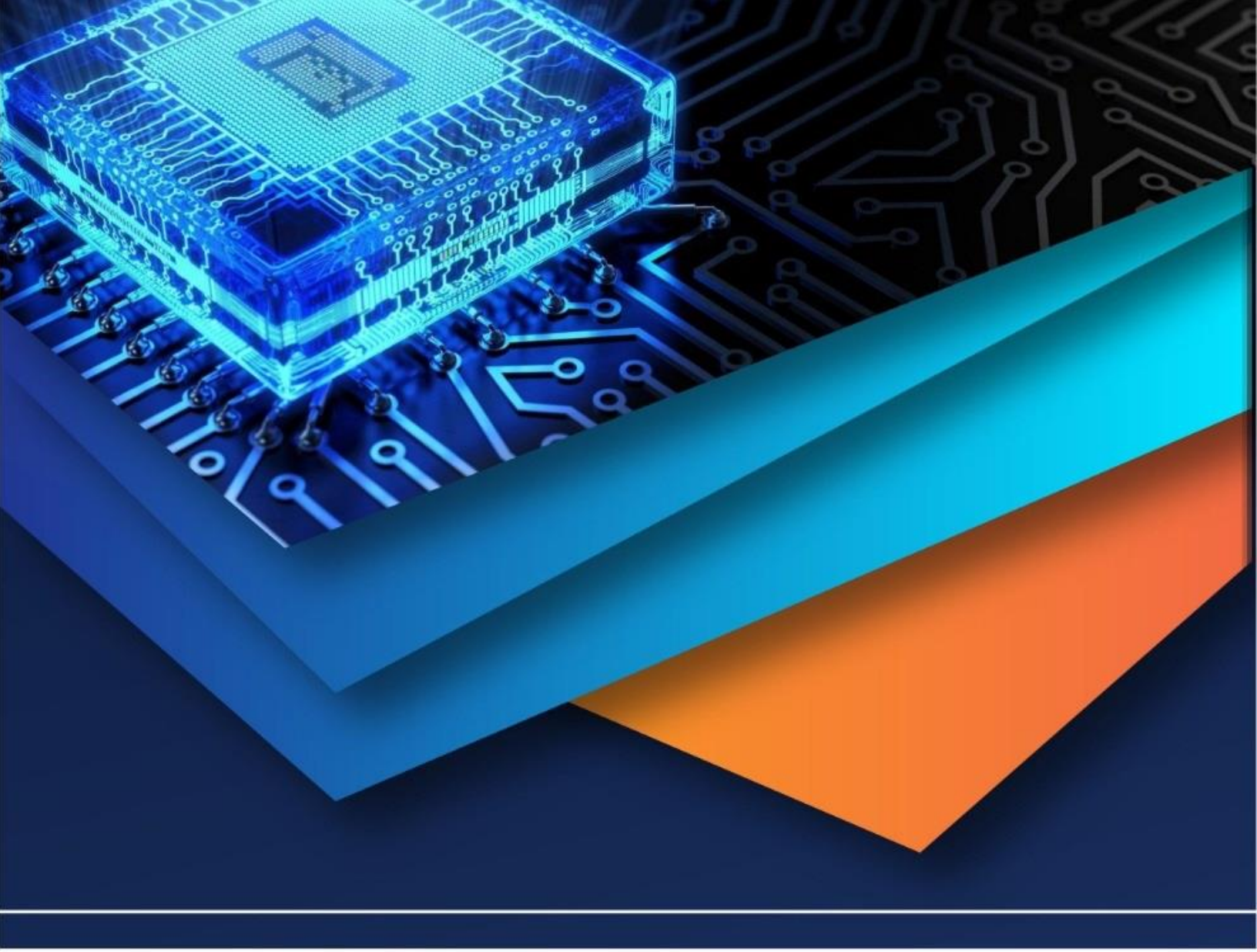
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