

DESIGN & DEVELOPMENT OF PEDAL OPERATED MULTIPURPOSE FOOD PROCESSING UNIT- A REVIEW

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ABSTRACT

This project relates to the design and fabrication of “Design and Development of Pedal Operated Multipurpose Food Processing Unit”. This is a technology that may develop as an alternative to the electrically operated stationary machines with high efficiency and portability. The project is related to the food processing unit. Current activities include analysis as well as experimental work. After analysis this project has developed what quantity and what kind of raw material is required to produce different food items. Under experimental work the project deals with the proper functioning of the machine. The machine is run by a person seated on a seat provided, operating the pedal which connects the machine with a chain drive to the different units of the machine, and the machine starts producing the required food items such as potato chips, vermicelli (sevai), slices of various vegetables etc. The main purpose of the machine is not only to eliminate the usage of electricity. The project is portable and consumes less floor area. This project is a welcome edition and a new concept where we thought this as an ideal replacement for the electrically operated stationary machines.

KEYWORDS: Pedal Operated, Food Processor, Vermicelli Making Unit, Potato Slicer, Coconut Shredder, Potato Chopper.

INTRODUCTION

Vermicelli (sevai) is a popular instant food product. It falls under the category of extruded product and is made from wheat flour. At times tapioca or soybean or groundnut flour is also added. Thus, it is rich in proteins and liked by people from all walks of life, irrespective of age. It is basically a snack food item and at times it is also used as a table enricher. With changing lifestyles, greater awareness about health and preference for instant food items have made vermicelli very popular and an item of mass consumption. India is one of the largest producers of potato. Besides being used as a daily food item in various vegetable preparations, potato today increasingly finds use in the form of chips or wafers as snacks food. The potato chips and wafers are popular processed food items that give considerable value addition to potatoes. The main consumers of potato chips and wafers are families especially in urban and semi-urban areas. Besides, hotels, restaurants, canteens, army establishments require potato chips in significant quantities. Coconut is a spherical tropical fruit with a hard brown exterior and milky white interior. Its sweet flesh is used in numerous cooking recipes as well as a main ingredient in soaps. Grated coconut is often used as a dessert ingredient or topping. The hard outer shell of the coconut can pose a problem for those who wish to open the fruit and use its edible contents. Cracking the fruit open in order to grate fresh coconut can be difficult, but with the right tools and proper procedure, it's possible. The vegetables are the sources of energy gain in the body; it also has many types of vitamins, proteins and

carbohydrates which are very useful for human body. So for cutting of these vegetables in various shapes and sizes the various cutters are needed. To minimize this cost of various cutters the knife is the best tool for cutting of vegetables in different sizes and shape. The air pumps are now a day's used for cleaning of tables, vessels with the force of air. The air is freely available in the nature so it is the best way to use the air for cleaning purpose.

KEY FEATURES

1. Vermicelli making machinery (sevai machine) machine is fitted with heavy duty mild steel fabricated structure
2. Easy to operate, time saving.
3. Operator needs no experience, production is rapid. The thickness of vermicelli and size of finished products are adjustable.
4. Advanced design and sanitary
5. Special alloy bevel gears minimize both friction and noise providing quiet operation.
6. Machine is easy to assemble, clean and maintain
7. The vermicelli (sevai) making machinery are highly effective as well as nonstop continuous vermicelli (sevai) making machinery making process.
8. Uniform products, reasonable price, small size, easy maintenance
9. Continuous product length: end numbers

OBJECTIVE

The main aim of this project is to overcome the traditional method

1. To present the profile of the food-processing industries and it's recent trends.
2. To study the economics of food processing units.
3. To make complete mechanically operated machine.
4. To develop a low cost machine which can be used by anyone.
5. To make a device or machine which will not require any skilled worker.
6. To save electricity and make a eco-friendly device.
7. Ease of Handing.

COMPONENTS

BICYCLE FRAME

A bicycle frame is the main component of a bicycle, onto which wheels and other components are fitted. The modern and most common frame design for an upright bicycle is based on the safety bicycle, and consists of two triangles, a main triangle and a paired rear triangle. This is known as the diamond frame.

Frames are required to be strong, stiff and light, which they do by combining different materials and shapes.

CHAIN SPROCKET ARRANGEMENT

A sprocket or sprocket-wheel is a profiled wheel with teeth, cogs, or even sprockets that mesh with a chain, track or other perforated or indented material. The name 'sprocket' applies generally to any wheel upon which radial projections engage a chain passing over it. Roller chain sprockets engage chain drives in power transmission and conveyor systems, though sprockets can engage any perforated material. Chain drives can be highly efficient and reliable in applications with limited shock and torque loads, provided the drive is well maintained. Chain drives can produce a mechanical advantage as speed reducers/increasers, created by utilizing sprockets of varying sizes. While related to gears, a sprocket's main differences are that it never engages another sprocket directly and a sprocket's radial projections require a sloped profile for smooth chain engagement and release.

BEARINGS

Pillow blocks are usually referred to the housings which have a bearing fitted into them and thus the user need not purchase the bearings separately.

Pillow blocks are usually mounted in cleaner environments and generally are meant for lesser loads of general industry. These differ from "plummer blocks" which are bearing housings supplied without any bearings and are usually meant for higher load ratings and corrosive industrial environments.

However the terms pillow block and plummer block are used interchangeably in certain parts of the world. Bearing housings are usually made of grey cast iron. However various grades of metals can be used to manufacture the same.

BEVEL GEARS

Bevel gears are gears where the axes of the two shafts intersect and the tooth-bearing faces of the gears themselves are conically shaped. Bevel gears are most often mounted on shafts that are 90 degrees apart, but can be designed to work at other angles as well. The pitch surface of bevel gears is a cone. Bevel gears can be used to change the direction of drive in a gear system by 90 degrees. A good example is seen as the main mechanism for a hand drill. As the handle of the drill is turned in a vertical direction, the bevel gears change the rotation of the chuck to a horizontal rotation.

SHAFTS

A shaft is a rotating machine element, usually circular in cross section, which is used to transmit power from one part to another, or from a machine which produces power to a machine which absorbs power. The various members such as pulleys and gears are mounted on it.

The material used for ordinary shafts is mild steel. When high strength is required, an alloy steel such as nickel, nickel-chromium or chromium-vanadium steel is used.

HOPPER

A storage container used to dispense granular materials through the use of a chute to restrict flow, sometimes assisted by mechanical agitation.

SCREW CONVEYOR

Shafted screw conveyors are used in thousands of industrial applications every day for efficiently conveying a variety of bulk materials. A screw conveyor's main function is to transfer bulk materials from one process to another. Screw conveyors are very cost-effective and require minimal maintenance to operate.

RECIPROCATING ARRANGEMENT

A crank is an arm attached at right angles to a rotating shaft by which reciprocating motion is imparted to or received from the shaft. It is used to convert circular motion into reciprocating motion, or vice versa. The arm may be a bent portion of the shaft, or a separate arm or disk attached to it.

Attached to the end of the crank by a pivot is a rod, usually called a connecting rod. The end of the rod attached to the crank moves in a circular motion, while the other end is usually constrained to move in a linear sliding motion. The term often refers to a human-powered crank which is used to manually turn an axle, as in a bicycle crank set or a brace and bit drill. In this case a person's arm or leg serves as the connecting rod, applying reciprocating force to the crank. There is usually a bar perpendicular to the other end of the arm, often with a freely rotatable handle or pedal attached.

SHREDDER

The Shredder is a component of the food processing unit, which is used for the purpose of shredding of coconut.

METHODOLOGY

The project is related to the food processing unit. Current activities include two phases, analysis as well as experimental work. On the analysis phase this project has developed to add a quantity of 1kg of raw material to produce the vermicelli at the initial stage and as the material gets emptied from the hopper again it's added to get continuous production.

Simultaneously, on the right side of the machine is the potato slicing unit in which fresh potatoes are dropped into the tubular chamber as and when it gets emptied. Meanwhile there is also a coconut demeating tool on the right side of the machine.

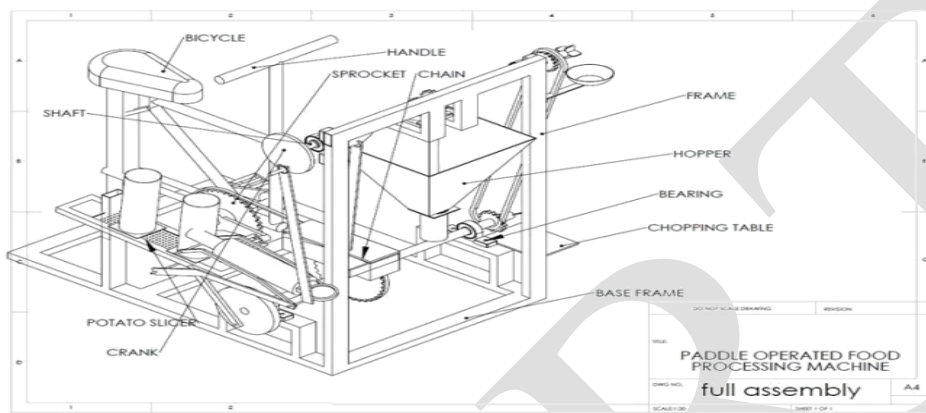


Fig. Working skeleton diagram of Pedal Operated Multipurpose Food Processing Unit.

Under experimental work the project deals with the proper functioning of the machine. The machine is basically mounted on the base frame consisting of a pedaling unit; the machine's main shaft is connected by a chain link to the crank of the pedal. A person seated on the seat provided, operates the pedal which connects the machine with a chain drive, and through the geared arrangement in the machine, conveys the material during rotation of the conveyor to compress and eject the material through the die plate and the machine starts producing the vermicelli. Simultaneously, on the right side of the machine a reciprocating mechanism is attached to the main shaft which converts rotary motion into reciprocating motion of the plate, provided with the blades under the tubular chamber, which slices the potatoes (also similar types of other vegetables). Continuing with the driven shaft, a coconut shredder is attached at the right side of the machine. The shredder rotates along with the driven shaft which in turn shreds the coconut applied against the shredder.

All the above mechanisms work at a time, unless and until the operation of the pedal is stopped.

APPLICATIONS

1. Used to Slice or chop various vegetables. (Eg. Potato chips)
2. Used to produce vermicelli (sevai) and similar kinds of other eatable items (especially South Indian)
3. Used to produce electricity for lighting purpose or charging batteries.
4. Used to grind/shred the coconut.

ADVANTAGES

1. Compact in size
2. No power consumption
3. Initial low investment cost
4. Multipurpose work
5. Easy to operate
6. Ease of maintenance

DISADVANTAGES

1. It leads to fatigue in operator for continuous operation in mass production.
2. It also becomes hectic at the time of cleaning.

CONCLUSION

We put to the use of all the knowledge we gained in 3 years of study in finishing the project DESIGN AND DEVELOPEMENT PEDAL OPERATED MULTIPURPOSE FOOD PROCESSING UNIT.

The difference between what we learnt in class and what is being practiced in industries is very vast and complicated. The systematic approach in each and everything done in industries is of great revolution to us. We became part of a big system and we appreciated it. Design in industry does not have any standards and it is all depend on individual likes and dis-likes. Designing and fabrication involves various steps. Through study of these steps gave a great insight into the subject practically. It is our great achievement in our college life and we are proud to say so.

FUTURE SCOPE OF THE PROJECT

1. We feel the project that we have done has a good future scope in any domestic purposes. The main constraint of this machine is the low initial cost and has low operating costs.
2. Savings resulting from the use of this device will make it pay for itself with in short period of time & it can be a great companion in any food processing units.
3. The device affords plenty of scope for modifications, further improvements & operational efficiency, which should make it commercially available & attractive. If taken up for commercial production and marketed properly, we are sure it will be accepted to all. There are plenty of scopes if the machine is improvised as explained in the further improvisation concept.

REFERENCES

- 1) Shigley J, 1986, "*Mechanical Engineering Design*", p44, International Edition, pub McGraw Hill, ISBN 0-07- 100292-8.
- 2) Gere, J. M. and Timoshenko, S.P., 1997, "*Mechanics of Materials*", PWS Publishing Company'
- 3) Omre, P. K. 1999. "*Design, Development and Testing of Multi-Fruit Grader*". Ph. D Thesis, Department Post Harvest Process and Food Engineering, Pantnagar, pp-137/140.
- 4) Bansal, 2007, "*Strength of Material*" 4th Edition, Laxmi Publication house Pvt. Ltd., New Delhi.
- 5) R.S.Khurmi and J.K.Gupta, 2014, "*Text book of Machine Design*" 14th Edition, Eurasia Publication house Pvt. Ltd. Mumbai.
- 6) Karl. T. Ulrich, Steven D Eppinger, "*Product Design and Development*", McGraw-Hill, 3rd Edition. 7] A.C.Chitale and R.C. Gupta, "*Product Design and Manufacturing*", Prentice-Hall of India Private limited, 4th Edition, 2008.