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Design and Fabrication of Multi Blades Coconut Scraping Machine with Single drive

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Abstract: The Coconut grater makes fresh, moist coconut from fresh coconuts. This is a perfect kitchen utensil for making fresh coconut recipes. When cooking in large amount, usually there will be lack of time and man power. Hereby the scraping of coconut shell one by one takes much time or more labours are needed when using the ordinary coconut scraper available in the market.This project is mainly designed for the commercial ventures for scratching of coconut in order to save the time. It is used to scratch the coconut in quicker rate by using chain drive. This saves the labour's time and maximum number of coconuts can be scraped in full swing with less number of workers. It is a table mount model that clamps to any flat work surface. It can grate four coconuts in less than five minutes. Made from high-quality stainless steel, this Coconut scraper is a must for most cooks from South India where coconut is used in almost every dish.

Keywords: Coconut, scraper, blades, tray, chain drive, stainless steel.

1. Introduction

A **scraper** (also known as grater) is a kitchen utensil that is usually made from metal (and sometimes ceramic or even wood), with sharp perforations or protrusions used to shred food. Graters come in various sizes: from those with larger perforations which are often used to shred cheese and vegetables, to the very fine graters and micro planes that can be used to zest citrus fruit. There has been no change in the way coconut is grated, for several decades. The only change being the introduction of a motorized blade. But still, one has to hold the coconut. But all that is set to change with the invention of an innovative coconut grater which can do the job in just few minutes with improved safety and convenience.Basically this machine is highly useful and applicable with commercial viability. The coconut scraper makes fresh, moist coconut from fresh coconuts.

2. Literature Review

In order to make a Coconut scraper, a new design is proposed. To obtain this scraper, the following journals are referred.

[1] KedarDeokar et al (2014), have proposed the design and manufacturing of coconut de-husking, cutting and grating machine consists of three operations, namely: Peeling of coconut fibres i.e. de-husking of coconut, breaking the coconut into two parts i.e. cutting and grating of coconut i.e. removing out the copra (edible white part). For de-husking process, the method selected for removing the fibres is the opposite movements of toothed shafts whose spiked pins are inserted into the fibrous layer of coconut for its removal. If copra is the desirable product then it will be sent to cutting process where it will be cut into two halves. After this, grating will be executed.Sub-assemblies of each operation are made separately to test the working of each process without any interference.

[2] Ketan K. Tonpe et al (2014), have discussed about the coconut de-shelling machine comprising of cutter with belt drive. Performances test analysis conducted show that the machine de-shelled the fruits without nut breakage and also that its average de-shelling efficiency and capacity are 90% and 195 coconut per hour. The machine also eliminated dependency on the epileptic public electric power supply in our rural areas which constitutes the major obstacle in the use of other mechanized coconut de-shelling equipment in the rural area.

[3] Jerry James et al (2016), have described the proposed machine a Coconut Breaker Extractor Grater which can break a de-husked coconut into two pieces, collect coconut water and grate the coconut pieces into desiccated coconut. The main highlight is that there is no contact between the tool and hands of the user both in breaking and grating of the coconut.

[4] Naveen.J et al(2016), have discussed about thedesign and fabrication of a machine that can perform the operations such as grinding rice flour, vegetable cutting and coconut scrapping.It requires no special skills to operate the machine and would help the society in a better way by reducing the time and also the number of labours.

3. Principle of Working

Two pieces of coconut can be manually grated on the grating tool arrangement as per the requirement of type of product the consumer needs. The grating tool is mounted on the shaft which is driven by motor and which is directly coupled to gearbox via a no-reduction chain drive. The hemispherical grating tool is selected over the other types of tools for removing more amount of material in one pass. Dimensions of tool are selected in such a way that major possible part of the coconut will be grated. The disadvantage of using tool with smaller diameter is that there will be a need of rotating the tool along the inner periphery of coconut for grating and that will be a tedious task. Tool will be having serrated teeth on its flaps which will actually be coming into contact with the part to be grated from coconut. It will chip down the maximum part of the edible part from the shell. In this machine instead of single blade we have used four blades which runs at a time in which four pieces of coconuts can be scraped at the same time. This will reduce the man power, time and power consumption. The following are the components used in the coconut scrapping machine.

3.1 Frame

A rigid frame in structure is the load-resisting skeleton constructed with L-shaped straight members interconnected by mostly rigid connections which resist movements induced at the joints of members. Its members can take bending moment, shear, and axial loads.

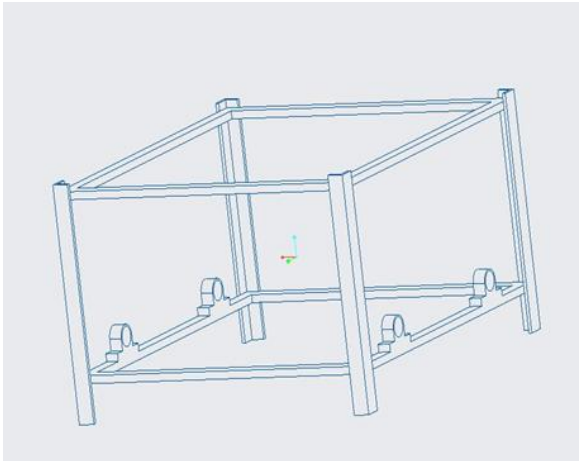

Figure 1: Frame

3.2 Worm shaft

Worm-and-gear sets are a simple and compact way to achieve a high torque, low speed gear ratio. In this arrangement speed ratio limited to gear ratios of 10:1,while worm-and-gear sets vary from 10:1 to 500:1.

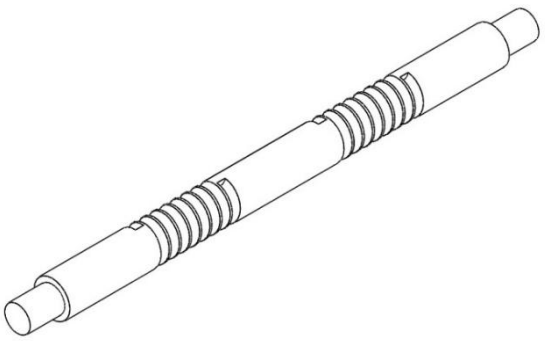

Figure 2: Worm Shaft

3.3 Worm gear

Worm gear is a type of helical gear, but its helix angle is usually somewhat large (close to 90 degrees) and its body is usually fairly long in the axial direction.

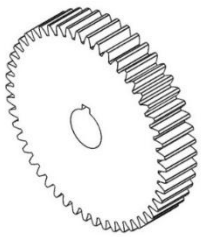

Figure 3: Worm Gear

3.4 Assembly model of components

The worm drive gear arrangement in which a worm(shaft) meshes with a worm gear transfers motion in 90 degrees.The direction of transmission is not reversible due to the greater friction involved between the worm and worm-wheel.

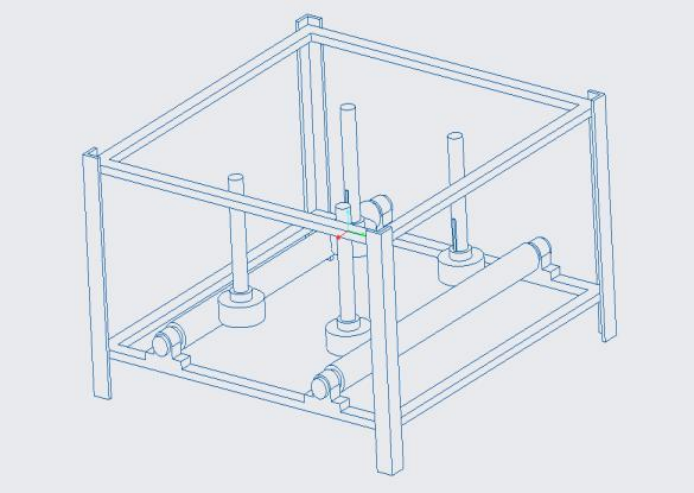

Figure 4: Internal setup of the machine

4. Fabrication of the Machine

The operational grating machine is a hardware that can be effortlessly gathered or dismantled, a machine in which the coconut scraping tool enables materials to go through successfully.The grinding instrument is made of stainless steel to build its suitability; the grated pulp is gathered in a stainless steel plate by falling descending by gravity.

Figure 5: Various components used in the machine

Figure 6: Internal assembly of the Machine

Figure 7: Front View of the Machine

4.1 Table

Table1: Components Specifications

S.No.	COMPONENTS	SPECIFICATIONS
1	Motor	Horse Power(hp)=1 N=1500 rpm P=0.75 kw
2	Drive	Chain Drive
3	Material	Worm: Mild Steel Wheel: Aluminium
4	Centre Distance	43.5 mm
5	Module	3 mm
6	Worm Gear	Outer Diameter = 62 mm Pitch Diameter = 33 mm Number of teeth = 22
7	Worm Shaft	Outer Diameter =35 mm Pitch Diameter =30 mm Length of Worm =500 mm Number of threads =10

5. Result and Discussion

The manufactured scraping machine can be worked just by single phase power supply. It is in this manner adaptable and straightforward machine with four scratching sharp edges. The aggregate cost of generation of a unit is assessed to be about INR=15000 including both assembling and work costs. This is moderate for a normal clients. The execution tests directed showed that high benefits of grinding efficiencies are achievable when contrasted with existing machines with single scratching sharp edges.

6. Conclusion

Scraping is done in quick process than the conventional machines and time and power consumption is very less. Man power needed is very less and thus this machine is now implemented in several mass food production areas. The man power and time consumption for scraping of coconut can be reducedby using multi blade system using single drive.

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