

DESIGN AND FABRICATION OF PUSH BUTTON COCONUT PALM COLLECTOR

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# UNIVERSITI MALAYSIA PAHANG

## BORANG PENGESAHAN STATUS TESIS

JUDUL : DESIGN AND DEVELOPMENT OF PUSH BUTTON COCONUT  
PALM COLLECTOR

SESI PENGAJIAN: 2012/2013

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*I specially dedicate to my beloved parents  
(Halijah Binti Embong), my siblings,  
My supervisor and those who have guided  
And motivated me for this project*

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## **ABSTRACT**

This project is about design & development of push button coconut palm collector that can be used easier and everywhere. The objectives in this project are to create an easy method to make worker easier to collect the fruit at anytime and anywhere. Besides that, to design and fabricate an apparatus that can help in drying the shoes with simple action. This project involves the process of designing the push button coconut palm collector by considering the functionality, shape, environment fitting, and the manufacturing cost for people to use it. The selection of suitable materials in the fabricating of the push button coconut palm collector is a loaded material which has minimum weight, long life-span and can detain heavy load. Material is purpose for the fabrication of the push button coconut palm collector is stainless steel. In assembled the product and parts of the product, welding process is suitable because it will heat and melt the origin metal to joining.

## ABSTRAK

Projek ini adalah tentang penghasilan suatu benda baru untuk memungut buah kelapa sawit dengan mudah. Ia dapat memudahkan lagi manusia untuk memungut buah kelapa sawit di mana sahaja. Oleh itu, objektif utama untuk menghasilkan alat ini adalah untuk menghasilkan satu kaedah atau cara yang mudah untuk memungut buah kelapa sawit walaupun dimana sahaja. Projek ini melibatkan proses untuk membentuk satu alat memungut buah dengan berkonsepkan *butang tekan* dengan mengambil kira dari segi tujuan dibuat, bentuk, kesesuaian persekitaran dan juga dari segi kos penghasilan untuk kegunaan ramai. Pemilihan bahan yang sesuai untuk digunakan bagi pembentukan pemungut buah ini merupakan bahan yang mempunyai berat yang ringan, jangka hayat yang tahan lama dan boleh menahan berat beban. Bahan yang dicadangkan untuk pembentukan pemungut buah adalah bahan jenis stainless steel. Dalam penyambungan produk dan bahagian produk, kaedah kimpalan adalah sesuai kerana ia akan memanaskan dan mencairkan logam asal untuk disambung.



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## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 PROJECT SYNOPSIS**

##### **1.1.1 General Project Synopsis**

The project involves design & development of push button coconut palm collector. As the Diploma final year project allocates the duration of 1 semester, this large man-hour project therefore requires significant efforts of the students to participate. Basically the entire push button coconut palm collector could be divided into three stages, which are concept review and development, designing and fabrication.

The push button coconut palm collector is equipped by using stainless steel 304 2B material which include, rod steel, round hollow steel, aluminum plate and Perspex in manufacturing process by perform MIG welding to joints the part. The advantages of the push button coconut palm collector are not expensive, can bring anywhere and lightweight.

The process of development is initiated from designing the shape of the push button coconut palm collector by considering the function as well. In order to produce user friendly product that is suitable to the consumer, consideration to the ergonomic factor is taken into account. It involves the measurement process before the materials are cut into pieces before joined together.

### **1.1.2 Specific Project Synopsis**

The project title is to design & development of push button coconut palm collector. The project involves small analysis of the push button coconut palm collector and fabrication of the push button coconut palm collector itself with concerns regarding strength, durability, ergonomic factor, and convenience. Test need to be done to verify the strength of the push button coconut palm collector right before the fabrication process to avoid material and fund wasting. The projects prerequisites are Static, Dynamic and Engineering of Material. Overall, the project will meet acquire skills of design, analysis, and fabrication.

## **1.2 PROJECT STATEMENT**

Nowadays, basically there was only traditional collector and there was no specific collector for palm oil. Therefore, there are lots of problems for workers to collect the fruits such as, workers need to squatted to collect fruits on land and it may cause sore waists. The next problem is, the traditional collector are not friendly for a user, because there are need to squatted, heavy to carry, hand become dirty and waste the time.

## **1.3 PROJECT OBJECTIVE**

### **1.3.1 General Objectives**

Diploma final year project objective is to practice the knowledge and skill of the student that have been gathered before in solving problem using academic research, to born an engineer that have enough knowledge and skill. This project also important to train and increase the student capability to get know, research, data gathering, analysis making and then solve a problem by research or scientific research.

The project also will educate the student in communication like in a presentation and educate them to defend their research in the presentation. The project also will generate students that have capability to make a good research report in thesis form or technical writing. This project also can produce and train student to capable of doing work with

minimal supervisory and more independent in searching, detailing and expanding the experiences and knowledge.

### **1.3.2 Specific Objectives**

The project objectives are to design & development of push button coconut palm collector that is suite to its application especially for workers and to minimize the manufacturing cost by minimize the complexity of the push button coconut palm collector and simulate the material used with cheaper material but having high strength and endurance.

## **1.4 PROJECT SCOPE**

- i. Literature Review: Valuable data are searched and gathered. Considering the shape of the push button coconut palm collector in terms of its complexity and method to produce.
- i. Sketching & Design: Sketching and designing using Solid Work software in creating the design of the push button coconut palm collector.
- ii. Fabrication: Fabricate and produce the push button coconut palm collector by using basic engineering methods such as cutting, drilling and welding.

## **1.5 PROJECT PLANNING**

If the project task is referred, the project starts with the introduction, followed by literature review, design & measurement consideration, material preparation, methodology study, fabrication process, improvement, report writing and make a presentation on these project topics which are the push button coconut palm collector. This is involves of review of the push button coconut palm collector and examples of the current traditional collector. These tasks have been done through research on the internet and books.



The planning is dividing in two categories which are planning and actual items. For making a literature review part, it take one to three weeks to the planning process but an actual, that is different because it take until week seven of semester to do. After that, in design and measurement consideration of scope is about week three to week five to follow by the planning and for the actual take more than week five. In this scope, the design is thinking and makes some sketching to get an illustration about the push button coconut palm collector.

In material preparation, the material that wants to use is decide by planning and actual items because the material is also important to choose before fabrication process. On the methodology study, the planning is about from week six until week eight. Therefore, for an actual it's start from week five to week eight to finish it.

After that, in fabrication scope is very important because it's important to follow the work of schedule to finish the project. For the planning is only start from week six until week ten to finish. But, after start an actual activity is take a long time to complete the apparatus properly. It's about start from week seven until week twelve.

Lastly, after finish the fabrication process is make some improvement about the apparatus as good as possible in week nine to week twelve in actual term and follow the next scope until complete it.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 INTRODUCTION**

Nowadays, as we all know there is no specific collector oil palm in the market. Basically, the traditional collector basically using scope and hand to collect oil palm. Scope is easy to use and very affordable price but requires more movement to use. It will cause sore waist because of often squatted. Besides that, using hand will cause your hands become dirty and the percentage of hand injuries is high.

Coconut palm push button collector allows users to collect oil palm without feeling pain, the percentage of injured at the waist is smaller than using traditional collector. By using coconut palm push button collector it can decrease time of collecting the fruits.

The using of Perspex on the bottom of collector can facilitate the working process .Besides that we will be able to seeing the fruits stick on nail by using transparent Perspex. In addition, the nails play the main rule to make oil palm fruits stick on it. In this condition we using large amount of nails to collect a large fruits on the land. Therefore, it will cause the working process running smoothly.

## **2.2 CURRENT SITUATION AND PROBLEMS**

As we can see today, there was no specific tool to collect oil palm fruits in the market. Therefore, in this situation, workers spent a lot of time just for collect the fruit and there are no proper tool for this problem .In addition, using scope will make the sore waist and by using hand it will cause hand dirty. Besides that, workers need more time to collect the fruits on the land and it will bother working time process.

## **2.3 SOLUTION CURRENT**

The solution for the current situation or problems is by creating a new push button coconut palm collector. Push button coconut palm collector are lightweight and generally come as a complete coconut palm collector system, including a push button, transparent Perspex and suitable nails. The nails will make the fruits stick on it by move up and down. In addition, the nail is easy to assembly and change if the previous nails are rusting or not easy to penetrate. However, the nails are the best choices in order to make the fruits stick on it. Look for a push button coconut palm collector.

Therefore, that push button making the collector easily to use. Push button coconut palm collectors are also expensive. Users can bring the collector to anywhere and it is easy to restore. They also can keep it at home. Besides that, the user can save time by using push button coconut palm collector. In addition it can prevent from sore waist because normally users need to squat when they want collect the fruit on the land. Besides that, by using this collector the user don need to squat.

## **2.4 PAPER REVIEW**

### **2.4.1 Push Button Coconut Palm Collector and Functions**

- i. Scoop: Basically user must squatted when want use it.
- ii. Hoe: A lightweight but user must squatted when want use it.
- iii. Hand: Basically using hand will make hand dirty and workers need to squat.

## 2.5 TECHNICAL REVIEW

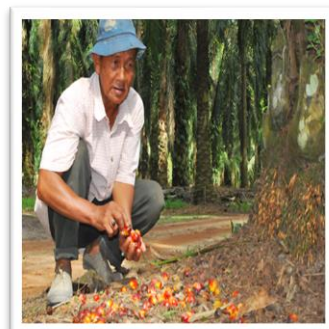
### 2.5.1 Pictures

Based on figure 2.1 below, it showed that one of the traditional coconut palm collector. Basically, this equipment knows as scope. The advantage of this product is the worker hands are not dirty when using this product. For disadvantage is the product not heavy to bring anywhere.



**Figure 2.1:** Traditional coconut palm collector using scope

Base on figure 2.2 below, the worker using hand to collect the fruit on the land. The advantages in this situation, there are no rubbish is collected. Disadvantages of this condition are worker hand will become dirty.



**Figure 2.2:** Traditional coconut palm collector using hand

Base on figure 2.3 below, there are knows push button coconut palm collector using concept of spring .The are several advantages of this product, such as it is light weight and easy to restore and the disadvantages of this product are hardly to assembly.



**Figure 2.3:** Push Button Coconut Palm Collector

## 2.6 JOINING METHOD

Joining involves in assembly stage. Commonly used method to join metal part is Metal Inert Gas (MIG) welding.



**Figure 2.4:** Metal Inert Gas (MIG) Welding

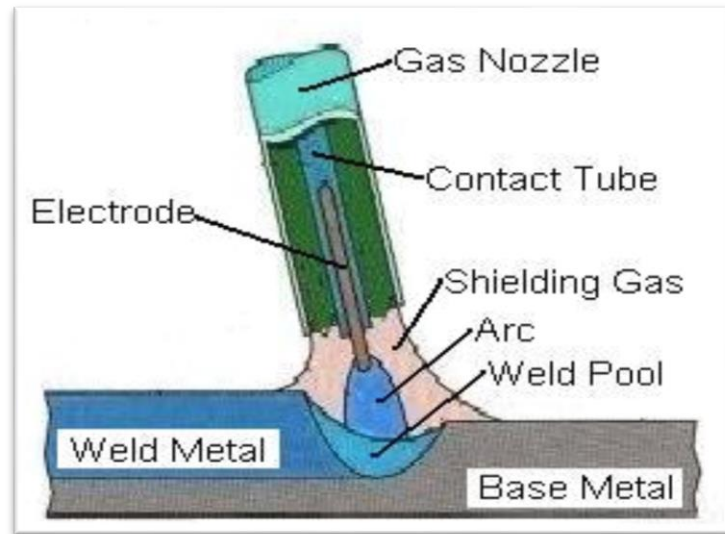
### 2.4.1 Metal Inert Gas (MIG) Welding

MIG (Metal Inert Gas) or as it even is called GMAW (Gas Metal Arc Welding) uses an aluminum alloy wire as a combined electrode and filler material. The filler metal is added continuously and welding without filler-material is therefore not possible. Since all welding parameters are controlled by the welding machine, the process is also called semi-automatic welding.

The MIG-process uses a direct current power source, with the electrode positive (DC, EP). By using a positive electrode, the oxide layer is efficiently removed from the aluminum surface, which is essential for avoiding lack of fusion and oxide inclusions. The metal is transferred from the filler wire to the weld bead by magnetic forces as small droplets, spray transfer. This gives a deep penetration capability of the process and makes it possible to weld in all positions. It is important for the quality of the weld that the spray transfer is obtained.

There are two different MIG-welding processes, conventional MIG and pulsed MIG:

- i. Conventional MIG uses a constant voltage DC power source. Since the spray transfer is limited to a certain range of arc current, the conventional MIG process has a lower limit of arc current (or heat input). This also limits the application of conventional MIG to weld material thicknesses above 4 mm. Below 6 mm it is recommended that backing is used to control the weld bead.
- ii. Pulsed MIG uses a DC power source with superimposed periodic pulses of high current. During the low current level the arc is maintained without metal transfer. During the high current pulses the metal is transferred in the spray mode. In this way pulsed MIG is possible to operate with lower average current and heat input compared to conventional MIG. This makes it possible to weld thinner sections and weld much easily in difficult welding positions.



**Figure 2.5:** Schematic of Metal Inert Gas (MIG) Welding

Gas Metal Arc Welding (GMAW) is frequently referred to as MIG welding. MIG welding is a commonly used high deposition rate welding process. Wire is continuously fed from a spool. MIG welding is therefore referred to as a semiautomatic welding process.

There are some advantages and disadvantages in using MIG welding: The advantages of MIG welding:

- i. All position capability.
- ii. Higher deposition rates
- iii. Less operator skill required.
- iv. Long welds can be made without starts and stops.
- v. Minimal post weld cleaning is required.

The disadvantages of MIG welding:

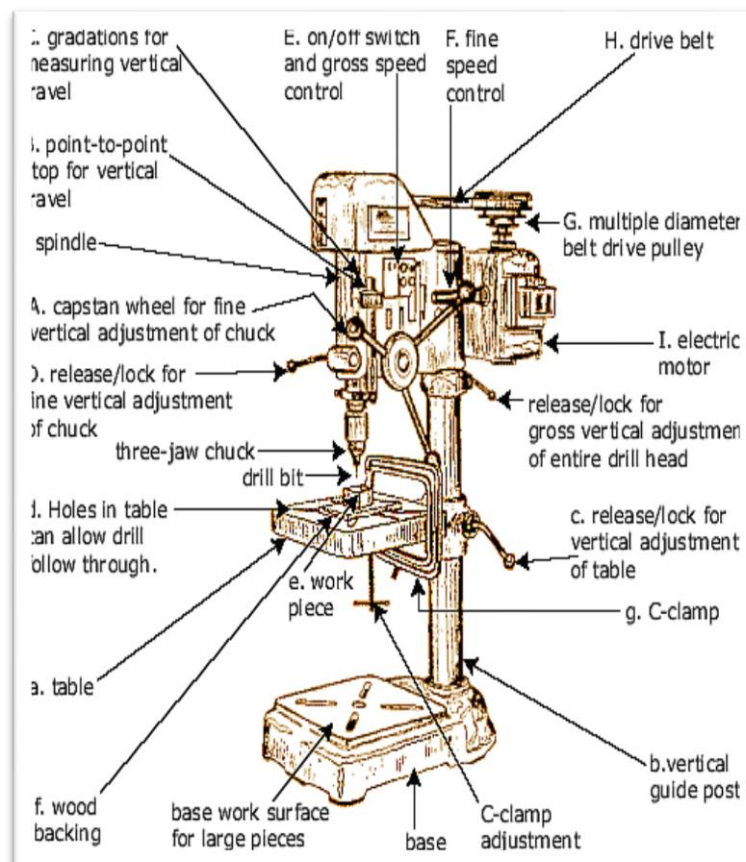
- i. Costs money of consumable, such as tips and nozzles.
- i. Is not worth a dang on paint, rust, or dirty surfaces.
- ii. No good for thick steel because it does not get the proper penetration.

## 2.7 DRILLING

Drilling is easily the most common machining process. One estimate is that 75% of all metal-cutting material removed comes from drilling operations. Drilling involves the creation of holes that are right circular cylinders. This is accomplished most typically by using a twist drill, something most readers will have seen before. The chips must exit through the flutes to the outside of the tool. As can be seen in the figure, the cutting front is embedded within the work piece, making cooling difficult. The cutting area can be flooded, coolant spray mist can be applied, or coolant can be delivered through the drill bit shaft.

### 2.7.1 Drill Press

A typical manual drill press is shown in the figure below. Compared to other powered metal cutting tools, a drill press is fairly simple, but it has evolved into a versatile necessity for every machine shop.



**Figure 2.6:** Drill Press Machine



## 2.8 GRINDING PROCESS

Grinding is a finishing process used to improve surface finish, abrade hard materials, and tighten the tolerance on flat and cylindrical surfaces by removing a small amount of material. Information in this section is organized according to the subcategory links in the menu bar to the left.

In grinding, an abrasive material rubs against the metal part and removes tiny pieces of material. The abrasive material is typically on the surface of a wheel or belt and abrades material in a way similar to sanding. On a microscopic scale, the chip formation in grinding is the same as that found in other machining processes. The abrasive action of grinding generates excessive heat so that flooding of the cutting area with fluid is necessary.



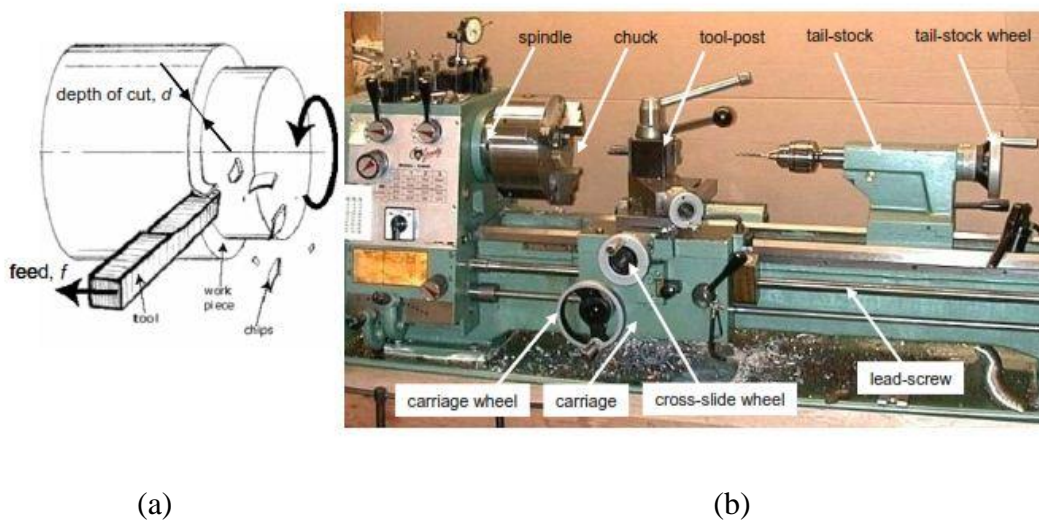
**Figure 2.7:** Grinder

## 2.9 CUTTING PROCESS

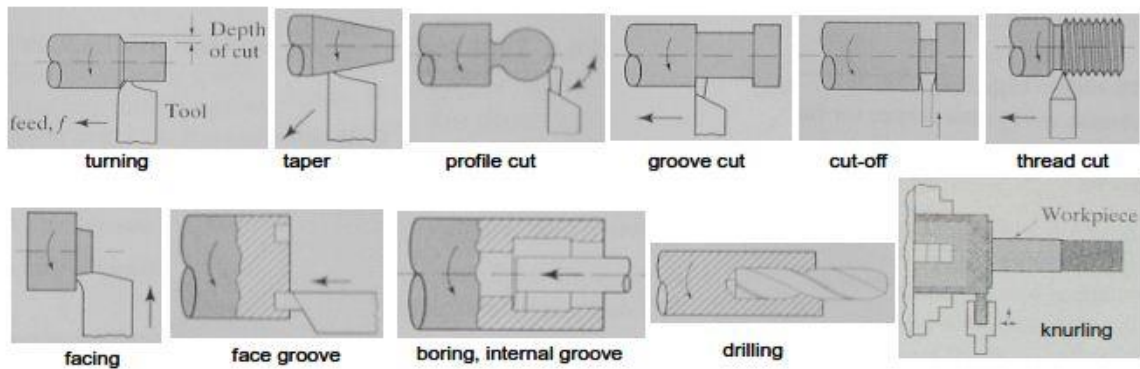
### 2.9.1 Turning Process

Turning is a cutting operation in which the part is rotated as the tool is held against it on a machine called a lathe. The raw stock that is used on a lathe is usually cylindrical, and the parts that are machined on it are rotational parts – mathematically, each surface machined on a lathe is a surface of revolution. The cylindrical part is held in the chuck, and the spindle rotates the part at high speed. The tailstock wheel is then used to feed the tool into the face of the part, to cut the hole.

However, in most cases, the lathe is used by holding a single-point cutting tool in the tool post. The part is held in the chuck, and rotates at high speed, by controlling the relative position of the tool against the part (by using the cross slide wheel and carriage wheel), we can control the material removal and the shape produced. Note that the turning of the cross-slide wheel controls the depth of cut, and the rate of turning the carriage wheel controls the feed rate (figure 2.11). Turning can produce a variety of revolved shapes.



**Figure 2.8:** (a) is a turning and (b) is a manual lathe with its important parts labelled



**Figure 2.9:** Typical lathe operations

The tool can perform cutting on the outer cylindrical surface. Among these, only drilling requires the tool to be fed by moving the tailstock along the slide. In all other processes, the bar stock is held in a fixture at the spindle, with the opposite planar face free. However, if the stock is long, the tailstock may be used to provide extra support to the free end of the bar. This is done by a special supporting fixture called a dead-centre. On the spindle side, the most common methods of holding the stock are. (a) Collector, (b) 3-jaw chuck, or (c) 4-jaw chucks (see figure 2.10 below).

Note that if several different machining operations must be performed on a single work piece, then it is important to plan the sequence in which they will be done – this will affect how many times the part needs to be released from the fixture and re-located in a different position to allow the tool to access the required geometry (for example if both planar ends must be faced, then we need at least two setups using a chuck).

Therefore, this allows the entire outer surface to be accessible to the tool. Finally, by reversing the jaws, larger sized bars can be held by using different levels of the steps. All three jaws move in and out simultaneously – so the bar axis is aligned with the axis of the chuck, and so, with the axis of the spindle. 4-Jaw chucks can be used to cut rotational shapes whose axis is offset (but parallel to) the axis of the part. This is because the opposite pairs of jaws can move independently.

## **CHAPTER 3**

### **METHODOLOGY**

#### **3.1 INTRODUCTION**

In fabricate of push button coconut palm, there are several step must be follows. In this part, all students should be understand why chosen the material and why must chose the particular methods used to characterize the material. Methodology is important before make the product. In fabricating process, it is include about measuring, transferring, punching, joining and finishing process. We should know a chronology of project until it finish. Others, students must clearly about the objects and equipment that used in making a project.

#### **3.2 PROJECT FLOW CHART**

For the diagram as shown as below, the project starts with title given from supervisor. Push button coconut palm collector was given. The project continued by finding the project objectives, problems statement and scope following by collect the data about the project. In this session, all the information was searched in the internet.

After that, the project continued by making the literature review and research about the title. This consist a review of the concept of current palm oil collector, collector system, collector features and type of current product. These tasks have been done through research on the internet, books and others sources.

Next, after gathering all the relevant information, the project undergoes design process. In this step, from the knowledge gather from the review is use to make a sketch design that suitable for the project. After several design sketched, design consideration have

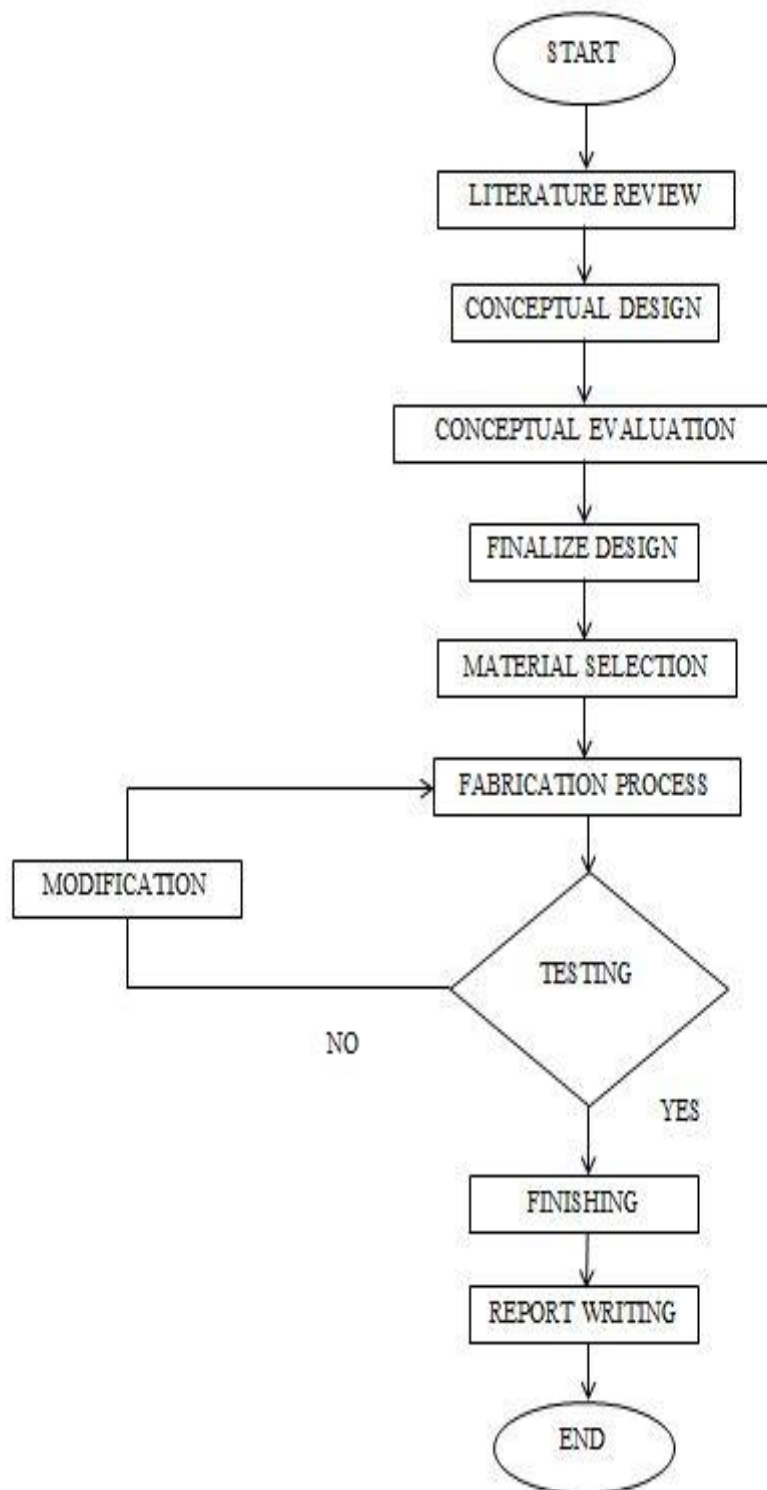
been made and one design have been chosen. The selected design sketched is then transfer to solid modeling and engineering drawing using Solid Work program. The materials and the measurement needed for the push button coconut palm collector listed down and calculated to give an ergonomic shape of the push button coconut palm collector.

Therefore, after the needed material is listed, acquisition step take places. There are only a few materials that need to buy such as bolt and nut, holder and nails. Some of the needed material is well-prepared by the university.

Besides that, after all the parts needed has been gathered, the project proceeds to next step that is fabrication process. The finished drawing and sketching is used as a reference by following the measurement and the type of materials needed. The fabrication process that involved is cutting, welding, and drilling. If all the parts had been processed, the parts are joined together to produce full-scaled push button coconut palm collector. Here come the testing and evaluation process. The push button coconut palm collector will be test to see if it fulfills the requirement such as ergonomic aspect, safety, strength and maneuverability

After all the parts had been joined together, here comes the last phase of process that is data discussion. In data discussion, the draft report and all the related articles are gathered and hand over to the supervisor for error checking. The finish product will be compared with the report to make sure that there is no mistake on both project and report.

Next, after the product and the report had been approved by the supervisor, the report is rearrange and print out to submit at the supervisor, the project coordinator and faculty of Mechanical Engineering. In this stage, the final presentation was also being prepared and waited to be present.



**Figure 3.1:** Project Flow Chart

### 3.3 DESIGN

The design of the push button coconut palm collector must be compliance to several aspects. The design consideration must be done carefully so the design can be fabricated and the parts are all functioning. The aspects that must be considered in designing the push button coconut palm collector are:

- i. Strength: Must have certain strength to ensure that it can use in long.
- ii. Ergonomic Factors: The push button coconut palm collector must be user friendly as easy and convenience.
- iii. Suit to environment: Push button coconut palm collector must be suitable to be use at any place.

### 3.4 DRAWING

The drawings are divided into two categories, which are:

- i. Sketching: All the ideas for the push button coconut palm collector fabrication are sketched on the paper first to ensure that idea selection can be made after this.
- ii. Solid Work: The final idea is drawn into the Solid Work format with details features.

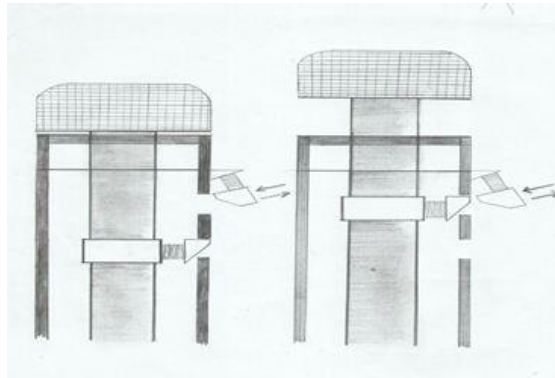
### 3.5 DESIGN SPECIFICATION

The design of the push button coconut palm collector must be considered that it can endure several specifications, which are maximum load : 1kg – 2kg, overall materials are 1.5 mm X 750 mm hollow steel (1 Unit), 4 mm X 954 mm rod steel (1 Unit ), 0.5mm X 25mm X 70mm Steel plate (1 Unit) , 254mm Nail ( 98 Unit ), 160 mm X 60mm X 0.3 mm Aluminum Plate ( 1 Unit ), 0.25mm X 25mm Spring (2 Unit),260 mm X 180 mm X 3mm Transparent Perspex (4 unit),170 mm X 20 mm Holder (1 Unit),M4X1 Bolt and Nut ( 32 Unit ), and Steel Stopper (1 Unit).

### 3.6 SKETCHING DRAWING SELECTION

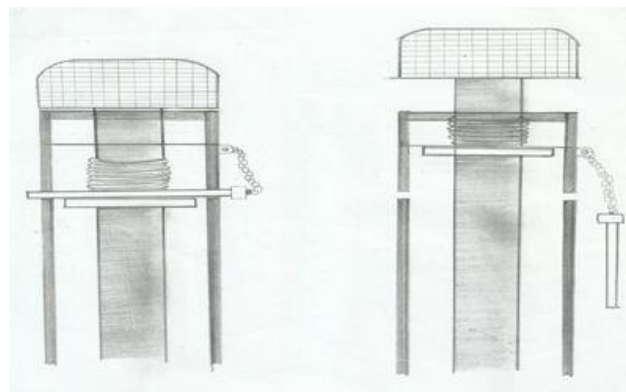
From the existing ideas, only four concept button coconut palm collector was sketching that had been chosen to be considered as the final ideas, which are:

#### 3.6.1 Concept Design 1



**Figure 3.2:** Concept Design 1

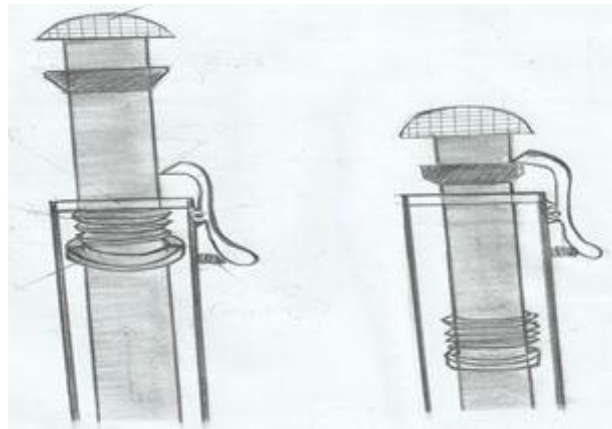
#### 3.6.2 Concept Design 2



**Figure 3.3:** Concept Design 2

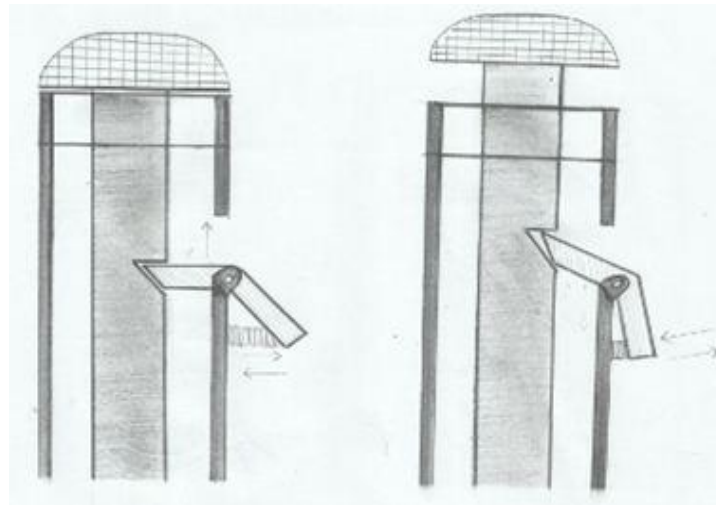


### 3.6.3 Concept Design 3



**Figure 3.4:** Concept Design 3

### 3.6.4 Concept Design 4



**Figure 3.5:** Concept Design 4

### 3.7 CONCEPT SELECTION

#### 3.7.1 Concept Varian

Base on table 3.1 below it shows that 14 of different concept are listed. It is show the best way to choose the best among the best of 4 concepts had been sketching previous page. The table was divide by five line including criteria and the level of marking was given by refer level marking above.

**Table 3.1:** Concept Varian

Criteria	Concept			
	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>
Easy to fabricate	2	2	3	2
Level of marketing	2	3	3	3
Materials use	2	3	3	3
economy	4	4	4	4
safety	2	2	2	2
Cost production	2	3	4	3
Weight materials	4	4	4	4
Material hardness	2	3	3	2
Spare part	2	2	3	2
Materials assembly	2	3	3	3
Easy to collect fruit	4	4	4	4
Rubbish presence	2	2	2	2
Performance	2	2	3	1
Size	2	2	2	2
<b>Total</b>	<b>34</b>	<b>39</b>	<b>43</b>	<b>37</b>

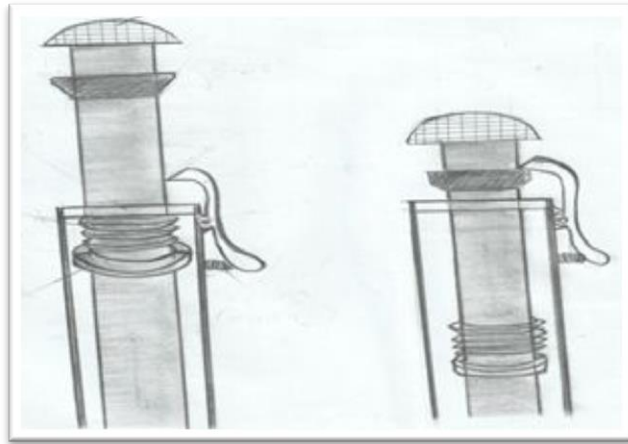
4 = Excellent

3 = Good

2 = Average

1 = Low

### 3.7.2 Design Selection



**Figure 3.6:** Concept Selection

#### **Advantages**

- i.** Easy to use.
- ii.** Friendly.
- iii.** Easy to assembly.
- iv.** Easy to fabricate.
- v.** Low cost.
- vi.** Safe time

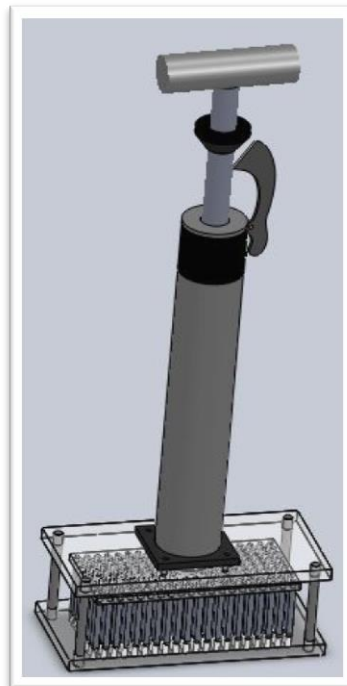
### 3.8 SOLIDWORK

After a design has been selected, the next step in the designing process is dimensioning. The dimensioning is based on relevant dimensions and also referring to the push button coconut palm collector so that the design is fit into others part.

After dimensioning, the engineering drawing of the design is drawn by using Solid Work application, at this stage solid modeling method is used. Part by part solid modeling created according to the dimension done before, after all part created, the 3D model is assembled with each other base on the design.

### 3.9 OVERALL VIEW OF THE DESIGN

#### 3.9.1 Design Description



**Figure 3.7:** Solid Work

This design show that the final idea of the push button coconut palm collector. Additional of transparent Perspex were added to make sure that the fruit stick on nail will easy to see and the round holder are exchange with the cylinder one.

### **3.10 FABRICATION PROCESS**

After designing phase, comes fabrication process. These process are involves of using the material selection and make the product base on the design and by followed the design dimension. Many methods can be used to fabricate a product, like welding, cutting, drilling and many more method. Fabrication process is difference from manufacturing process in term of production quantity. Fabrication process is a process to make only one product rather than manufacturing process that focus to large scale production. In the project fabrication process needed to make the base plate, framework of display board and display board. Fabrication process was used at the whole system production. This was include part by part fabrication until assembly to others component.

#### **3.10.1 Process Involve**

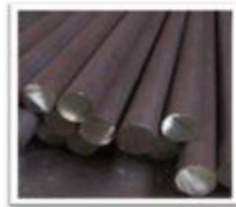
In order to make the design come to reality, fabrication process needs to be done first. The fabrication process starts from dimensioning the raw material until it is finish as a desired product. The processes that involved are:

- i. Measuring: Materials are measured to desired dimensions or location.
- ii. Marking: All measured materials need to be marked to give precise dimension.
- iii. Cutting: Marked materials are then cut into pieces.
- iv. Joining: Materials joined by the method of welding and using bolt nuts.
- v. Drilling: Marked holes are then drilled to make holes for bolts.
- vi. Lathe: Making stopper using lathe machine
- vii. Finishing: Any rough surface cause by welding spark were grind to give smooth and safe surface.

### 3.10.2 The Material of Project

Material of the project is mostly using stainless steel according to the title given which is design & development of push button coconut palm collector. Grade 304 is the standard "18/8" stainless; it is the most versatile and most widely used stainless steel, available in a wider range of products, forms and finishes than any other. It has excellent forming and welding characteristics. The balanced austenitic structure of Grade 304 enables it to be severely deep drawn without intermediate annealing, which has made this grade dominant in the manufacture of drawn stainless parts such as sinks, hollow-ware and saucepans.

For these applications it is common to use special "304DDQ" (Deep Drawing Quality) variants. Grade 304 is readily brake or roll formed into a variety of components for applications in the industrial, architectural, and transportation fields. Grade 304 also has outstanding welding characteristics. Post-weld annealing is not required when welding thin sections. Grade 304L, the low carbon version of 304, does not require post-weld annealing and so is extensively used in heavy gauge components (over about 6mm). Grade 304H with its higher carbon content finds application at elevated temperatures. The austenitic structure also gives these grades excellent toughness, even down to cryogenic temperatures.



(a)



(b)



(c)



(d)



(e)

**Table 3.2:** Material Involves

	Material Involves
a	Rod Steel
b	Hollow Steel
c	Perspex
d	Spring
e	Sheet Metal

**3.10.3 Bill of Material****Table 3.3:** Bill of Material

No.	Material	Quantity	Size
1.	Bolts and nuts	321 unit	M4 X 1
2.	Nail	98 unit	1 inch
3.	Mild steel plate	1 unit	0.5mm x 25mm x 70mm
4.	holder	1 unit	Length: 170mm
5.	Perspex	4 unit	Wide : 2600mm Base : 180mm Thickness : 3mm
6.	steel rod	1 unit	Diameter : 4mm Length : 954mm
7.	Hollow steel	2 unit	Length : 750mm
8	Springs	2 unit	Length: 25mm Diameter: 0.25mm
9	Aluminum Plate	1 unit	160 mm base : 60 mm Thickness : 0.3m

### 3.11 STEP BY STEP OF THE PROCESS

The fabrication process was started with measuring the material into the required dimension. Firstly, 750mm hollow steel was the first material that measured. A total of a plate of 160mm X 60mm X 0.3mm aluminum plate was the next that will be measured. All the measuring and marking process is done by using steel ruler, measuring tape, and steel marker.

Then, after several quantities of material had been marked, the next step is to cut the material into its desired length. This process is done using the floor cutter disc and jigsaw. Before proceeding with this process, safety measurement had been carried out by wearing Personal Protective Equipment (PPE) such as goggle, gloves and ear plug. These safety measurements are so important in order to prevent the projectile spatter from the process. During this process, I'm using the L-shape in order to make sure the dimension of the material length is correct and precise.

All the material that had been cut is grinded to give smooth surface on the edge to make sure that joining process can be done precisely. Then all the material was arranged into joining position. Next is the joining process.

The joining process was carried out by using the Gas Metal Arc Welding or formerly known as MIG (Metal Inert Gas). First, the welding machine is set up to make sure that the output of the process will satisfy. Face shield, apron, goggle and others PPE equipment are not to be forget. Then, all the materials were weld together. During this process, a minor movement of the materials will give bad effect to the joint and to the framework. It is because the hollow tube will expand and twist a little due to the temperature changes.

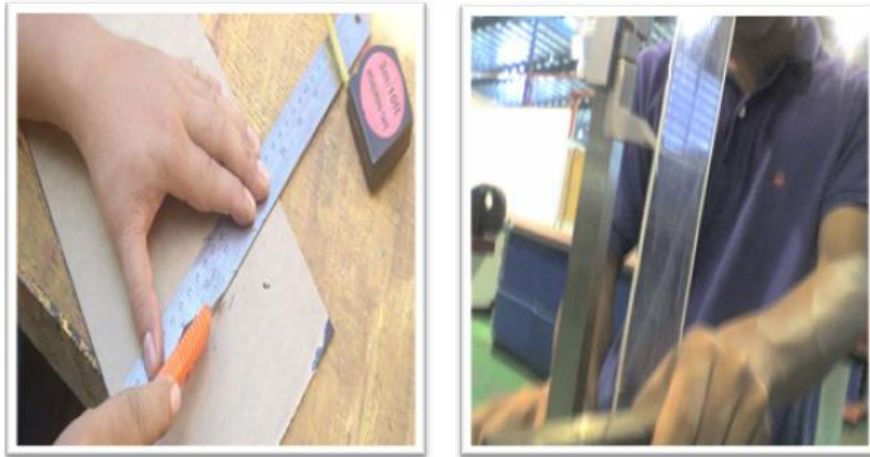
After finished welding, the entire welded places were then grinded to make sure that the entire joint surface was smooth from any spatters or sharp edge. During the process, the careless of wearing an ear plug will cause high risky damage to ears. Hand gloves and goggles are also need to give attention.



Then, several locations were drilled to make holes for bolts and nuts for the support bar. Hand drill was used during the process because all the hollow tube had been weld together. It is also one of the ways to make sure that all the joint are joint together perfectly before drilling any holes because any mistake of drilling will cause the material to damage.

After all the process had been done, come the last part that is tightening the bolt and nut of the base part.

### 3.12 FABRICATION PROCESS



**Figure 3.9:** Measuring and Marking



**Figure 3.10:** Drilling Process



**Figure 3.11:** Welding Process Using MIG Welding



**Figure 3.12:** Finishing Step Using Grinder

## **CHAPTER 4**

### **RESULT AND DISCUSSION**

#### **4.1 INTRODUCTION**

This chapter is about result and discussion the project encounter before, during and after the project finish. The final fabrication of the push button coconut palm collector is done from only limited times due to several problems occur to the project. For this part, the result is come from what is the how came after finish the push button coconut palm collector. Besides that, from this chapter is also about discussion. It discusses about the how the push button coconut palm collector. After the fabrication process is complete, the push button coconut palm collector should be test of the function.

#### **4.2 PROJECT PROBLEMS**

- i. Literature Review: The concept and ideas review for this project are not very wide because it is not widely modified by the manufacturer. Students should come with their ideas on the project.
- ii. Designing & Sketching: Because of the idea were from the student directly, so there are no references that can be referred. All the drawing and dimension need to generate by student itself.
- iii. Fabrication Process : Students need to be given more time to finish fabricating their product because of slackness of skill and training, the joining finishing was not so god but yet can still reliable.
- iv. Material Preparation: Some of the needed material needs to buy at the city. University should prepare the material or either provides the place where the material can be obtained from.

- v. Budget Preparation: It is not so effective to use student's money to get the materials. University should provide budget at first stage so that student's expenses are not interfere.

### **4.3 PROBLEM DURING FABRICATION PROCESS**

#### **4.3.1 Material (Stainless Steel)**

Problem during this stage is very critical that make the project schedule is delayed. The problem comes when the material buying handle by supervisor is undergoing strict procedure and the budget for the project is in unknown situation. Because of this problem the fabrication process cannot be run according to schedule. This is because, no material needed is ready to fabricate.

#### **4.3.2 Welding Process**

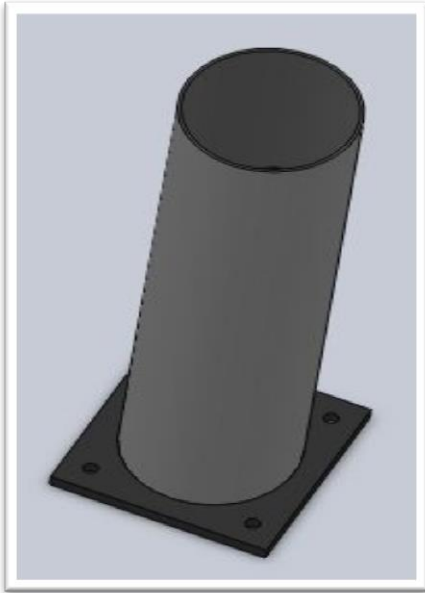
During welding process some problem has occurs. Using the MIG welding we need to set a suitable voltage. If the voltages to high, the material like stainless steel will be melting.



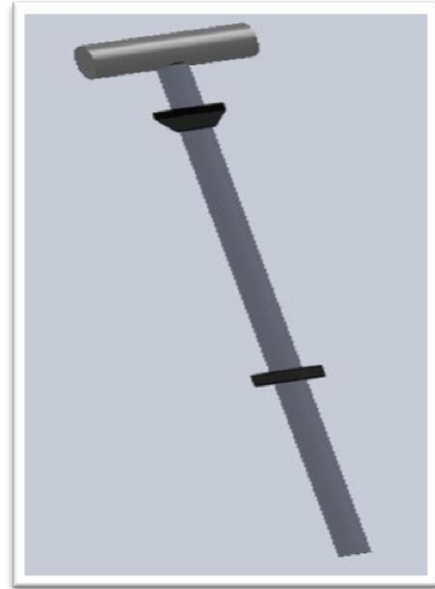
**Figure 4.1:** The Result of High Voltage

#### 4.4 RESULT

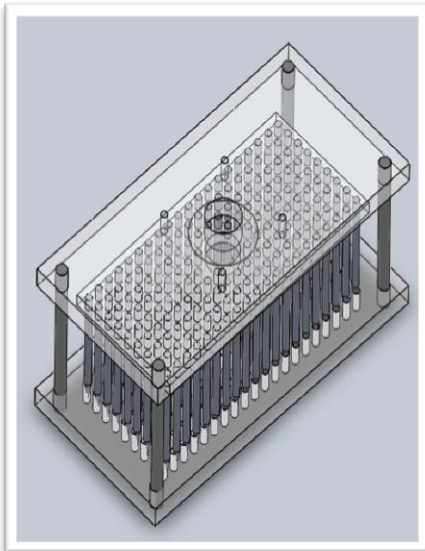
Figure Below Shows about finished each parts of push button coconut palm collector:



**Figure 4.2:** Main Part



**Figure 4.3:** Inside Part



**Figure 4.4:** Base Part



**Figure 4.5:** Real Product

## **CHAPTER 5**

### **CONCLUSIONS AND RECOMMENDATIONS**

#### **5.1 INTRODUCTION**

For the final chapter it represent about conclusion and recommendation for the project. In this chapter will discuss mainly about the conclusion of the project, concluding all the process that involved. Besides that this chapter also contains recommendation about the project. So for this recommendation it can make improvement about the project in the future.

#### **5.2 CONCLUSION**

As the conclusion, overall perception of the project carried out was good. This project gains student knowledge by searching information in the internet. The project also gains student communication skill like in a presentation and after meeting with supervisor every week. The project also generates student capability to make a good research report in thesis form or technical writing. This project also produce and train student capable of doing work with minimal supervisory and more independent in searching, detailing and expanding the experiences and knowledge about to complete the Push Button Coconut Palm Collector.

In this project, student also get all the objective that accomplished, which are to create an easy method to make people more easier to collect fruits and to design & development of push button coconut palm collector.

From this project, the push button coconut palm collector was designed by using Solid Work software and fabricate the product by using any kinds of facility were exists in laboratory such as cutting the material using cutting machine, weld the certain parts by using metal inert gas welding (MIG) and with set of screw.

Besides that, the project will help the student in making a good knowledge before developing one new idea. It also teaches the students about step by step how to complete the project by following a guide.

### **5.3 RECOMMENDATION**

Some recommendations are expressed based on fabricating this project for future final year projects:

- i. Design a good shape of Push Button Coconut Palm Collector to state more stability.
- ii. All materials should be lightweight and hardy.
- iii. The steel must be painted to prevent it from becoming rusty.
- iv. More time given to the project, it includes the final year student should focus more on the final year project.
- v. Some of the materials also need the student to buy such things that aren't available in the mechanical laboratory. So students need the budget to buy the things. For the budget, the faculty should provide the budget to the student first.

## REFERENCES

### BOOKS

A.M Howatson, P.G. Lund and J.D Todd. 1972. “*Engineering Tables and Data*”. Chapman and Hall.

Leo Alting, *Manufacturing Engineering Processes*, 2<sup>nd</sup> edition, Madison Avenue, New York, Marcel Dekker Inc, 1999.

### WEBSITE

[http://en.wikipedia.org/wiki/Gas\\_metal\\_arc\\_welding](http://en.wikipedia.org/wiki/Gas_metal_arc_welding), dated on Sept 15<sup>th</sup>, 2009

[http://www.efunda.com/processes/metal\\_processing/shearing.cfm](http://www.efunda.com/processes/metal_processing/shearing.cfm), dated on Oct 15<sup>th</sup>, 2009

[http://www.efunda.com/processes/machining/drill.cfm?search\\_string=drilling](http://www.efunda.com/processes/machining/drill.cfm?search_string=drilling), dated on 15<sup>th</sup>, 2009

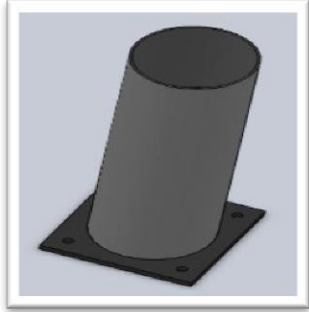
<http://www.efunda.com/processes/machining/grind.cfm>, dated on Oct 15<sup>th</sup>, 2009

[http://www.roymech.co.uk/Useful\\_Tables/Beams/Shear\\_Bending.html](http://www.roymech.co.uk/Useful_Tables/Beams/Shear_Bending.html), dated on Oct 15<sup>th</sup>, 2009



**APPENDIX A**

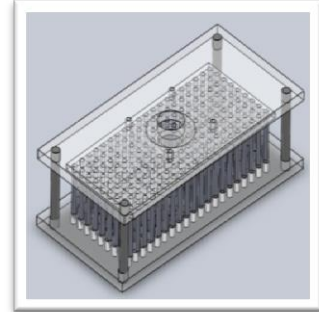
**Part by Part**



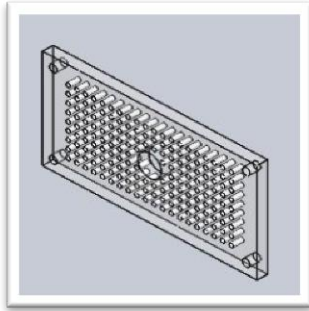
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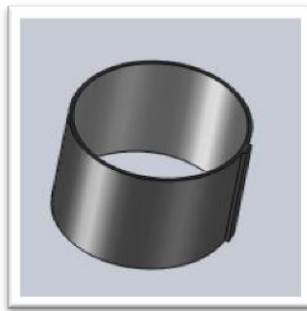
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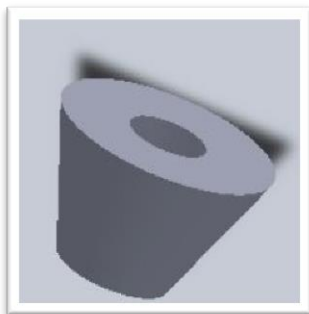
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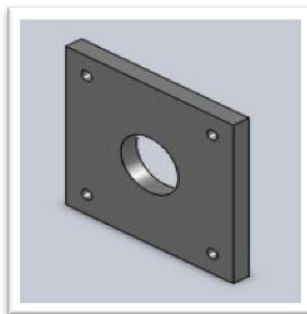
**A5**



**A6**



**A7**



**A8**



**A9**

**APPENDIX B**  
**Project Schedule**

Project Activities	Week													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Identify the Problem														
Identify the scope, objective & project background														
Literature review														
Conceptual design/ selection														
Material selection														
Concept evaluation & finalized design														
Material preparation & fabrication process														
Testing & modification														
Report writing														
Presentation														

**TASK**



**APPENDIX C**

**Final Drawing**

