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Banana Leaf Cutting Machine: Design for Fabrication

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ABSTRACT: Generally dinning plates are made in plastics. Plastics are harmful and it has many disadvantages to us. Naturally we can get Banana leaves that can be used as a spread sheet over silver plates. This banana leaves have very good advantages, it does not have any chemical effects and it is very cheap. The banana leaf spread sheet for different silver plates is cut by a pneumatic machine which is designed and fabricated by us. The machine is operated by the pneumatic system. The air enters to the flow control valve and gives pressure to the double acting cylinder. The direction is controlled by the solenoid valve. The speed of piston will be varied by adjusting the flow control valve. By adjusting the speed, the production rate will be varied. By using this we can produce banana leaf spreads at high production rate. By using different shape die we can produce different shape and size leaf spreads. The machine is compact.

KEYWORDS: Banana leaves, Leaf spreads, Pneumatic system, double acting cylinder and Production rate.

I. INTRODUCTION

Banana leaves have a wide range of applications because they are large, flexible, waterproof and decorative. They are used for cooking, wrapping and food-serving in a wide range of cuisines in tropical and subtropical areas. They are used for decorative and symbolic purposes in numerous Hindu and Buddhist ceremonies. In traditional homebuilding in tropical areas, roofs and fences are made with dry banana-leaf thatch. Banana and palm leaves were historically the primary writing surfaces in many nations of South and Southeast Asia.

Banana leaves are large, flexible, and waterproof. They impart an aroma to food that is cooked in or served on them; steaming with banana leaves imparts a subtle sweet flavour and aroma to the dish. The leaves are not themselves eaten and are discarded after the contents are consumed.

Banana leaves are used by Hindus and Buddhists as a decorative element for special functions, marriages, and ceremonies in southern India and Asia. Balinese Hindu prepared banana leaf as the container for floral offerings called canang dedicated for hyang (spirits or deities) and gods. These floral offerings were placed in various places around the house.

The pneumatic banana leaf cutting machine is used to produce different shapes of leaf spreads in faster production rate. The principle of operation is the same as the conventional simple press. The difference is only in the type of drive and the type of fixtures used.

The following points reveals why we have to make use of this type of press

- Pneumatic leaf cutting machine reduces the manual work.
- This type of machine reduces working time.

By using this machine the bearings can be inserted in the various lengths of shaft (up to 600mm).

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Paper is organized as follows. Section II describes banana leaf cutting machine operations and connected components. The working and methodology of the machine is given in Section III. Section IV presents experimental results showing results of images of the machine. Finally, Section V presents conclusion.

II. LITERATURE REVIEW

From the survey taken in Achampathu (Erkudi), Madurai nearly 1500 leaves are cut per day and people are given wages of Rs 500 per day. It's a very tedious and time consuming process. For a month they make a profit of Rs 45000. Many people are involved in these risky jobs.

All Activities are done manually resulting

- Improper quality of cut leaves having cuts.
- Leads to cuts and injuries of person performing the task.

III. SCOPE AND ACCESSORIES OF BANANA LEAF CUTTING MACHINE

The main objective of our project is to develop a new machine that cuts banana leaves in an easy and simple manner. It also saves time, reduces manpower in an efficient way and thereby increases the production rates and is ecofriendly.

It improves the accuracy of cutting banana leaves and thereby increases the Production rates. It requires less floor space, operation cost is less and also less skilled operators are sufficient to operate the machine. It is also assembled in such a way that all secondary parts can be removed easily for portability.

The components required for building the banana leaf cutting machine were designed using the standard CAD modelling software Solidworks 2015. The components are:

- Frame
- Die
- Pneumatic Cylinder

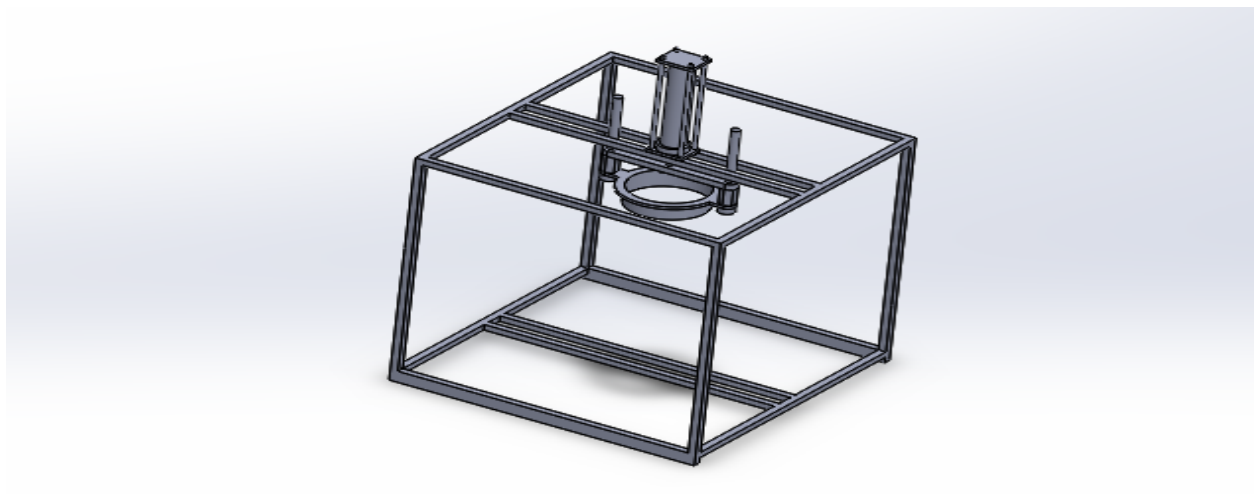


Fig. 1 Design of Banana Leaf Cutting Machine

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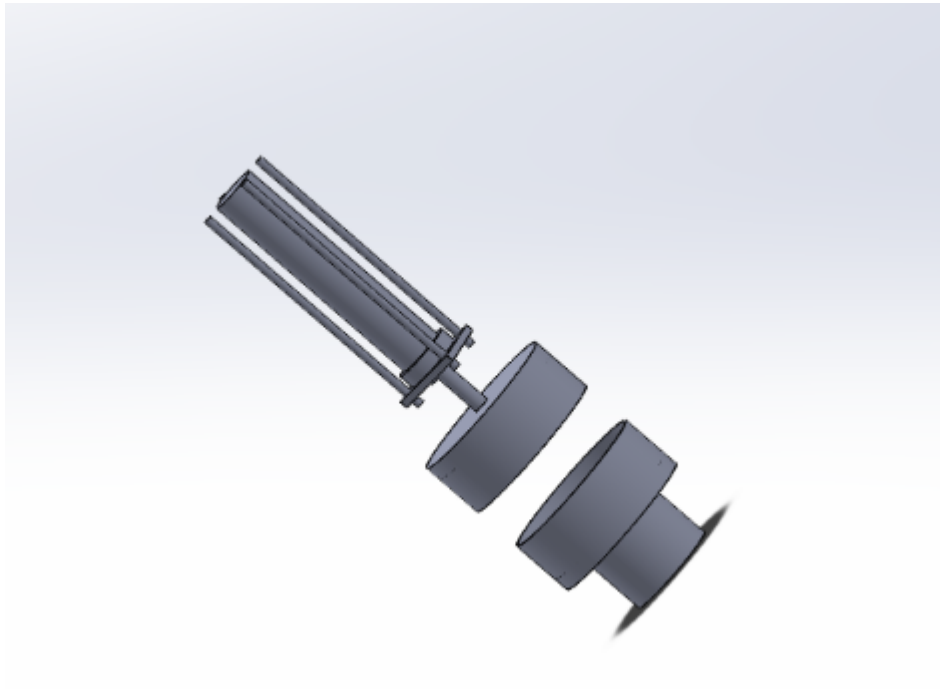


Fig. 2 Pneumatic cylinder

IV. WORKING

In this banana leaf cutting machine there is a double acting cylinder which is a pneumatic device, a punch, die, screwrod, topplate, bottomplate, direction control valve, flow control valve, connectors and hoses. A compressor supplies high pressure air to the cylinder, whose flow is controlled by a flow control valve. The air passes through a direction control valve. This is used to actuate the piston and to specify direction of movement. The piston is connected to ram

At the end of the ram punch is fastened. The die in the ram can be replaced. The piston, ram and punch are the moving parts in this machine. The die is fixed on the base of the machine by screw rod. The whole unit is fixed on column when the air flows through the flow control valve, its volume is restricted to the specified amount. Then the direction control valves control the part of cylinder which it should occupy.

When it occupies part of the cylinder, it moves the ram downwards along with punch. The punch, punches the banana leaf kept over the die. The project will be wet. To recover the wetness and makes the shape stable a heating coil is placed in the die. Next, direction control valves are actuated which makes the air to flow in cylinder. Due to the release of air to the atmosphere by a valve, this makes the punch to move upwards. The leaf plates can be taken out and the next set of leaves can be placed over the die for the next cycle

V. EXPERIMENTAL RESULTS

This machine relates to cutting banana leaves by using pneumatics mechanism. Banana leaves have wide range of applications as they are large, flexible, waterproof and decorative. They are used for cooking, wrapping and food serving in wide range of cuisines in tropical and sub tropical areas. Presently people cut leaf manually. Cutting a bunch of banana leaves by hands is not a simple process. It's a tedious process as well as it is dangerous and slow process. So the below pictures shows the machine and its components.

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Fig. 3 Fabrication of Banana Leaf Cutting Machine

MERITS:

- This product is an alternative for plastic plates.
- Easily decomposing product.
- Cheaper and easily available material is used.
- Eco friendly product.
- The pneumatic arm is more efficient in the technical field.
- Quick response is achieved.
- Simple in construction.

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- Easy to maintain and repair.
- Cost of the unit is less.
- No fire hazard problem due to over loading.
- Comparatively the operation cost is less.
- Continuous operation is possible without stopping.
- It reduces the manual work.
- It reduces the production time.
- Occupies less floor space.
- Less skilled operator is sufficient.

DEMERITS:

While working, the compressed air produces noise therefore a silence may be used.

- High torque cannot be obtained.
- Initial cost is high.
- Cylinder stroke length is constant.
- Need a separate compressor.

VI. CONCLUSION

Presently there is no machine for cutting banana leaves automatically. Till now its only been done manually and many problems like cuts and injuries are faced by the manual operators. These problems faced by operators have been persisting ever since the evolution of usage of banana leaves for decorative purposes and serving food in hotels. Our design has been conceived as an effort to solve this problem.

The idea is expressed through CAD models and the required design calculations are performed. Simulation of assembly was made in Solidworks and tested in software. The parts were assembled using various types of fasteners and resins. The project assembly was tested in our labs and the design proved to be feasible.

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