Grain Collector

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Abstract: In mills and agricultural fields grains are collected by means of number of labors and more time consumption. In order to limit the time and work wages a simple mechanical heaping machine is been constructed to handle with less labors. The main objective of this project is to heap the paddy and also to clean the garden in an effective manner with simple adjustments and less remuneration. In this machine the driving shaft of the wheel is welded with sprockets on either side of the shaft. A parallel shaft is been connected adjacent to the preceding shaft by mechanical means. This shaft is also with the same sprocket attachment. The center part of this shaft consist the sweeper. The power from rotating shaft is transferred to the sweeper shaft by chain drive. The rotation is provided by driving shaft which is connected to wheel. The sweeper could also be adjusted based on its application. Unlike other Grain collecting machines it is operated fully in a mechanical means. In modern grain handling machines, the grains are collected by means of vacuum suction and it requires external power supply. So, the frictional losses in modern machines will be more and so the maintenance cost for the machines will be a great problem. For making these conditions prevailing in modern machines easier and cost reduction, this grain collecting machine could be used. It has a great advantage over modern machines both in design and product manufacturing cost.

Keywords: Vacuum suction, Conveyor belt, Spur gear, Sprocket, Grain collector.

1 INTRODUCTION

We all know that Agriculture is the back bone of India. In this modern world however the technologies are improved and new modes of business types has emerged Agriculture has its own forms of development through evolution of new machineries and new varieties of crop yield is been employed. These kinds of development accounts the number of harvesting machines and related tractor attachments has been developed since the evolution of modern Agriculture startedThis involves a lot of investments and engineering minds are required to give a cost efficient, easily handling machines. All this implementation is for the sole purpose of making profit with minimum expenditures and with less labor input. Industrial Revolution and the development of more complicated machines, farming methods took a great leap forward Instead of harvesting by hand with a sharp blade, wheeled machines cut a continuous swath. Instead of threshing the grain by beating it with objects such as rods, threshing machines separated the seeds from the heads and stalks. By following this process, the grains are been collected and dried by means of large number of labors.In order to cut short the labor usages and to reduce time consumptions, manually operated heaping machine is employed in order to reduce the labor usage and reduce time consumption. Our machine is with fully mechanically operated with gear transmission system and there is no necessity of power supply.

2 CHARACTERISTICS OF GRAINS

India's total cultivable land area accounts 159.7 million hectares (394.6 million acres), which is the second largest in the world, preceeding United States. The total gross irrigated crop area is 82.6 million hectares which is 215.6 million acres is the largest in the world. In this form of agriculture there will be a wide range of cultivation of grains. This grain could be like paddy, ground nut, wheat, maize, sorghum etc. In this huge variety there are a lot of processes carried over to condition the grains in a precise value.

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3 MANUAL HANDLING

To main grains in a good condition and packaging it for transportation requires a large workforce involvement. First process is that the grains are collected from the agricultural fields and are transferred to a facility where the grains are conditioned by the labours in a large area after that process the grains are manually heaped by the labours and gets stored in the respective storage means for further transportation or to the storage facility.

4 NEED FOR MACHINE

For handling the grain there need to be a large workforce. It involves, add up increased values of the grain. And so if a machine is employed for the grain collection, then there will be a tremendous change in the collecting process. This machine should absolutely reduce the labour input. The main objective is to create evolution in this field and not to create any casualties.

5 ALTERNATE CONCEPT

The present grain collecting machines are huge with a vacuum powered suction technology. This requires an external power supply for the suction and also it is not suitable for narrow passages but as far as our grain collecting machine is concerned the main alternative is that the machine is wholesomely operated in mechanical means and it does not require any external power supply and it is also applicable for narrow passage routes.

Fig 2 *Fabricated setup*

3 DESIGN CALCULATION

BENDING STRESS

$$\sigma_b = 32M / (\pi d_0^3 (1-k^4))$$

Where, M: Bending moment at the point of interest
do: Outer diameter of the shaft
k: Ratio of inner to outer diameters of the shaft (k = 0 for a solid shaft because inner diameter is zero)

AXIAL STRESS

$$\sigma_a = 4\alpha F / (\pi d_0^2 (1-k^2))$$

Where,
F: Axial force (tensile or compressive)
α: Column-action factor(= 1.0 for tensile load)

STRESS DUE TO TORSION

$$\tau_{xy} = 16T/(\pi d_0^3 (1-k^4))$$

Where,
T : Torque on the shaft
τ_{xy} : Shear stress due to torsion

Combined Bending and Axial stress
Both bending and axial stresses are normal stresses, hence the net normal stress is given by,

$$\sigma_x = \{(32M/(\pi d_0^3 (1-k^4))) \pm (4\alpha F / (\pi d_0^2 (1-k^2)))\}$$

SHAFT MODEL CALCULATIONS

If a 50KN weight acts on the point of the shaft of length a to b then the reaction would be, Calculating reactions at a and b 50KN
Ra + Rb = 55 N
(50*275)+(5*50) = (Rb*550)
Rb=25.45N
Ra=29.45N
From bending moment diagram assumption,
Maximum bending moment (M)=6998.5N-mm
DESIGN OF PLUMMER BLOCK
Bearing No. 6204
Housing number = P204
Thickness (B)=14 mm
Inner Diameter (d)=20 mm
C = Dynamic Capacity (N)=12863N
P = Equivalent Bearing Load (N)
N = Rotating speed in RPM
e = 3.0 for ball bearings, 10/3 for roller bearing

3.1 COST ESTIMATION

Table.3.1. *Cost estimation*

SL.NO	DESCRIPTION	COST Rs
1	WHEEL	1200
2	BRUSH	800
3	BEARING	1200

4	FRAME, SHAFT	1300
5	CHAIN DRIVE	1000
6	METAL STRIP	200
7	SHEET METAL	400
8	CONVEYOR ROLLER	500
9	CONVEYOR BELT	3000
10	SPUR GEAR	400
TOTAL		10000

4 CONCLUSION

This project is made with pre planning procedures including direct inspection of a grain collecting mill and taking the labor utility characteristics of the work on daily basis and their rate of working efficiency is calculated with a flexible means. So the design and working principles are mainly based on the labor working factors and work involvement. It is more desirable and economical. Our project "GRAINCOLLECTOR" is designed with the hope that it is very much economical and helpful to agricultural dependent industrial mills. This machine is also been empowered with a lot of flexible adjustments like the vehicle can be operated by all the average and tall persons, clearance for ground and collector can be adjusted, speed could also be varied by changing the gear ratio systems, frictional losses are determined to be minimum at all the moving parts and the machine handling is ensured with good linear movement. It is also been empowered with the different storage means as the final part of the process is storing the grains in a container and it could also be varied and replaced based on the owner's perspective utilization of grains. A lot of constrains are felt by our team in the fabrication sector and for each process constrains are analyzed and solved properly. This project helped us to know the succeeding steps in completing a project work. A series of running tests are made and some adjustments are made to collect the grains in a well effective and an efficient manner. Now our project is at an optimum condition in best of our knowledge. Thus, we have completed the project successfully.

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