

“DESIGN & FABRICATION OF GREEN COCONUT CUTTING MACHINE”

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ABSTRACT

Nowadays activity of punching the hole and cutting the coconut water is done by conventional way and just for insignificant scale. The traditional way of opening such coconut is to cut the top portion with sharp knife. To cut and open the coconut requires expertise and anybody cannot do it and even an expert may get injured by mistake, but the machine developed will make the task easier. By using such type of machine anyone including non-expert man can easily punch a hole and cut the coconut water. Coconut water is energetic fluid for human being and which have the great importance in day to day life. This final project, study and fabrication of coconut water extracting machine, is intended to extracting coconut water in massive scale for extracting coconut water enterprise.

The initial design is used to get optimal of hydraulic punching and shearing machine for tender coconut. The present innovative work is helpful for hawker, which reduce the mental fatigue and decrease the operation time for extracting coconut water on large extent. We promote our machine for street hawkers to reduce his effort for punching and cutting of coconut water. As they use conventional cutting method in which they use sharpened knife they may get injured during cutting.

The punching tool has a locking device to hold the tender coconut when pulling the piercing tube from the tender coconut. The locking device has into two rod which is fixed in the frame. And the remaining two rod are moving upward during shearing operation. The stainless steel blade is keyed in the whole of frame rod. The fixed base plate has is then ready to place the coconut for shearing operation and for holding purpose

KEYWORDS

Green coconut cutting machine, Design, Blade, Frame, Hydraulic Pressure

INTRODUCTION

On an average, street hawker sells at about 100 green coconuts per day. The conventional way of cutting the coconut is done by the sharp knife and the task is done by the expertise and anybody cannot do it. In the conventional way, cutting the top portion of the coconut and the time required for the operation is more than 1 Minute. Hence the waiting time for the customer is more and attraction of the customer is less. Now a day the process of chopping the green coconut is very tedious and chances of causing the accident are more. Utmost care and skill is required to chop the coconut in traditional way. To compare “our invention” with traditional method, ours is safest, he says. Our main objective is to fabricate a low-cost hydraulic coconut punching and shearing

machine for tender coconut in which we punch the hole and cut the coconut into two halves and ready to sell the coconut to customer and anyone can chop and have a sip of coconut water.

DATA COLLECTION THROUGH LITERATURE SURVEY

Review on benefits of coconut water:-The water of tender coconut is a sterile, nutritious, thirst quenching health drink. The pure and sweet tender coconut possesses enormous therapeutic properties and is a thirst quenching refreshing health drink for all age groups. Dr. Anitha Anchan October 4, 2013 presented a paper on benefits of coconut water. On website healthcorpindia.com

Review on conventional coconut cutting method:- Review deal with the presently used method of cutting coconut by using sharp knife. Causes of accident during operation are more in conventional method.

Review on market analysis:- This chapter Introduces the effects of coconut drinks and aerated drinks on global market. Demand of coconut drinks in past and future. And last the survey in Nagpur's has done to know sales proportion of coconut on September, 17 2015

Review on mechanism: - The various mechanisms were studied which works on electrically motor operated, hydraulically operated, foot operated, hand operated. The final machine is very economical mechanism and is hand operated which utilizes hand effort to punch hole in coconut.

Review on study of hydraulic mechanism: This chapter presents the types of hydraulic mechanism, from Wikipedia.com. the hydraulic jack is easy to lift the heavy load of 1 ton to 20-25 ton. Hydraulic operated jack by applying less forces by up and down movement of the piston travel the distances of 13-16 cm from the initial position

Review on comparison between conventional method and proposed machine: This chapter refers to the comparison of conventional method and proposed machine i.e. the machine is more efficient than conventional method of cutting.



From past years the tender coconut is being opened and cut by completely manual effort by using a hard knife. The tools used are unsafe, messy and need skill and training. The risk of injury is also too high other drawbacks are as mentioned.

Risk of injury Handicapped people not able to do business
Not able to provide tender coconut as soon as customer orders for new workers Aged people not able to do this.

WORKING CONCEPT

The machine as depicted in the diagram above works when the hydraulic Cylinder is operated by means of a lever pump.

- As the lever pump of the hydraulic cylinder is operated, the piston rises out of the cylinder.
- Before operating the lever pump, the flow control valve has to tighten by the user by moving it in clockwise direction.
- The user is supposed to put the tender coconut on the pedestal above the hydraulic piston.
- As, the piston rises, the pedestal along with the fruit also rises, and are pushed against the steel rod being suspended from above the metal frame. Due to this a hole is punched into the coconut as the steel rod gets pushed through the husk of the coconut.
- Before performing the punch operation, the user has to move the blade member to the resting position.
- To perform the shearing operation, the user has to move the blade member from resting position to the level of the punching rod and the pump the hydraulic cylinder by pushing the lever.

To retract the piston back in the cylinder, the user has to move the flow control valve at the base of the cylinder in anti-clockwise direction.

COMPONENTS REQUIRED IN FABRICATION

Punch :- It is used to make a hole on the coconut. It is made up of mild steel. The length of this component is 28 cm. It is sharp pointed at one end.

Shear :- It is used to split the coconut into two halves. It is made up of stain less steel. The thickness of this tool is 5 cm. A rod pipe is welded at top of shear for the stationary position of shear.

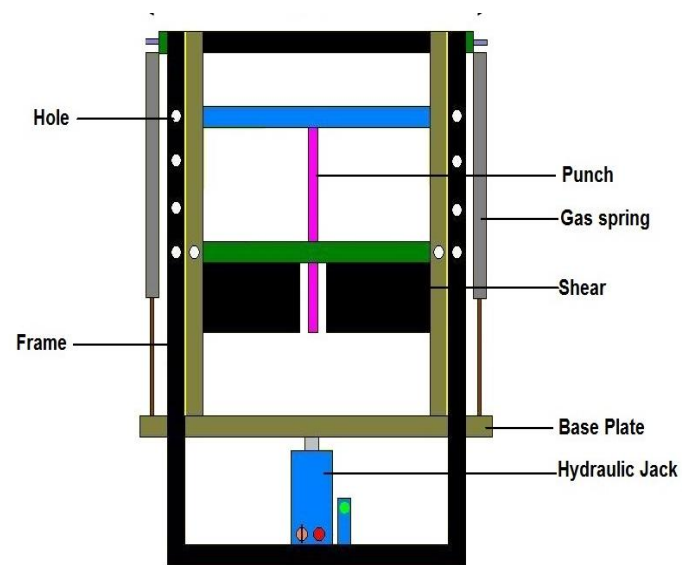
Hydraulic Jack:- This is the main working part of this machine. It is used to lift the coconut with the help of piston for punching and shearing operation.

Bed:- It is use to place the coconut for punching and shearing operation.

Gas spring :- It is used to move the piston at downward position with the help of bed.

Frame : Frame is a structure of machine on which the other components are placed. It is made up of iron.

CONSTRUCTIONAL MODEL DETAILS



Design for Punching

Required punching force:-

Punching is a forming process that uses a punch to force a tool, called punch, through the work piece to create a hole via shearing.

Therefore, the punching force is required to punch the hole, is given by

$$\text{Punching force} = \text{perimeter} * \text{thickness} * \text{shear stress}$$

$$\text{Perimeter} = \pi * d = 5 * 3.14 = 15.7 \text{ mm}$$

$$\text{Height} = 250 \text{ mm}$$

$$\text{Shear stress} = 25 / 1.27 \text{ N/mm}^2 = 19.63 \text{ N/mm}^2$$

According to the ergonomics study the effort or force applied by the single hand by a human is 2.5 kg.

$$\text{Therefore, Force} = \text{mass} * \text{acceleration}$$

$$F = 2.5 * 10$$

$$F = 25 \text{ N}$$

Required Shearing Force for splitting:-

The force required to slice the tender coconut is, $P = F/A$

$$F = P * A$$

Where, A = Area of Slicing (m²)

$A = L * S$ where L = Average Length of slicing and S= Thickness of slicing

$$A = 16 * 10$$

$$A = 160 \text{ mm}^2$$

$$\text{Hence, } P = 250 / 160 = 1.56 \text{ N/mm}^2$$

Effort applied by Hand:-

According to the ergonomics study the effort or force applied by the single hand by a human is 2.5 kg.

$$\text{Therefore, Force} = \text{mass} * \text{acceleration}$$

$$F = 2.5 * 10$$

$$F = 25 \text{ N}$$

COMPARISON BETWEEN CONVENTIONAL AND FABRICATED MACHINE

CONVENTIONAL METHOD	FABRICATED MACHINE
Effort required for cutting = 300 N Effort required for punching = 150 N More effort required	Effort required for cutting = 100 N Effort required for punching = 25 N Less effort required
Skilled person required	No skilled person required
Accident possibility	No accident possibility
Slow operation	Fast operation
Time required for punching = 20 sec Time required for splitting = 30 sec	Time required for punching = 15 sec Time required for splitting = 20 sec

ADVANTAGE & LIMITATIONS

Advantages:

- The entire assembly shall be made of light weight materials and hence portable, as none of the joints shall be welded but bolted.
- Thus, the assembly can be disassembled to pieces for packing, storing or transportation.
- The entire assembly shall be manually operated but effortless because of the use of hydraulic cylinder.
- Also, no electricity is being used in any of the process.
- Both the operations of shearing and punching are being done with the use of separate tools hence both operations can be done simultaneously.
- Shear blades and punch don't require any sharpening with time as both the entire operation shall be completely harmless for the user. The entire assembly is made up of cheap and easily available components

Disadvantages

- Hydraulic cylinders are prone to leaks hence periodic replacement and maintenance of oil seals is required.
- When continuous wear and tear of shear case more force required to hydraulic jack for that it has sharpen as per requirement.

APPLICATIONS

1. This machine can be setup in shop.
2. Can be used by street side hawkers.
3. Can be use in farm, house etc.

FUTURE SCOPE

1. In the place of hydraulic jack, double acting cylinder will be used for automatic operation of machine with the help of electricity
2. It is the simple mechanism machine hence, the operating system is very easy and sophisticated.
3. The size of machine is small hence, the space require for the machine is very less. Due to compact size it is easy to handle.
4. In future the machine is efficient because the components used for the machine is less hence it is maintenance is less or negligible

CONCLUSION

1. The project carried out by us is helpful for street hawkers and make the task easier for them.
2. This project greatly reduced the operation time as compared to conventional method.
3. By the implementation of this machine new entrepreneur can easily purchase and start his or her business.

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FILE PICTURES

