PINEAPPLE SAPLING BINDER

DESIGN PROJECT REPORT

Submitted

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BONAFIDE CERTIFICATE

This is to certify that the Design Project Report entitled "Pineapple Sapling Binder" submitted by Anandu Anilkumar - AJC18ME021, Asish S Nair - AJC18ME028, Balagopal R - AJC18ME034, Bibil Jose - AJC18ME038 in partial fulfillment of the requirement for the award of the Bachelor of Technology in Mechanical Engineering is a bona fide record of the work carried out at Amal Jyothi College of Engineering under our guidance and supervision.

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First and foremost, we would like to thank God for his grace and love, without which we could not have been able to complete this project. Next, we extend our gratitude to the college and especially the Mechanical engineering department for giving us the opportunity and facilities to work on this project. We would also like to take this opportunity to thank our Mentor, Mr. Abi Varghese for his constant support and for his endless encouragement to help us come up with innovative ideas and designs.

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ABSTRACT

Pineapple cultivation has been among the farmers for many years and has been cultivated in countries worldwide in different terrains and by people of various cultures. Commercial cultivation of pineapple in India started four decades back and the transportation of the saplings through trucks as large bundles is not an uncommon sighting, but an efficient and simple method to make bundles has still not been developed instead bundles are still conventionally hand wound which is time consuming would require at least the work of two labor.

In this report we will discuss the various mechanisms available to make bundles for various materials like wood, paper, pipes etc. but these devices could not be used for winding the saplings as the bundle shouldn't be too tight because the saplings are delicate and tight bindings may lead the saplings to rotten. Our team considered environmental impacts and availability of resources to avoid any sort of motors and sensors which were utilized in the present binding techniques and required additional source of power. Therefore we utilized only mechanical movements in order to get the desired results of creating bundles.

Keywords

Commercial crop, binding technique, efficient and simple, environnemental impact, mechanical movements.

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Chapter 1

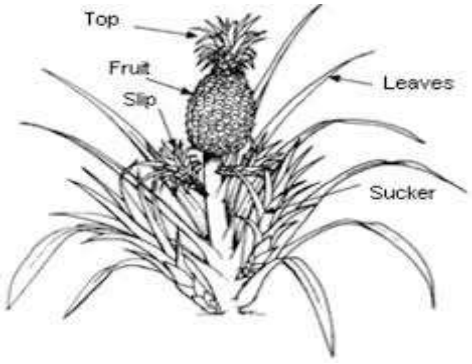
Introduction

Pineapple cultivation has been around for many decades cultivated by people all around the globe but still has not yet developed a mechanism to bind the saplings so as to transport it from present plot to the next for replanting. The farmers face difficulty in binding these as they are long and therefore difficult even with gloves and also they have hire the labors to tie up the bundle of saplings in the same number as to that hired for plucking the fruits. Also the saplings cannot be wound in any random manner as care should be taken to prevent the saplings to rot.

As a solution to the said challenges of present machines and difficulties faced by the farmers we have developed a winding machine that works only by using mechanical movements of the various parts and also would be suitable for all sorts of terrains both for sloped and flat surfaces. The winding machine is also mobile and therefore can be moved around the plot as the saplings are usually separated during the time of fruit plucking and piled up as separate heaps which will be some distance apart throughout the land.

1.1. **Section used to plant**

Pineapples can be cultivated by using different parts of the fully grown pineapple plant and the different sections of the pineapple plant are illustrated below.



Top, slip and suckers are the three parts of a pineapple that can be used for cultivation, but commercial farmers use the suckers and thus are the part that is to be wound using the winding machine that is discussed in this report

Fig 1

1.2. Pineapple suckers

Pineapple suckers are long parts of the pineapple plant which is about an arm length and used for commercial cultivation of pineapples. It has a bulb like portion towards its end which is the part that goes beneath the ground and the rest sticks up similar to the saplings that are used in paddy fields

During the bundling of the suckers, they are stacked in such a way that one row will have heads in a certain direction while the second row will be in inverted position. This is done to ensure that a compact bundle will be made without any loose ends.

Fig 2

1.3. Replanting

Suckers start growing with the emergence of inflorescence, whereas slips grow with the developing fruits. The fruit weight increases with increasing number of suckers/plant, while the increased number of slips delays fruit maturity. Crown size has no bearing on the fruit weight or quality. Hence de-suckering can be delayed as much as possible, while the slips are recommended to be removed as soon as they attain the size required for planting.

When the farmer knows that the suckers have matured enough they will be piled up as illustrated which is later wound into bundles manually ant taken to trucks which is transported to the next land for cultivation.

Fig 3

Chapter -2

LITERATURE REVIEW

2.1.Adjustable Semi Automatic Twist Tie Machine:

The perfect tie machine for applications where, variable tying diameters are necessary it has an Adjustable tying diameters from 1/8 inch to 13/8 inch.

Fig 4

It Manufactured with finest components.It uses 5/32 inch wide twist tie ribbon including polycore , non-metallic twist tie ribbon. It cannot be used for tying large bundles of materials and variable tying strength.Requires a power of 110v for operations. Perfect for large bags, coils, band saw blades, cord sets, cables tubing, flowers, harnesses, or anywhere a twist tie is needed around a large diameter bag or product. Straight line ribbon feed for reliable jam free operation. Ultra-tight re-usable closure. Independent ribbon feed so only the necessary amount is used. It costs around $3,925.00

2.2.XLS Smart Tyer:

The XLS Smart Tyer is a compact twist-tying machine. Featuring a programmable tie length and tension options. It is the perfect fit for any automated or stand-alone workstation.Integrated for a relaxed or rigid tie on your products.The XLS smart tyer is a 110v machine that twist ties products inserted into the ring shaped tying area.

Fig 5

It can also be adjusted to tie almost any products. Gather materials into a round or nearly round shape from ½ inch diameter up to a maximum of 4 inch diameter. Because of self adjusting versatility, the XLS is also an excellent choice for twist tying hoses, cords, cables, produce and vines. Requires electric power for operations. Pre-programmed with universal tying tensions accessible through control panel. Optional entry points easily allow for employee-preferred product insertion and Suitable for workbench access. It costs around: $13,150.00.

2.3.Pak Tyer Offset Tying Machine:

This advanced elastic tying machine is an excellent alternative to rubber banding and twist tying.It is used heavily in the floral and agricultural industries. An ergonomic design that allows for quick product pass through.It is Capable of completing up to 2,400 cycles per hour.

Fig 6

It consists of an upper delivery arm guide pin through which the tying material is passed. While cycle the machine the guide pin moves down and tie the material held on the

platform, and thus the process is completed. The Offset Pak-Tyer automatically adjusts to varying product sizes. It requires Minimal maintenance and Utilizes economical materials including elastomer, twisted poly, polytape, and twine.

2.4.Horizontal strapping machine- The SF 172 LIGO bis:

It is specially developed for stabilisation of light-weight products with polypropylene (PP) strap. Highly suitable for the fruit and vegetable industry, where large number of boxes can be packed together. Polypropylene strap of width 9 – 15 mm is used for strapping.It provides Heat sealing and has a Sturdy aluminium frame. It is Easy to use and easily programmed via touch screen.

Fig 7

A separate double coil for low down times during strap coil change. It has modular design. For higher products the sealing head can be installed in a higher position. It has Capacity of up to 26 cycles per min

2.5.PAK-TYER RPT-8 Rotary Tying Machine:

It is a machine used in industries for tying purpose.It consists of a pedal, motor, wheel, arm, twine, twine holder, knotter, and blade. Put on an article to be tied and make it the standard at knotter. Hold it with hand in order not to be moved from position and step on the starting pedal. It will start the motor which in turn rotates the wheel present in it which rotates the arm all with the help of chain mechanism.

Fig 8

The arm consists of twine which is provided from the twine holder. While rotating the arm the twine will cover around the article through the gap provided between the two platforms. After completing the process the twine will get in to the knotter and it will create a knot and the blades present in it will cut the twine.

2.6. Duplo UP-240 Table Top Paper Banding Machine:

It bundles the finished pieces such as business cards, postcards, and brochures. The machine wraps a strip of craft paper around the bundle, providing you with the same security, but at a lower cost, than a box or bag. It can be placed near your folder or other finishing equipment for an efficient finishing and packaging operation. The sensor will detect the bundle and automatically wrap a band around it.

Fig 9

It uses strips of craft paper or clear film. Banding tension is easily adjusted by the use of side guides. It has Manual or auto start operation and Uses a variety of banding

tape.Adjustable guilds ensures band placement accuracy. It is an inexpensive method of packaging printed materials.

2.7.TMB 400 Tying Machine:

TMB 400 Tying machine is mainly used in metal industry plants for tying bundle of steel rods and other components. It consists of a binding material provided over the bundle of steel rods with the help of advanced mechanism and it is twisted and cut out. It is electrically driven and mainly used in larger industries.

Fig 10

This Machine will be equipped with latest technology where automatic setup and operations has been exploited. Smooth integration or operation. It has a Min bundle diameter-150mm and max bundle diameter-400mm.Heavy and sturdy machine minimize maintenance , cost and reduce downtimes and production loss.

2.8.Max Taper Hand Tying Machine:

It is designed to quickly and efficiently tie up plants, trees or vines. It Simply squeeze the handle once to stretch tape between jaws then it is ready for wrapping around plant stem and support. Then squeeze the handle a second time to staple and cut tape firmly into place.

Fig 11

It includes one set of cutting blades and has a simple mechanism. It has an increased durability and Lighter in weight, Comfortable to handle and safe to use. It costs around $87

2.9.Steel Strapping Machine:

Used as a mechanism for binding TMT bars, timber logs, container boxes etc. Therefore is of high quality and strength. Mechanism involved is simply pushing force. It must be used only when equipped with work gloves as steel straps are extremely sharp and has tendency to wobble.

Fig 12

Steel strap used once can be melted and reproduced and therefore saves material. Many other strapping machines have been developed that involves tensioning, sealing and trimming altogether by the same machine

Chapter 3

DESIGN AND MODELING OF PINEAPPLE SAPLING BINDER

After considering the difficulties faced by the pineapple cultivators and also by understanding the ways in which the saplings were wound conventionally without affecting its structure we have fabricated a winding machine which not only has a simple working mechanism but is also mobile.

3.1. **Working:**

In our winding machine we have utilizing pure mechanical movements of the components which involves

a. oscillatory movement of the cylindrical container
b. Rotary movement of roll casing and driving wheel

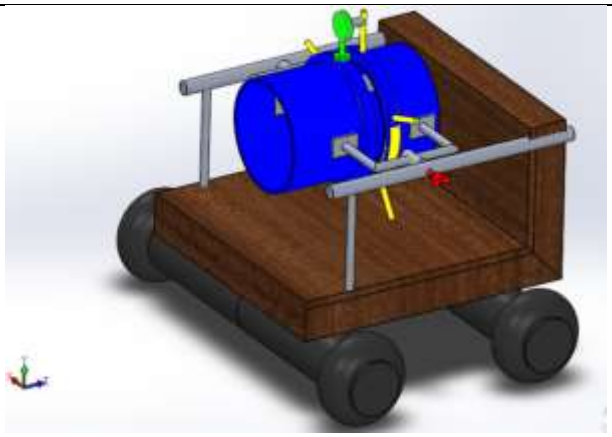


Fig 13

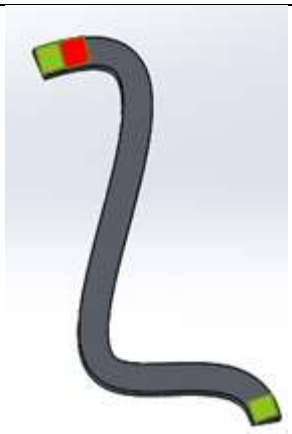


Fig 14

Cylindrical Container **Roll Casing** **Locking Key**	**Driving Wheel** **Carriage** **Wheels**

The roll consists of adhesive sections each of 5 cm which is separated by a distance that is equal to the circumference of the container.The pineapple suckers are placed in to the container keeping head portion inward until the container is filled. Half the width of the

adhesive portion is pressed onto any of the sucker on top and the roller is wound around the bundle with the help of the driven wheel .Just as the roller completes one revolution the next section of the adhesive comes up. Half the portion of the next section is torn so as to stick it as per the preferred tightness of the bundle. The key in the slot is loosened which in turn allows the container to oscillate. The acquired bundle is let down onto the carriage with help of the oscillatory movement of the container. The container will be restored to its original position and the key is tightened so as to keep the container in a stationary position.

3.2.Prototype

As of now we have fabricated a working prototype of the winding machine but was scaled down due to the unavailability of materials and a workshop due to the current Covid-19 scenario. For the current prototype we used

a. 4 inch pipe (2 ft)
b. 5 inch pipe (½ ft)
c. 20 mm wiring pipe (3 full length)
d. 25 mm wiring pipe (1 full length)
e. 4 elbows and 4 T joints (25 mm)
f. 4 elbows and 2 T joints (20 mm)
g. 9 hook screws
h. 1 cm sellotape
i. Wooden sticks
j. blade

The separate view of the prototype is illustrated below. Since the prototype was scaled down we could not demonstrate the winding on the actual suckers used, instead we have used dry coconut leaves as it is nearly similar to the pineapple suckers i.e. long and wobbly.

Fig 15

Therefore it can be seen that the dry coconut leaves which was simply collected and piled up was inserted into the winding machine and then wound by rotating the driving wheel which in turn drove the tape concentrically. When the tapes moves a distance equivalent to the circumference of the outer concentric circle it meets the blade which is cut and tightly pulled to make a bundle.

When the locking pin/key is removed the central part of the system can be easily rotated which in turn lets out a bundle of the stacked leaves.

3.3.ADVANTAGES:

a. Reduces the human effort.
b. Easy to handle simple mechanisms.
c. Low cost.
d. Time efficient.

e. No involvements of hazards.

3.4.NOVELTY

a. Simple mechanisms as only simple rotary and oscillatory movements are involved.
b. Use of gravitational forces
c. Additional energy source not required for winding compared to the present technology.
d. Mobile

CHAPTER 4

CONCLUSION

As an overall conclusion to this report I would like to say that most of the people try to invent or fabricate machines or equipments that are futuristic but they seem to forget about the present needs of the common man. During the design stage of our winding machine there was not available for pineapple winding though it has been a major commercial crop in many parts and hence weren't able to find pineapple winding machines for literature review as well.
This was the same reason why we opted to study the winding process used to bundle several other products. With this project our team hopes to reduce the effort and time that was taken by the farmers in a simple manner and also hope to proceed further with this same project into the product development phase as well.

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