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DESIGN AND FABRICATION OF MULTIPURPOSE SOWING MACHINE

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ABSTRACT:

India is an agricultural country cultivating more number of ground nuts, corns, etc., in the village sides of the country. The available sowing machines are imported from foreign countries. The imported machines are not only bulk in size but also costing around rupees one lakh. In this project an attempt has been made for the design and fabrication of maintenance free multipurpose sowing machine exclusively for small farmers at cost not exceeding rupees 6000 per unit. The different components of above multipurpose sowing machine are modeled using one of the end parametric modeling software Pro-E creo parametric 2.0. The modeled components are fabricated and assembled together to form a complete machine.

Key words: Hopper; Seed metering mechanism; Ground wheel; Power transmission system; Seed distributor; Tiller; Pro-E creo parametric 2.0.

1. INTRODUCTION

The production and productivity of ground nuts, corns, etc., were quite low, when India became independent in 1947. The production was not sufficient to feed the Indian population. The country used to import them in large quantities for fulfilling the needs of our people from many countries. The reasons of low production and productivity were unavailability of machines in the cultivation field. In India most of the farming work is done manually when compared with foreign countries. There were no machines for sowing the seeds like ground nuts, corns then and it is done by man power only. The cost spent for man power was more and the speed of the operation was very less. When small farmers with minimal physical resources or financial assets attempt to improve their productivity, they have a limited choice. The only resource they can maximize is knowledge in which they are not poor. To prove the above statement, Mr.Shivraj was invented the first bullock driven sowing machine in the year 1987 at Madhya Pradesh to improve his productivity. It was light weight and can perform up to six agricultural operations. India is a world leader in groundnut farming with 8 million hectare of cultivated area in the year 2003. Groundnut cultivation has increased from 6.8 million hectare in 1980 to 8 million hectares in the year 2003. Groundnut is grown mostly in five states namely Andhra Pradesh, Gujarat, Tamilnadu, Karnataka and Maharashtra and together they account for about 90 percent of the crops total. The sowing time is the most

important non-monetary input influencing productivity. Delay in sowing by one week result in considerable yield losses. Results obtained from all India coordinated research projects revealed that in most parts of the country, sowing should be done between the first week of June and the last week of July. Advancement of sowing by a fortnight with pre-sowing irrigation was found to increase the yield substainly. The government of India appointed a commission to assess the feasibility of increasing the crop productivity under prevailing Indian ecological conditions. In order to develop the standard of living of small farmers we should make the machines with low cost. Then only small farmers can implement the recent modern machines for farming purposes. Our proposed multipurpose sowing machine is used to sowing different types of seed like groundnuts, corns, etc. So in this work an attempt has been made to provide the multipurpose sowing machine at low cost.

2. MATERIAL SELECTION

Selection of material is based on stiffness, cost, availability and suitability of materials for heat treatment. Hopper is made up of G.I sheet of 20G material. The tiller is made by square steel pipe of 16G light weight material. The other parts which are essentially required for make the metering mechanism and ground wheel are mild steel. All parts are suitably heat treated and necessary precautionary steps are taken to prevent corrosion.

S.NO	COMPONENTS	QTY	MATERIALS
1	Hopper	1	GI Sheet 20G
2	Tiller	1	Steel pipe 16G
3	Bolts Nuts	1	C45 Steel
4	Bevel Gears	2	Hardened Steel
5	Seed Distributor	4	Nylon pipes
6	Sliding plate	1	Mild Steel
7	Ground Wheel	1	Mild Steel
8	Bearings	4	Stainless Steel

3. EXISTING SOWING MACHINES- PROBLEMS

The existing seed sowing machine is too cost. It is not abundantly available in India. It has a complex design. Every seed distributor has the individual seed storage place. Hence, it leads to increase the cost of the machine. It is not compact in size and weight. Hence, it is difficult to transportation from one place to another place.

The existing sowing machine is shown in figure 1(a) and 1(b) to understand the pictorial parts of the machines and also the problem associated with them. In the existing sowing machine every seed distributor needs separate seed storage place and seed metering mechanism. In this work we have taken this as problem because it leads to add the weight of the machine, increases cost of the machine, bulky in size.

Fig.1 (a) Existing Machine

Fig.1 (b) Metering mechanism

3.1 JUSTIFICATION FOR THE PROBLEM

The cost of the machine is going to be reduced by introducing the common seed storage place in the machine. Common seed storage needs a single metering mechanism instead of number of mechanisms in the existing machine. If it is removed design is going to be simple and easy to fabricate. The size of the machine, production cost, transportation, everything will be reduced.

3. MAJOR COMPONENTS IN THE PROPOSED SOWING MACHINE

The proposed Multipurpose sowing machine consists of the following components,

HOPPER

It is an arrangement to store the seeds. Hopper capacity varies according to customers demand from 20kg to 80kg. Due to the concentrated hopper very low quantity of seeds can also be sown. Here our hopper is truncated rectangular prism in shaped so the wastage of seeds can be avoided. Here hopper is made up of galvanized iron 20G sheet it reduces the weight of the hopper. Hence the weight and cost of sowing machine can be reduced.

SLIDING PLATE

The base of the hopper consists of a sliding plate with holes spacing in equal distance. The sliding plate reciprocates to and fro above the base of the hopper. It is made up of 1 mm thick mild steel plate.

SEED METERING MECHANISM

This mechanism is used to metering - in the seeds to the required seed distributor .When the ground wheel rotates the main shaft also rotates with the help of power transmission system. The seeds are sowed through the holes present in the sliding plate.

GROUND WHEEL

Ground wheel is the power generation device. It is attached with tiller. It has a circular disc. Teeth's are provided on the periphery of the disc. It is provided to make a fine grip with the land. When the tractor is moved, ground wheel also rotated. This motion can be transferred to the main shaft through power transmission system. It is made up of mild steel.

POWER TRANSMISSION SYSTEM

It consists of a pair of bevel gear which is connected to the ground wheel through a shaft. Hence the power is transmitted from the ground wheel to the sliding plate through the pair of bevel gears.

SEED DISTRIBUTOR

A number of flexible pipes are used as a seed distributor. It receives the seeds from the hopper. After receiving the seeds the distributor leaves the seeds in the prepared land through the pipes. The pipes are fitted in the legs of the tiller.

TILLER

It is a device used to stirring the soil to a greater depth for sowing the seeds. It has the main frame. The hopper is located in this main frame. It has the number of legs corresponding to the number of pipes.

5. 3D MODEL DEVELOPMENT USING PRO-E

Pro-E is the world leading 3D product development solution which is developed by PTC (Parametric Technology Corporation – US based company). It takes care of entire product development process from creative concept through detailed product definition to serviceability. Pro-E plays a vital role in creation of 3D models of all complicated components both in small scale and large scale industries not only in India but also in all western countries. This image represents 3D model of the

sowing machine

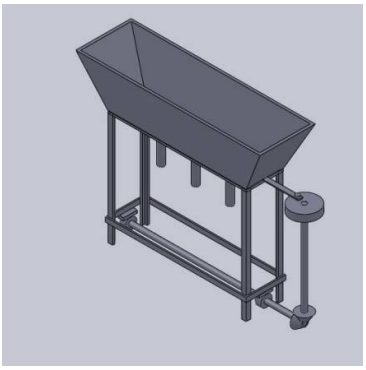

Fig.5.1 Entire 3D model

Fig.5.2 Hopper

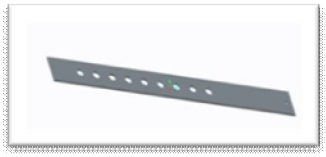

Fig.5.3 Sliding plate

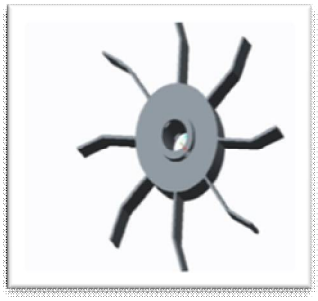

Fig.5.4 Ground wheel

6. PROPOSED MULTIPURPOSE SOWING MACHINE

In this chapter, it is proposed to explain how the seeds are sown with very little effort. Normally it is preferable to use for small farmers. The fabricated proposed sowing machine is shown. The entire arrangement of the multipurpose sowing machine is connected together with the tractor through the provision provided in the machine. When the tractor moves forward, the ground wheel will be rotated. The rotary motion of the ground wheel will be transmitted to the metering mechanism through the power transmission system. The bottom of the hopper consists of a sliding plate. The sliding plate is used to drive out the seeds from the hopper and leave the seeds in the seed distributor pipes. The flexible seed distributors are connected in the legs of the tiller. Here, tiller is used to prepare the land which will be ready for sowing the seeds. So, the seeds are delivered in the prepared land. Depending upon the nature of seeds, we can change the metering mechanism arrangement. The provisions are provided to change the metering mechanism easily. Thus, we can use this multipurpose sowing machine for sowing different kinds of seeds with very less cost.

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Fig.6.1 Proposed sowing machine

7. CORROSION PREVENTION

The following methods are used for corrosion prevention of the various components of the Multipurpose sowing machine.

RUST CLEANING

Oxidation creates a scale formation on the surface of the material. Scale formation gives rough structure of surface of iron oxide. This iron oxide formation penetrates into the surface and makes the metal weak and reduces the life of the components. Different grades of emery sheets are used to remove the rust formed on the surface of the steel and cleaned properly.

RED OXIDE COATING

This Red Oxide Paint Coating is to prevent the action of corrosion and protect the Surface of the components from atmospheric corrosion. Red Oxide Paint and Thinner liquid are mixed in proper proportion and coated on the surface of the components. The purpose of thinner is to reduce the viscosity of the paint and free flow of the paint over the surface of the components.

ZINC CHROMATE YELLOW COATING

This coating is also to protect the surface still further more effectively. This is also applied to the surface of the components after mixing with the Thinner in proper proportion. It also plays a major role in increasing the corrosion prevention to a larger extent.

FINISH COATING

Milky white color paint is applied over the surface of the machine after the application of the above coatings in a smooth manner using a paint sprayer. This final finish coating of the milky white color of the paint gives good pleasing appearance and effective corrosion prevention.

8. MERITS

- It is simple in operation.
- Maintenance cost is low.
- No seed loss in terms of remaining in the hopper.
- Low cost.
- It is more suitable for small farmers.
- Reduced size and complexity when compared to existing machine.
- Simple mechanism.

9. SCOPE FOR FUTURE IMPROVEMENT

Top priority is given only for safety operation lost reduction; the multipurpose sowing machine is fabricated with safety operation and reduced cost. Since, top priority is given only for cost reduction and safety operation it is noted that we should improve the strength of the machine members such as tiller and seed metering mechanism. No priority is given for strength and rigidity at the time of initial design. After installation and establishing successful working of the machine, it is proposed to concentrate on value engineering to increase the future value of the machine in all aspects. Presently, full focus is given only to design modification in seed metering mechanism for the benefit of the small farmers. At present, seed metering mechanism is used for sowing different types of seeds with single metering mechanism. We can use separate metering mechanism for every seeds. Thus, we can increase the value of the machine in future.

10. CONCLUSION

A multipurpose sowing machine is designed for small farmers to improve their productivity. In this machine a common seed storage place is introduced to reduce the cost of the machine. The existing sowing machine had the individual storage place and separate seed metering mechanism which leads to more cost. The drawbacks in the existing sowing machine are rectified successfully in our machine. It will be more useful for small farmers and the agricultural society. The cost of the machine comes around Rs 6000/- INR

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