DESIGN AND FABRICATION OF UMBRELLA SWING STAND

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DESIGN AND FABRICATION OF UMBRELLA SWING STAND

ABDUL KHALIQ BIN ABDUL KADIR

A project report submitted in partial fulfillment of the requirements
For the award of the Diploma of Mechanical Engineering

Faculty of Mechanical Engineering
UNIVERSITI MALAYSIA PAHANG

DECEMBER 2010

SUPERVISOR'S DECLARATION

I hereby declare that I have read this thesis and in my opinion this thesis is sufficient in terms of scope and quality for the award of the Diploma of Mechanical Engineering.

Signature : ……………………………….

Name of Supervisor : MUHAMMAD HATIFI BIN MANSOR

Date : __th DISEMBER 2010

STUDENT'S DECLARATION

I declare that this thesis entitled "Design and Fabrication of Umbrella Swing Stand" is the best result of my own research except as cited in the references. The thesis has not been accepted for any Diploma and is not concurrently submitted in candidature of any other diploma.

Signature : ……………………………………..

Name : ABDUL KHALIQ BIN ABDUL KADIR

Date : __th DISEMBER 2010

To my beloved parent and friends

ACKNOWLEDGEMENTS

First of all I would like to thank and express my fully gratitude to Allah SWT for giving me the chance to complete my final year project in this semester (2010). During this project, there were many obstacles starting from the beginning until the end with helps from Allah I can finish all successfully. To my previous supervisor, Mr. Muhammad Hatifi bin Mansor, thanks for giving me this task and the challenging project. I was learning so many things from you to settle down the entire problem that was have from starting until the end. To all lectures, JPs and PJPs thank for your help whenever I am lost. Dear all my friend from DMM, your comment and your idea that was given to me, I was so appreciated because from you all, that is given to me good benefit and helps me. Special thanks to my family for their support and prayers to ensure my successful. Thank you so much for each of you all. I appreciate your helps and support and may Allah bless you all.

ABSTRACT

The device for removing water drops from an umbrella is constituted such that a number of water absorption members with elastic property are disposed at certain intervals radially in the inserting opening for an umbrella of the device body. The inserting space for the umbrella is in the central part of a number of absorption members, thereby a closed rainy umbrella is inserted into the inserting space. The umbrella cloth is inserted into clearance between the each adjacent water absorption member, and then water drops on the umbrella cloth can be absorbed and removed by sliding the inserted umbrella in the direction of insertion of the umbrella. The device does not need such energy as electric energy and water absorption is performed certainly and within only short time.

ABSTRAK

Sebuah alat untuk menghilangkan titisan air daripada payung telah didasari yang terdiri daripada sejumlah anggota penyerapan air dengan sifat elastik dan diletakkan pada sudut tertentu jejari bulatan untuk memasukkan payung. Ruangan bagi memasukkan payung adalah di bahagian tengah alat. Payung yang basah boleh dimasukkan ke dalam alat penyerapan dengan jarak di antara bahagian penyerap air adalah berdekatan, dan membolehkan titisan air pada payung diserap dan dihilangkan dengan berlakunya geseran payung pada alat penyerap ketika memasukkan payung ke dalam. Alat ini tidak memerlukan tenaga seperti tenaga elektrik dan penyerapan air dan hanya boleh dilakukan dalam waktu yang singkat.

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LIST OF SYMBOLS

ft	feet
cm	centimeter
m	meter
MPa	megapascal
mJ/m^2	milijoule per square meter
nm	milimeter
g/cm^3	gram per cubic centimeter
lb/in^3	pound per cubic inch
psi	pound-force per square inch

LIST OF ABBREVIATIONS

PVA	Polyvinyl Acetate
OFW	Oxyfuel Welding
MAPP	Methylacetylene-propadiene stabilized
OAW	Oxyacetylene Welding
AW	Arc Welding
SMAW	Shielded Metal Arc Welding
GTAW	Gas Tungsten Arc Welding
GMAW	Gas Metal Arc Welding
FCAW	Flux Cored Arc Welding
SAW	Submerged Arc Welding
PAW	Plasma Arc Welding
AC	Alternating Current
DC	Direct Current
bcc	body centered cubic
fbc	face centered cubic
hcp	hexagonal close packed
fcc	face centered cubic
UV	Ultraviolet
IR	Infrared

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CHAPTER 1

INTRODUCTION

1.1 PROJECT BACKGROUND

My project title is Design and Fabrication of Umbrella Swing Stand. As the Diploma final year project allocates the duration of 1 semester, this is large main-hour project therefore requires significant number of students to participate.

These projects are supervised by Mr. Muhammad Hatifi bin Mansor who give me an advice when problem to occur and about planning of project. The projects actually focus on the storage of wet umbrella problem. I have 14 weeks to make sure this project was done and after that, it must be tested in order to work properly. This project is begin and start with investigation make duration in research literature review via internet, my supervisor, discussion with other friend and other relevant material that related for this project.

1.2 PROJECT OBJECTIVE

The objective of my project as bellow:

i) To design and develop a device for removing rainwater from umbrellas, that can easily, effectively and quickly remove water from umbrella that are wet with rain without using energy such as electricity power.

1.3 PROJECT SCOPES

There is several scope of my project:

i) To design a device that works without electrical power
ii) Minimize the time consume to wipe out the water droplets

1.4 PROBLEM STATEMENT

Existing devices are complex, have high cost, require energy and much time to remove water drops. In order to resolve the problems, a simple construction and does not need such energy such as electrical energy lies in this invention.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

For this chapter, generally main article or information is about how to joint each part with welding process and what is the procedure or information to be selected material for this project. That's because, main point to make sure this project succeed is about how to joint each part and the selected material that can be this product in a good hardness and good strength.

First method will be used is about welding. Welding is an efficient, dependable, flexible, and economical means of fabrication. Welding is widely used in industry as a principal means of fabricating and repairing metal product. Welding can lower production cost by simplifying design and eliminating costly patterns and machining operations. Welding can also be used in repair operations and adding new metal to worn parts.

Welding is the coalescence or joining together of metal, with or without a filler metal, using heat, and/or pressure. Bonding of metals during welding occurs through localized melting or micro structural changes at the interface between the metals. Welding is used throughout industry in building construction, aircraft manufacturing, and for automobile production.

Second method must be review and study is about the suitable material. As a product for removing water droplets, the absorbent material must be considered in a high quality. That is a main structure for this product to give answer at the end that it is high efficiency or not.

2.2 USAGE AND USABILITY OF UMBRELLA

An umbrella's primary purpose is to protect the user from rain, although they are also used in some cases to protect against sun or snow. To do this, an umbrella has a long, slender shaft with a handle on one end and a collapsible canopy on the other, coming to a point at the umbrella's tip. The umbrella's protective canopy is extended as a rider, initially located near the handle, travels up the shaft towards the tip. In a standard non-collapsible umbrella such as ours, the rider's motion is started by releasing the rider latch on the handle end of the shaft and manually moving the rider upwards until the rider engages a second latch on the tip end of the shaft, locking the rider and canopy in place.

Some improvements on the standard umbrella design have been made to overcome some of the standard umbrella's flaws. The rider mechanism in many umbrellas, such as the golf umbrella, is spring loaded to provide one-handed automatic opening. This is an improvement over the two-handed opening that the standard umbrella offers. The canopy must be forced closed and the spring must be manually reset after use.

Because an umbrella has a very specific intended usage environment- outside, in rain - there are times when the umbrella will not be in use but must be carried for later use, such as indoors. It is beneficial to the user for the umbrella to be lightweight and have a small footprint when not in use. One popular variation on the standard umbrella is the purse umbrella. This umbrella has a hollow telescoping shaft. The footprint of the umbrella and its weight are reduced substantially, enough that the umbrella fits conveniently into a purse or backpack and can be carried at all times. This decrease in size comes with an increase in component complexity, as the shaft cannot be a single piece of material and the arms must be folded as well. Additional joints are needed, and the overall strength of the umbrella is reduced. The most complex variant on the classic umbrella is an automatically opening and closing umbrella. This extends the functionality of the purse umbrella by using an additional mechanism to automatically close the canopy with a button press. While the canopy is automatically closed, the spring must still be manually reset.

Even with these improvements over the standard umbrella, some issues remain unaddressed. All of the umbrellas designed for personal use must be carried by hand, and even the most complex umbrellas must be forced closed manually after use. This can be a difficult task for people with motor or joint disabilities, such as Parkinson's disease or arthritis. The umbrella's circular canopy is generally held by the user. Because the canopy is held to the side of the user, rather than directly overhead, the coverage is not uniform for a single user, and about half of the canopy is unused on average. Offset umbrellas which maximize the usable coverage area exist, but are rare and significantly more expensive, in part due to lost efficiency because the umbrella is not radially symmetric.

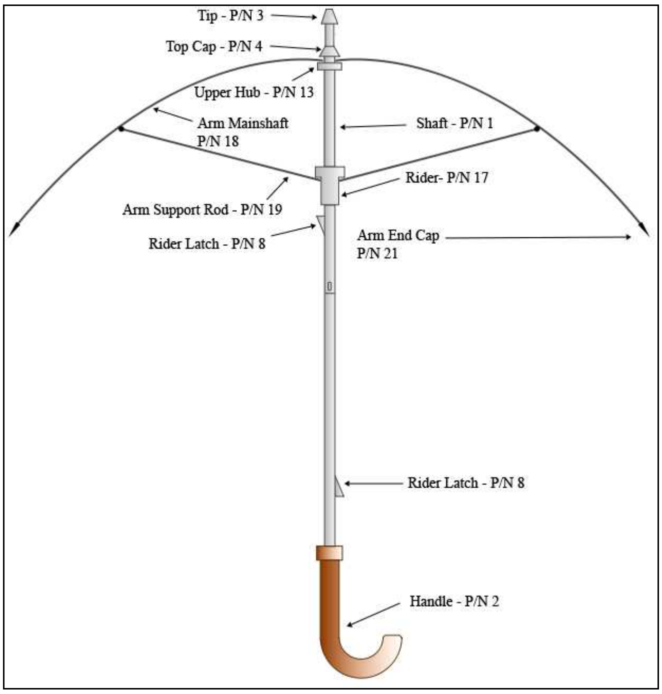

Figure 2.2: Overview of Main Component of Umbrella

2.3 HISTORY OF SPONGE

A sponge is a tool, implement, utensil or cleaning aid consisting of porous material. Sponges are used for cleaning impervious surfaces. They are especially good absorbers of water and water-based solutions.

Sponges are commonly made from cellulose wood fibres, or foamed plastic polymers. Some natural sponges are still sold for the same purpose, although most natural sponges are now used either as body/facial sponges or as decorating tools used for sponge painting.

There are three other categories of available synthetic sponges, low-density polyether (known as the rainbow packs of non-absorbent sponges), PVA (very dense, highly absorbent material with no visible pores) and polyester.

Polyester sponges are also sub-divided into a variety of types, some being reticulated (artificially broken-in) for ease of use. Other types are double-blown polyester, meaning that they have a high water retention ability, approaching or equalling PVA, but with visible pores and more flexibility of applications.

2.3.1 Raw Material

Many different types of sponge are harvested and dried for human use, but the most common one is the *Spongia oficinalis,* also known as the glove sponge. Another common type used commercially is the sheep's wool sponge, or *Hippospongia canaliculata.* Synthetic sponges are made of three basic ingredients: cellulose derived from wood pulp, sodium sulphate, and hemp fiber. Other materials needed are chemical softeners, which break the cellulose down into the proper consistency, bleach, and dye.

2.3.2 Harvesting Sea Sponge

To gather natural sponges, specially trained divers descend into sponge-growing waters with a large two-pronged hook and a string bag. Traditional sponge divers in Greece used no special breathing equipment. The men of seaside villages were trained from childhood and were expert deep water divers. The sponge industry in the United States centers around Tarpon Springs, Florida, a community that was founded by Greek immigrant divers. Today's sponge divers use modern diving equipment such as wet suits and oxygen tanks. The divers pry sponges off the rocks or reefs where they grow, and bring them up in their string bags. The divers pile the sponges on the deck of their boat and cover them with wet cloths. The animals die on the boat, and their skins rot off. After the skins have decayed, the harvesters wash the sponges and string them on a long, thin rope to dry in the sun. After they have dried completely, the harvesters wash the sponges several more times. This is all the preparation the sponges need to be ready for sale.

Natural sponges are the skeletons of a kind of simple sea animal. They grow in worm, shallow waters, and are particularly plentiful in the eastern Mediterranean and off the western coast of Florida. Artificial sponges have largely replaced natural ones in the United States, where at least 80% of the sponges in use are manmade.

2.3.3 Manufacturing Process

The steps necessary in the manufacture of synthetic sponge is discussed below.

1. The cellulose used for sponges arrives at the sponge factory in large, stiff sheets. Workers take the sheets and soak them in a vat of water mixed with certain chemical softeners. The cellulose becomes soft and jelly-like. Then workers load the cellulose into a revolving mixer, which is a large rotating metal drum. Workers add the sodium sulphate crystals, cut hemp fibers, and dye, and close the

mixer. The mixer is set to rotate, and it churns the ingredients so that they are thoroughly amalgamated.

2. From the mixer, workers pour the material into a large rectangular mold that may be 2 ft (61 cm) high, 2 ft (61 cm) wide, and 6 ft (1.8 m) long. The mold is heated, and the cellulose mixture cooks. As it cooks, the sodium sulphate crystals melt, and drain away through openings in the bottom of the mold. It is their melting that leaves the characteristic pores in the finished sponge. The size of the pores is determined by the size of the sodium sulphate crystals. A rough sponge used for washing a car, for instance, is made with coarse crystals, while a fine sponge of the type used for applying makeup is made with very fine crystals. As the celluolose mix cooks, then cools, it becomes a hard, porous block.

3. The sponge block is then soaked in a vat of bleach. This removes dirt and impurities, and also brightens the color. Next the sponge is cleaned in water. Additional washings alter the texture, making the sponge more pliable. The sponge is left to dry, to prepare it for cutting.

4. Some manufacturers make the sponge and cut and package it themselves. Others produce the raw blocks of sponge, and then sell them to a company known as a converter. The converter cuts the sponges according to its customers needs, and takes care of the packaging and distribution. Whether at the first manufacturing facility or at the converter, workers cut the sponges on an automatic cutter. They load each big rectangle of sponge into a machine that slices it into the desired size. Because the sponge block is rectangular, it can be cut into many smaller rectangles with little or no waste.

5. Many household sponges have a textured plastic scouring pad attached to one side. This is attached in a process called laminating, after the sponge is cut. The scouring pad, which is cut to the same size as the sponge, is affixed to the sponge in a laminating.

Softened cellulose is mixed with sodium sulphate crystals, cut hemp fibers, and dye in a large, revolving metal drum. Once blended, the material is poured into a large rectangular mold, which may be 2 ft. (61 cm) high, 2 ft. (61 cm) wide, and 6 h (182.9 cm) long. As the mold cooks, the sodium sulphate crystals melt, and drain away through openings in the bottom of the mold. It is their melting that leaves the characteristic pores in the finished sponge. Machine that uses specialized sponge glue made of moisture-cured polyurethane. Next, the sponges move to a packaging area where they are sealed in plastic. The packaged sponges are boxed, and the boxes sent to a warehouse for further distribution.

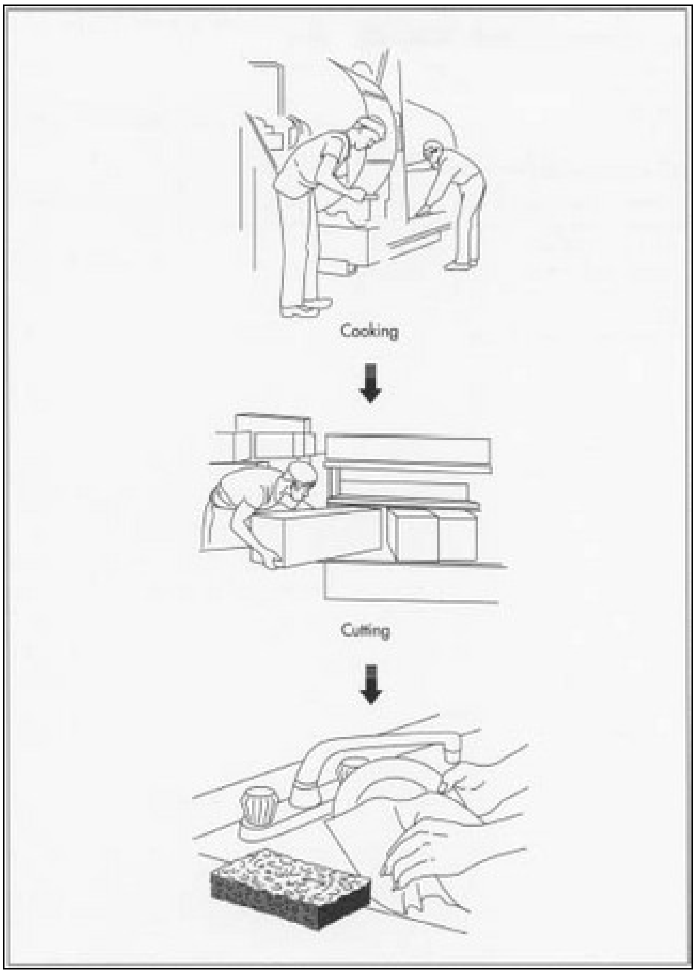

Figure 2.3.3: Manufacturing Process of Sponge

2.4 HISTORY OF WELD

Modern welding process evolved from discoveries and inventions dating back to the year 2000 B.C. when forge welding was first used as a means of joining metal by heating and hammering until the objects where fused together. Today, forge welding is used only limited application.

Acetylene gas was discovered in 1836 by Edmund Davy. When combined with oxygen, acetylene produced a flame suitable for welding and cutting. The application of heat generated from electric arc between carbon electrodes was the basis for the arc welding process. Resistance welding, which also uses electricity, was also developed in the late 1800s and first used in the early 1900s.

One of the most significant developments at the time was the invention of an electrode that is consumed into the weld while providing heat from an arc (the shield metal arc welding process). Modification to the coating applied on the consumable electrode allowed greater applications for arc welding.

Another improvement in the arc welding process was the addition of an inert shielding gas to protect the weld area from atmospheric contamination (the gas tungsten arc welding process). This proved to be an especially important process in welding magnesium and aluminum on World War II fighter planes. The electrode used was made out of tungsten and was not consumed into the weld. Originally, helium was used as a shielding gas, but was later replaced by the less expensive argon.

New developments in the field continue to address new requirements and applications in industry. Current welding processes are the product of continued refinements and variations of the welding processes discovered in the 1800s.

2.4.1 Welding Processes

The demands of a growing industrial economy during the 1800s spurred the development of modern welding processes. The welding process to be used for a particular job is determined by the following:

- Type of metals to be joined
- Cost involved
- Nature of products to be fabricated
- Production techniques used
- Job location
- Material appearance
- Equipment availability
- Welder experience

Welding processes used today are commonly classified as oxyfuel welding, arc welding, and resistance welding.

2.4.2 *Oxyfuel welding*

Oxyfuel welding (OFW) is a group of welding processes that use heat from the combustion of a mixture of oxygen and fuel for welding. Acetylene, methylacetylene-propadiene stabilized (MAPP) gas, propane, natural gas, hydrogen, or propylene may be used. The heat is obtained from the combustion of a combustible gas and oxygen.

OFW welding processes are used with or without filler metal. If filler is not used in the joint, the weld is autogenous. An autogenous weld is a fusion weld made without filler metal.

Oxyacetylene welding is the most commonly used oxyfuel process. Oxyacetylene welding (OAW) is an oxyfuel welding process that uses acetylene as the fuel gas. Because of its flexibility and mobility, oxyacetylene welding is used in all metalworking industries, but is most commonly used for maintenance and repair work.

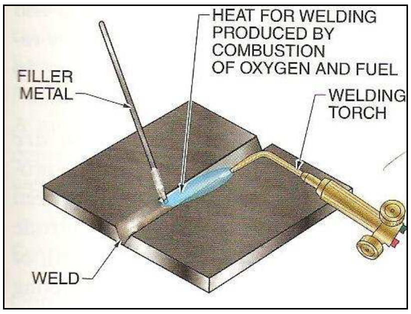

Figure 2.4.2: Oxyfuel Welding (OFW)

2.4.3 *Arc Welding*

Arc Welding (AW) is a group of welding processes that produce coalescence of metals by heating them with an electric arc. The arc is struck between a welding electrode and the base metal. The welding electrode is a component of the welding circuit that terminates at the arc. The joint area is shielded from the atmosphere until it is cool enough to prevent the absorption of harmful impurities from the atmosphere.

AW is the most common method of welding metals. AW processes included metal arc welding (SMAW), gas tungsten arc welding (GTAW), gas metal arc welding (GMAW), flux cored arc welding (FCAW), submerged arc welding (SAW), and plasma arc welding (PAW).

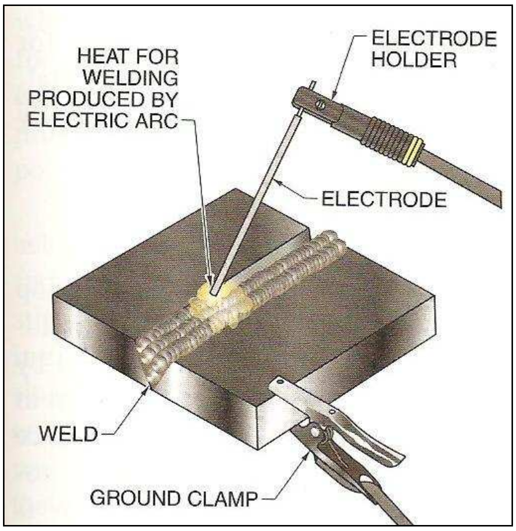

Figure 2.4.3: Arc Welding (AW)

2.4.4 *Shielded Metal Arc welding*

Shielded metal arc welding (SMAW) is an arc welding process in which the arc as shielded by the decomposition of the electrode coating. The electrode is consumed into the weld while providing heat from an electric arc. Variations in composition of the electrode coating allow different applications of the SMAW process.

Common applications of SMAW are in the fabrication of machinery and structural steel for buildings and bridges. SMAW is considered ideal for making storage and pressure vessels as well for production-line products using standard commercial metals. SMAW is also used in repair work and in welding large structures.

2.4.5 *Gas Tungsten Arc Welding*

Gas tungsten arc welding (GTAW) is an arc welding process in which a shielding gas protects the arc between a non-consumable (does not become part of the weld) tungsten electrode and the weld area. GTAW uses a non-consumable tungsten electrode and a shielding gas, usually helium or argon, for welding. The

GTAW process can be used to weld using filler metal, or without filler metal to form an autogenous weld. GTAW is widely used for joining thin-wall tubing and depositing the root pas in pipe joints. GTAW produces a very high-quality weldment.

2.4.6 *Gas Metal Arc Welding*

Gas metal arc welding (GMAW) is an arc welding process that uses an arc between a continuous wire electrode and the weld pool. Argon is used as a shielding gas for non-ferrous metals such as aluminum, and carbon dioxide/carbon dioxide mixtures with argon are used as a shielding gas for steels. The GMAW process uses a continuously fed consumable wire, eliminating the need to stop and change electrodes. This has increased the popularity of GMAW in manufacturing

2.5 JOINT DESIGN AND WELDING TERMS

2.5.1 Welding Terminology

Before proceeding with any welding operation, welders must understand common welding terms. The base metal is the metal or alloy that is to be welded. An electrode is a component of the welding circuit that conducts electrical current to the weld area. Electrodes may be consumable or non-consumable, depending on the welding process. Some electrodes, such as those used in shielded metal arc welding, are covered with a flux coating.

A weld bead is that results from a weld pass. A weld is a single progression of welding along a weld joint. A single pass weld requires only one weld pass. When laying a bead in a multiple-pass weld, each weld pass builds on the previous pass. The movement of the heat source creates ripples as the weld bead is deposited. A ripple is the shape within the deposited bead caused by the movement of the welding heat source. A crater is a depression in the base metal that is made by the welding heat source at the termination of the weld bead. Joint penetration measurement does not include the weld reinforcement measurement. Weld reinforcement is the amount of weld metal in excess of that required to fill the joint. Root reinforcement is reinforcement on the side opposite the one on which welding took place. Face reinforcement is reinforcement on the same side as the welding.

The root face is the portion of the groove face within the joint root. The root opening is the distance between joint members at the root of the weld before welding. The root opening must be accurate so that excess welding is not necessary. Weld width is the distance from toe to toe across the face of the weld. The weld toe is the point where the weld meets the intersection of the base metal and the weld face. The toes are the points where the base metal and weld metal meet. The weld face is the exposed surface of the weld, bounded by the weld toes on the side on which welding was done. The face may be either concave or convex. The weld root is the area where filler metal intersects the base metal and extends the furthest into the weld joint.

The actual throat is the shortest distance from the face of a fillet weld to the weld root after welding. The effective throat is the minimum distance, minus convexity, between the weld face and the weld root. A weld leg is the distance from the joint root to the weld toe. The weld leg is the size of a fillet weld made in lap or T-joints.

Filler metal is metal deposited in a welded, brazed, or soldered joint during the welding process. Fusion welding is welding that uses fusion of the base metal or base metal and filler metal to make a weld. Fusion welding is the most common method of joining metals. Welding progression concern the addition of filler metal in a weld joint root and beyond. A joint root is the portion of a weld joint where joint members are the closest to each other. A joint root may be a point, a line, or an area. A root bead is weld beads that extends into or includes part the entire joint root. A root pass is the initial weld pass that provides complete penetration through the thickness of the joint member. Several weld beads (multiple-pass weld) may be required to complete a weld. A multiple-pass weld contains two or more weld beads.

2.5.2 Weld joints

A weld joint is the physical configuration at the juncture of the work-pieces to be welded. Weld joints must be correctly designed and have adequate root openings to support the loads transferred from one workpiece to another through the welds. The following are some basic considerations in the selection of any weld joint:

- Whether the load will encounter tension, compression, bending, fatigue, or impact stresses.
- How the load is to be applied to the joint, i.e., whether the load is a static, impact, cyclic, or variable load
- The displacement of the load in relation to the joint
- The direction from which the load is to be applied to the joint.
- The cost of preparing the joint.

Weld joint design is based on the strength of the joint, safety requirements, and the service conditions under which the joint must perform. Additionally how stresses are to be applied during service, and whether tension, bending, or torsion is a factor, must be considered in joint design. Joint design requirements vary depending on whether the load is static, cyclic, or variable. Joints are also designed for economy or accessibility during construction and inspection. The five basic weld joints used are:

1- Butt
2- T
3- Lap
4- Corner
5- Edge

2.6 SELECTING ELECTRODES

An electrode is a component of the welding circuit that conducts electrical current to the weld area. When current from a welding machine flows through the circuit to the electrode, an arc is formed between the end of the electrode and the work. The arc melts the electrode coating, electrode metal, and the base metal. The molten metal of the electrode flows into the crater and forms a solidified bond between the two pieces of metal being joined. As the weld solidifies, it forms a slag that shows the cooling rate of the deposited metal.

Electrodes are manufactured to weld different metals, and are also designed specifically for DC or AC welding machines. A few electrodes work equally well on either DC or AC. Electrodes usage also depends on the welding position. Some electrodes are best suited for flat position welding and horizontal fillet welding, while other types may be used in any position.

2.7 MATERIAL SELECTION

Most important to design and manufacture this project is about the selecting of material that will be used it.

When selecting material for products, first consider is their mechanical properties like strength, toughness, hardness, elasticity, fatigue, and creep. The strength-to-weight and stiffness-to-weight ratios of materials are also important. There are three basic crystal structures in metal, body-centered cubic (bcc), face-centered cubic (fcc), and hexagonal close packed (hcp).

An ever-increasing variety of material is now available, each having its own characteristics, applications, advantages, and limitation. The following are the general types of materials used in manufacturing today, either individually or in combination.

2.7.1 Aluminum Characteristics

Aluminium is a soft, durable, lightweight, ductile and malleable metal with appearance ranging from silvery to dull gray, depending on the surface roughness. Aluminium is nonmagnetic and nonsparking. It is also insoluble in alcohol, though it can be soluble in water in certain forms. The yield strength of pure aluminium is 7–11 MPa, while aluminium alloys have yield strengths ranging from 200 MPa to 600 MPa. Aluminium has about one-third the density and stiffness ofsteel. It is easily machined, cast, drawn and extruded.

Corrosion resistance can be excellent due to a thin surface layer of aluminium oxide that forms when the metal is exposed to air, effectively preventing further oxidation. The strongest aluminium alloys are less corrosion resistant due to galvanic reactions with alloyed copper. This corrosion resistance is also often greatly reduced when many aqueous salts are present, particularly in the presence of dissimilar metals.

Aluminium atoms are arranged in a face-centered cubic (fcc) structure. Aluminium has a stacking-fault energy of approximately 200 mJ/m^2.Aluminium is one of the few metals that retain full silvery reflectance in finely powdered form, making it an important component of silver paints. Aluminium mirror finish has the highest reflectance of any metal in the 200–400 nm (UV) and the 3,000–10,000 nm (far IR) regions; in the 400–700 nm visible range it is slightly outperformed by tin and silver and in the 700–3000 (near IR) by silver, gold, and copper.

Aluminium is a good thermal and electrical conductor, having 62% the conductivity of copper. Aluminium is capable of being asuperconductor, with a superconducting critical temperature of 1.2 kelvins and a critical magnetic field of about 100 gauss (10 milliteslas).

2.7.2 Mild Steel Properties

Mild steel is the most common form of steel because its price is relatively low while it provides material properties that are acceptable for many applications. Low carbon steel contains approximately 0.05–0.15% carbon and mild steel contains 0.16–0.29% carbon, therefore it is neither brittle nor ductile. Mild steel has a relatively low tensile strength, but it is cheap and malleable; surface hardness can be increased through carburizing.

It is often used when large quantities of steel are needed, for example as structural steel. The density of mild steel is approximately 7.85 g/cm^3 (0.284 lb/in^3) and the Young's modulusis 210,000 MPa (30,000,000 psi).

Low carbon steels suffer from *yield-point runout* where the material has two yield points. The first yield point (or upper yield point) is higher than the second and the yield drops dramatically after the upper yield point. If a low carbon steel is only stressed to some point between the upper and lower yield point then the surface may develop Lüder bands.

CHAPTER 3

METHODOLOGY

3.1 FLOW PROGRESS OF THE PROJECT

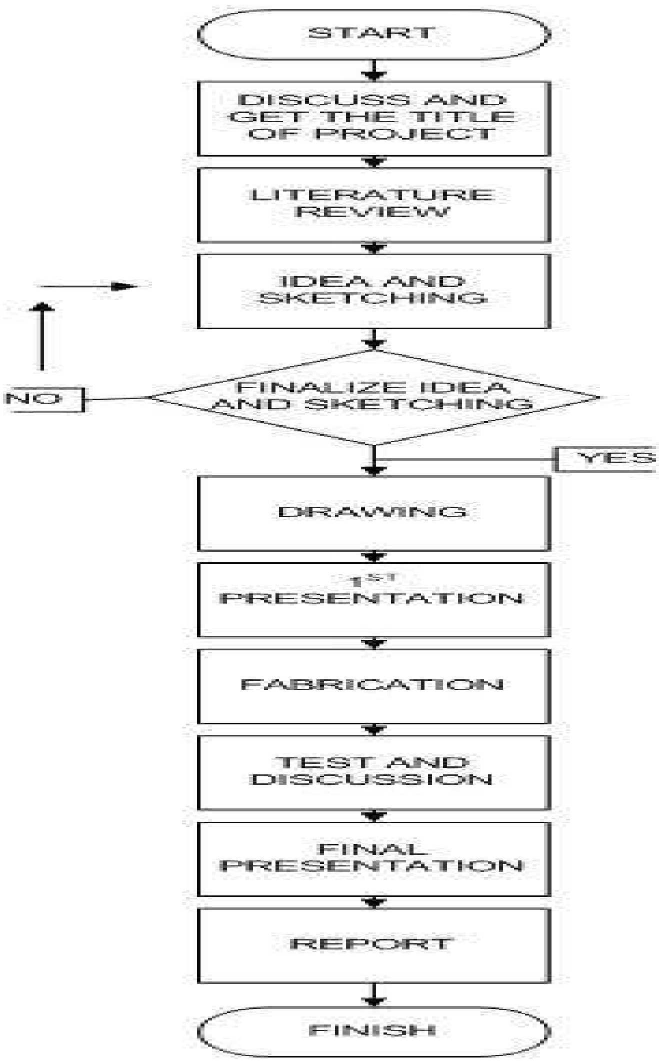

Figure 3.1: Flow Chart

3.2 GANTT CHART / PROJECT SCHEDULE

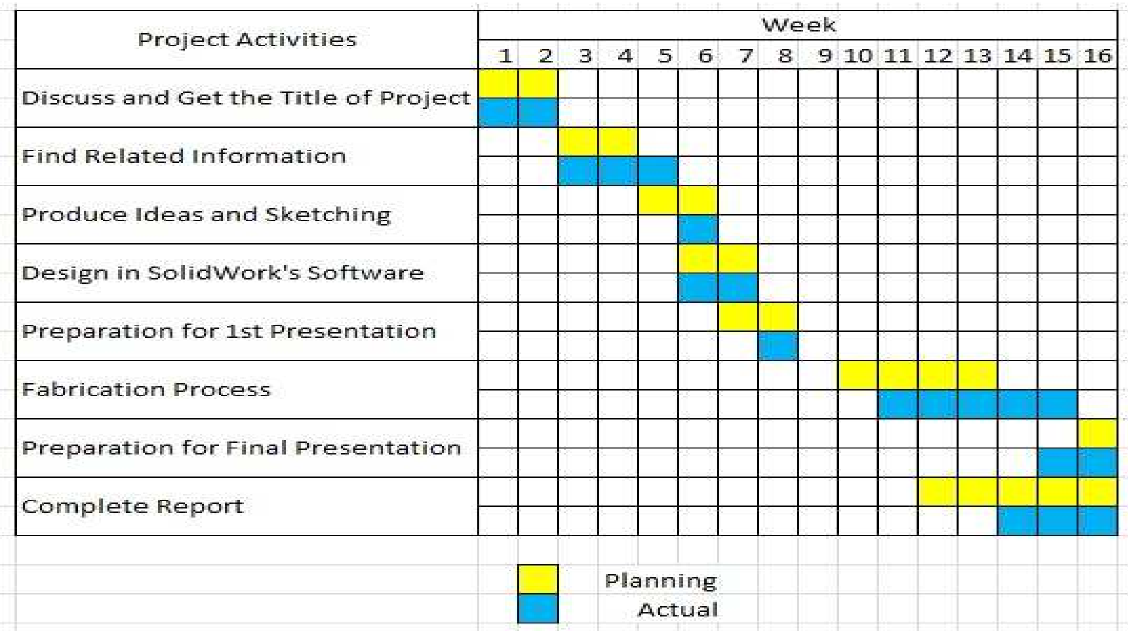

Table 3.2: Project Gantt chart

3.3 INTRODUCTION

In order to obtain a smooth research flow, a research flow chart is drafted. The flow chart is the guidance on how the research is conducted. With helps, ideas and information from supervisor and my own research, all of the processes required to finish the lock are selected. The process started with literature review about the title of my project. Then review current design from sketching or picture on the internet. After that, make the own design to selected. Next, the new design will be discussion with supervisor to make the good decision. Then, all of the parts and equipments are put together to build the umbrella stand in the fabrication process. The entire problem occurs are fixed when the process going back to design. The process continues after everything done and the lock will be presented and demonstration to the panel in final presentation.

3.4 DESIGN

To design a good product, there are several factors must be consider before designing the new product. This factor is concluding all aspect of the principle in the design. The factors are:

1-ergonomic
2-strength
3-material
4-cost
5-environment (suitable)

3.5 CONCEPT AND SELECTION

This method used to make idea how to select best concept. Actually, from sketching the designer can make more idea how to develop creative concept for the product. I have made 4 sketches concept to select the final design concept.

3.5.1 Concept 1

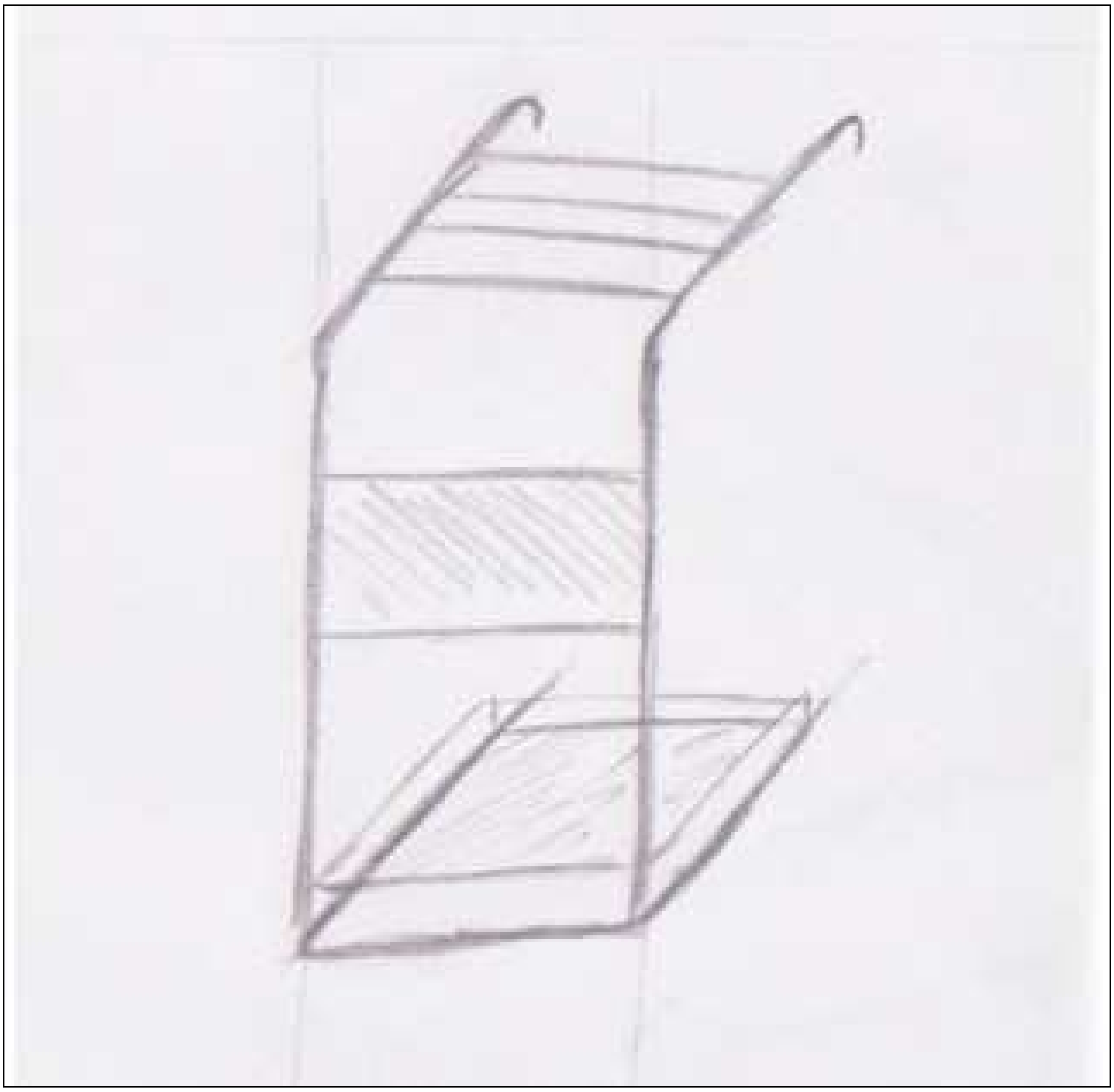

Figure 3.5.1: Sketch Concept 1

This sketch concept have a sleek futuristic. Contain only body frame which allow the flow of air through it. Beside that's, it can easily move to other places as it have simple design and lightweight. Because of it design, it need more time to drain up water droplets as it us only gravity pull to drain water.

3.5.2 Concept 2

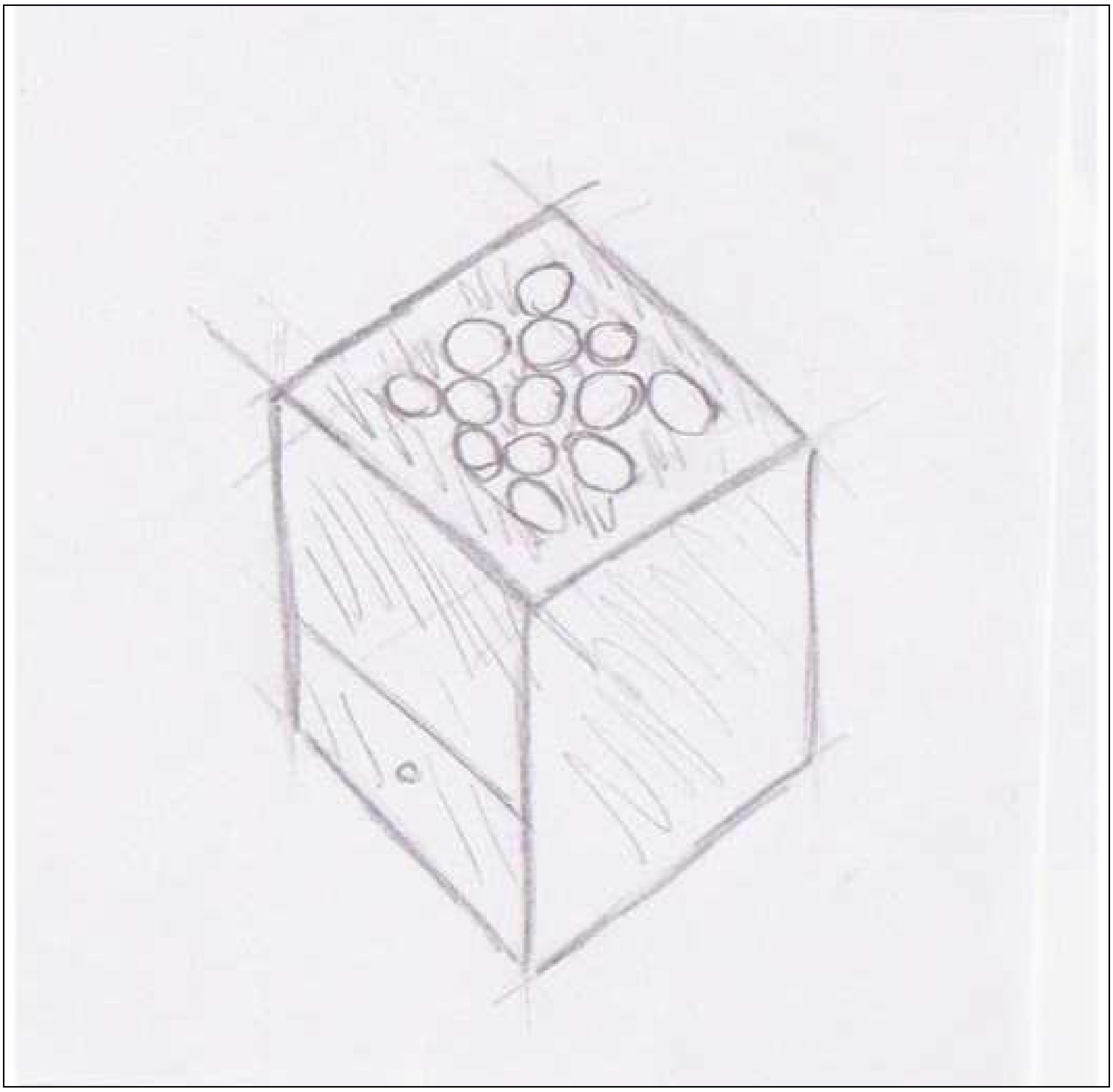

Figure 3.5.2: Sketch Concept 2

This sketch concept look like a box as it contain many hole that can be used to store numbers of wet umbrella at one time. It also has a small dimension which allows it to be stored anyplace and easy to keep. Because of it cube shape, it take longer time to drain up wet umbrella and may cause it to smell.

3.5.3 Concept 3

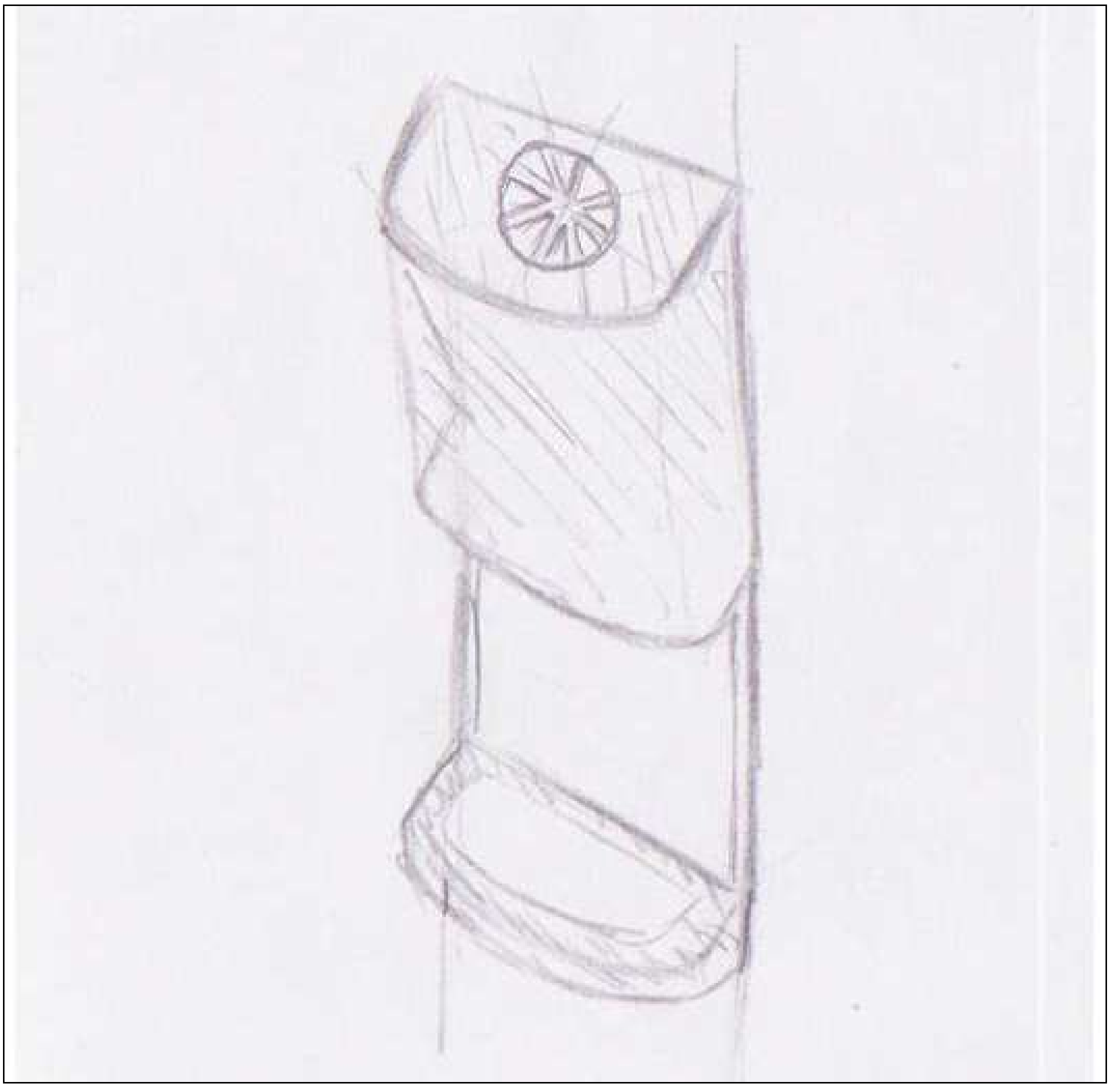

Figure 3.5.3: Sketch Concept 3

This sketch concept use sponge to drain up the water droplets from wet umbrella. It help to reduce time for it to ensure it dry. Beside that's, it have a small dimension which allow it to be store at the corner of the building. Because of it small dimension, it can only be used one at a time.

3.5.4 Concept 4

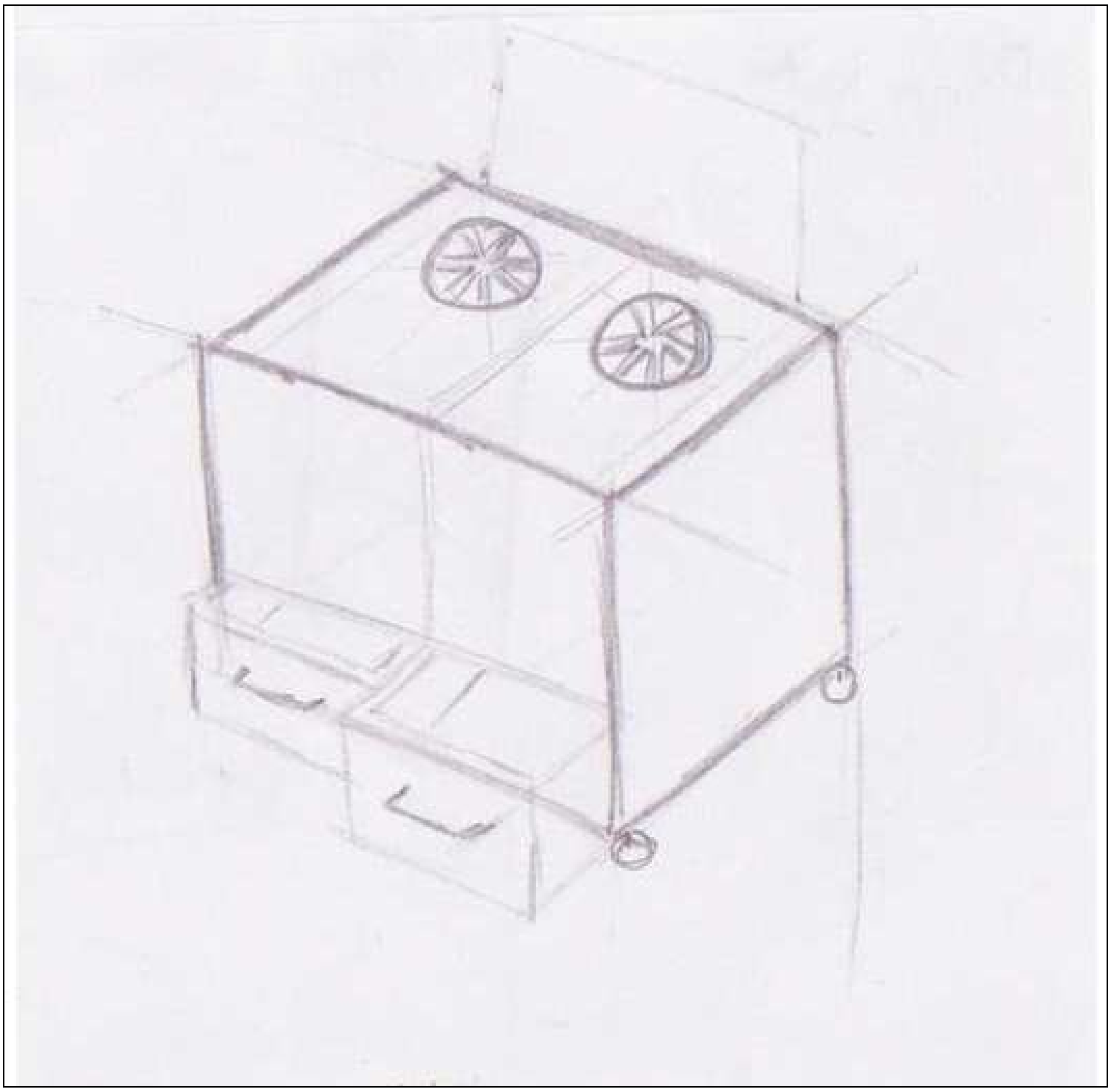

Figure 3.5.4: Sketch Concept 4

This sketch concept was produced by integrating all the advantages of the other concept. It has rollers which allow it to be moved easily and used sponge to absorb the water droplets and minimize the time consumes to dry the wet umbrella. It has two holes that allow two different users to used it at the same time. Because of it, it need a wider space to be store.

3.6 METRIC CHART

For this analysis using the metric chart, it can make the data about to choose what the best concept that can be developed. Below is the data analysis from discussion with 5 people random.

*= not good **= ok ***= not bad ****= good *****= very good

Criteria		CONCEPT			
		1	2	3	4
Aesthetics value		*	**	****	***
Time		*	*	***	****
Portability		**	**	***	*****
Effectiveness		**	*	*****	*****
Suitable cost		****	**	***	**
Suitable design (interesting)		***	*	***	****
Suitable size		**	**	***	***
	Very good	0	0	1	2
	Good	1	0	1	2
	Not bad	1	0	5	2
	Ok	3	4	0	1
	Not good	2	3	0	0
	Ranking	3	4	2	1

Table 3.6: Metric Chart Diagram Analysis

Discussion:

From this chart, I have several concepts to meet. I have chosen concept 1, 2, 3, and 4 I use this chart to classify which concept of umbrella stand have made a good point with my criteria from my objectives project. From my observation and this analysis data, concept 4 locks have met the criteria. This show that this concept of device is a good product although some of it specifications did not made a good marks.

The criteria that used for this table is a generally and commonly criteria for some product. If that can see, for concept 1 until concept 4 the result for very good and good criteria was higher at concept 4. This maybe the concept and design for concept 4 is better than other concept. But it has the good characteristics.

For concept 1, 2 and 3, basically it is the best design. But for the function to absorb moisture, concept 4 is the best. After make the decisions, concept 4 was selected and will be improvement for this project.

3.7 SOLID WORK'S 3D DESIGN

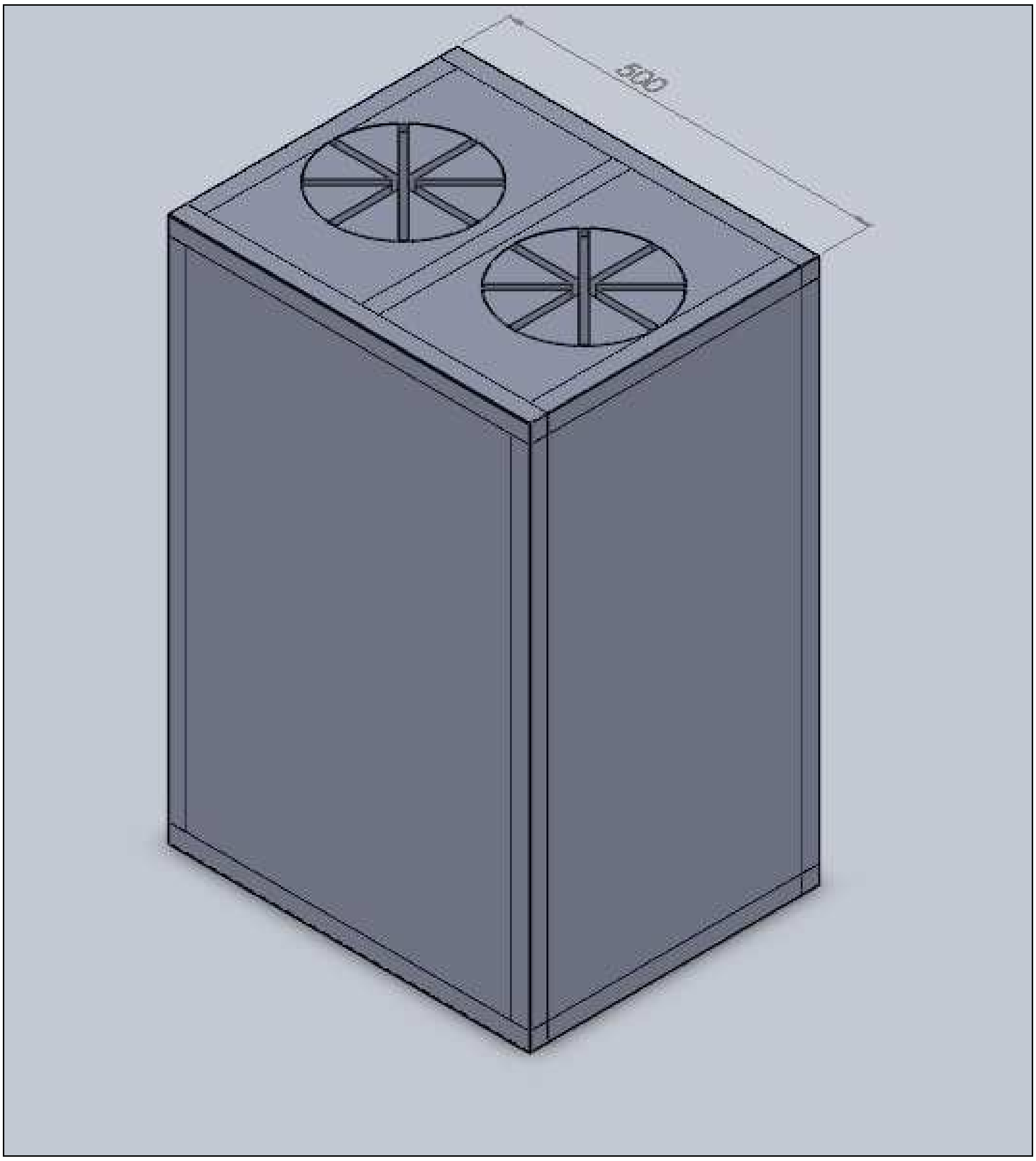

Figure 3.7: Isometric view

3.8 SELECTION OF MATERIALS

The materials that will be used in this project is determined and decided after considering the following factors;

3.8.1 Ease Of Getting The Type Of Materials

The survey is conducted around the mechanical lab and stores in order to find the best suitable materials. After that, some review is done by asking the laboratory coordinator and instructor engineers about the types of materials that available in store.

3.8.2 Easiness of fabricating

Some research on the internet and discussion with supervisor and friends was done to identify whether the materials will be used are suitable with the available machine in the laboratory.

3.9 FABRICATION PROCESS

There are two process are made. First is the process of making the umbrella stand body and second is the process of making the absorbents device.

3.9.1 Fabrication of the Umbrella Stand Body.

i) **Phase 1: Measuring the material**

Figure 3.9.1(a): Measuring the Sheet Metals

The first and very important step is to measure the materials. The material will be measured and marked in order to ease the cutting process. This process is performed by using the measuring tape, pencil and the scriber.

ii) **Phase 2: Cutting the material**

Figure 3.9.1(b): Machine Used To Cut the Metal

After all the material required measured, the next process to be done is cutting the material. The sheet metal and the square hole bar will be cut base on the required desired shape and dimension. The following process will be used to cut those materials are bench saw and shearing machine. The bench saw are used to cut the square hole bar according to the measurement while the shearing machine is used to cut the sheet metal. For the frame, the bench saw is used to cut the square hole bar.

iii) **Phase 3: Welding Process**

Figure 3.9.1(c): Safety Equipment of Welding Process

The square hole bar needs to weld together according to the design and dimension for permanent joint for the frame.

iv) **Phase 4: Drilling and Riveting process**

Figure 3.9.1(d): Drilling and Riveting Process

Drilling and riveting process required to make a hole in marked place and to join the sheet metal with the frame.

v) **Phase 5: Finishing process**

Figure 3.9.1(e): Painted Product

To give protection for the product from corrosion and to make it more attractive, the product was painted.

3.9.2 Fabrication of the Absorbent Device.

i) **Phase 1: Measuring the Absorbent Device Parts.**

The device is divided into three parts. First is the ring. It was made from sheet metal and measured using measuring tape. Second is the sponge. It was measured by using a ruler. Third is the net. This material is measured according to the segments of the absorbent device and the depth of the hole where the umbrella will be inserted into the hole.

ii) **Phase 2: Cutting the material**

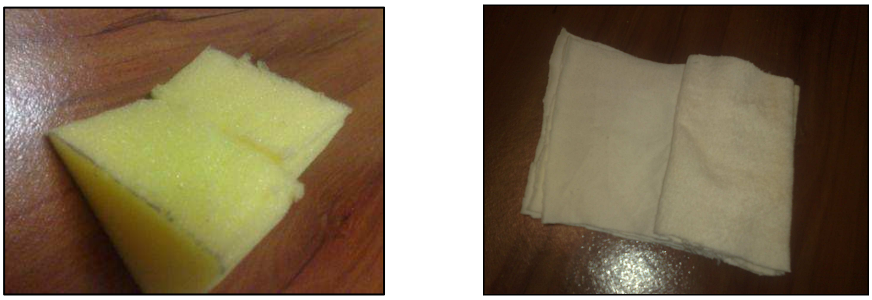

Figure 3.9.2(a): Cut Absorbent Parts

. For the absorbent parts, the knife is used to cut the triangular shape of sponge and shearing machine for the ring. Meanwhile, scissor is used to cut the cloth and net into desired shaped and length.

iii) **Phase 3: Sewing the Absorbent Parts Together**

Figure 3.9.2(b): Sewed Absorbent Device

After cutting process of the absorbent parts, it need to be sew together so that it can be used as an water absorbent for the wet umbrella.

CHAPTER 4

RESULT AND DISCUSSION

4.1 INTRODUCTION

This chapter is show all the result after finished all the fabrication process. For water remover product, the main analysis is about effectiveness of water absorbent and time consume for it. That's why for this chapter, the product was tested on how does it done.

4.2 FUNCTION OF PART

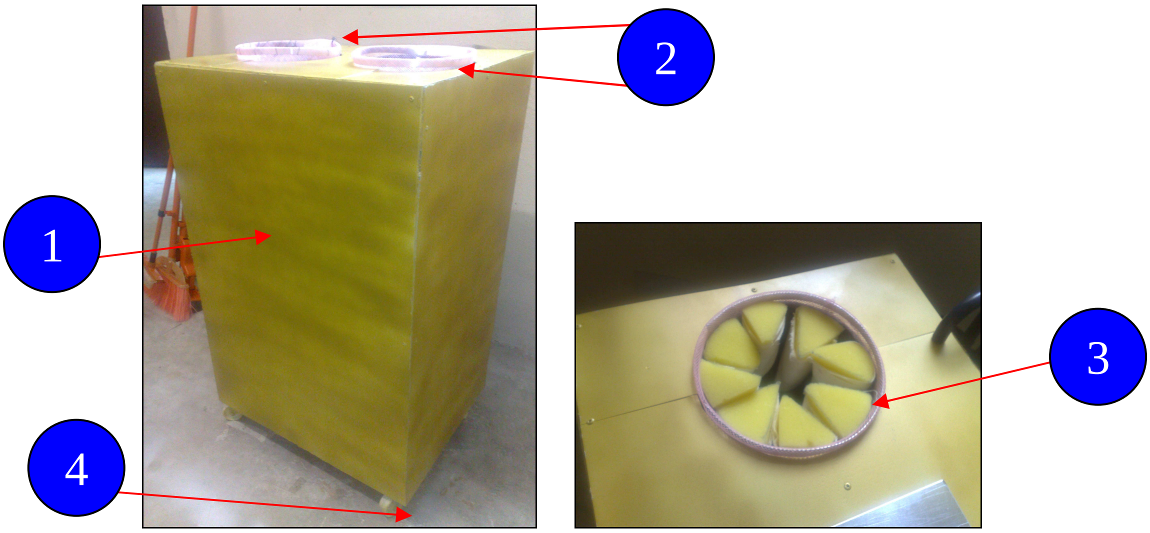

Figure 4.2(a): Product View

No of Parts	Function
1	This is main structure of product. This part is to put the umbrella in
2	Have two hole to give the option to customer which hole that want use
3	Main absorbent for water droplets on umbrella
4	Have four caster wheels for easy movement of the product

Table 4.2: Explanation Table View

Figure 4.2(b): Process on How to Use Product

4.3 TESTING PRODUCT

After finish all process, this product was tested with a wet umbrella. This process was done to conform that this product is achieving the project scopes or not.

4.4 RESULT OF TESTING PROCESS

Test / Result	1	2	3
Time Consume (s)	20	10	6
Number of Trial	10	6	3

Table 4.4: Result and Analysis Data

4.5 DISCUSSION

From the table above, it can be concluded that the moisture the absorbent device, the more effective and less time taken for the dry up the wet umbrella. Also found that the flipage between the umbrella canvas effect the result of the test as it remove the surface contact with absorbent device.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 INTRODUCTION

In this chapter overall project is conclude and some recommendation recognize. These recommendations based on the project ant it use for the study or future development of this project**.**

5.2 CONCLUSION

For this project, it is concluding that my project was succeeding to the objective target. The objective is about:

i) To design and develop a device for removing rainwater from umbrellas, that can easily, effectively and quickly remove water from umbrella that are wet with rain without using energy such as electricity power.

5.3 RECOMMENDATION

The new concept of umbrella dryer needs some improvement to make it much better. For the future study in this project, some recommendation had been identified. The improvement will affect the performance and operation in drying wet umbrellas. The idea to improve the product is to make it reliable in the situation and make it better in performance. The recommendation for the future study on this project is as below:

- Creating an absorbent holder to allow the absorbent to be replace when damage or else
- Improvising the making of absorbent device by choosing a better materials to increase it job

Through these recommendations, the new generation umbrella drier will be improves either at appearance or at the performance itself. The improvement of the product will satisfy its user and compatible with other same product in the current market.

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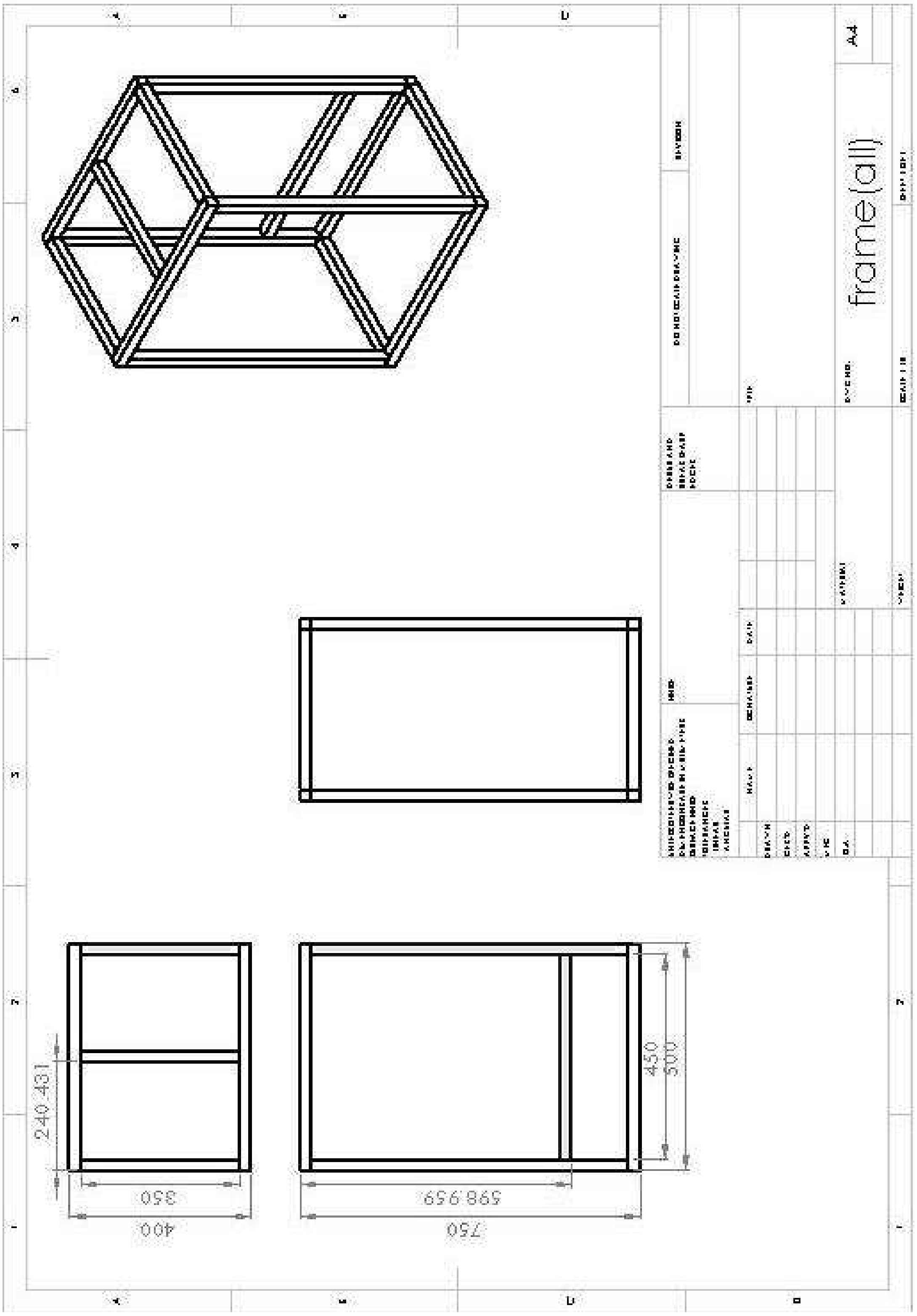
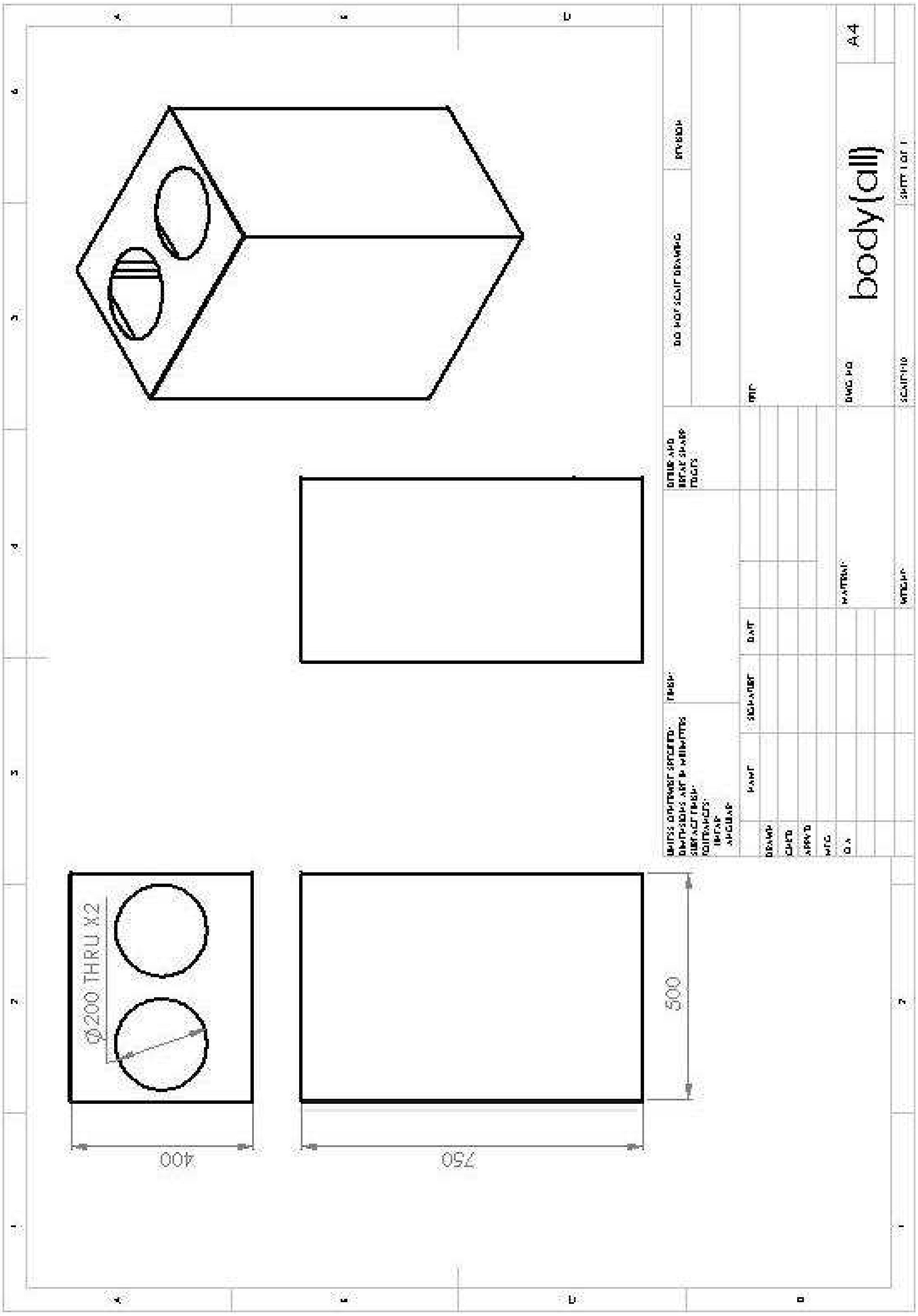
APPENDIX A

Solid Works 2D Drawing



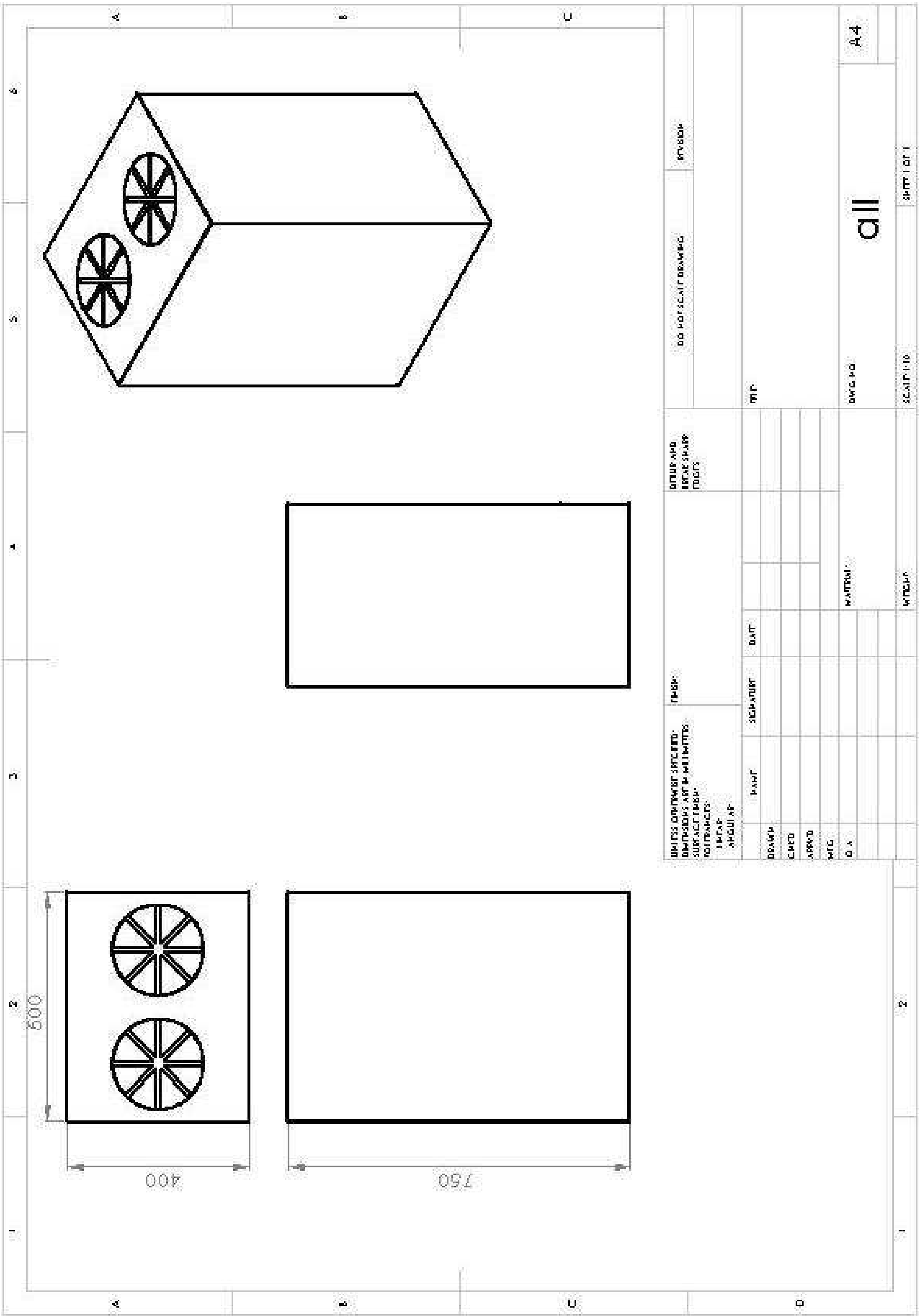
APPENDIX B

Solid Works 2D Drawing



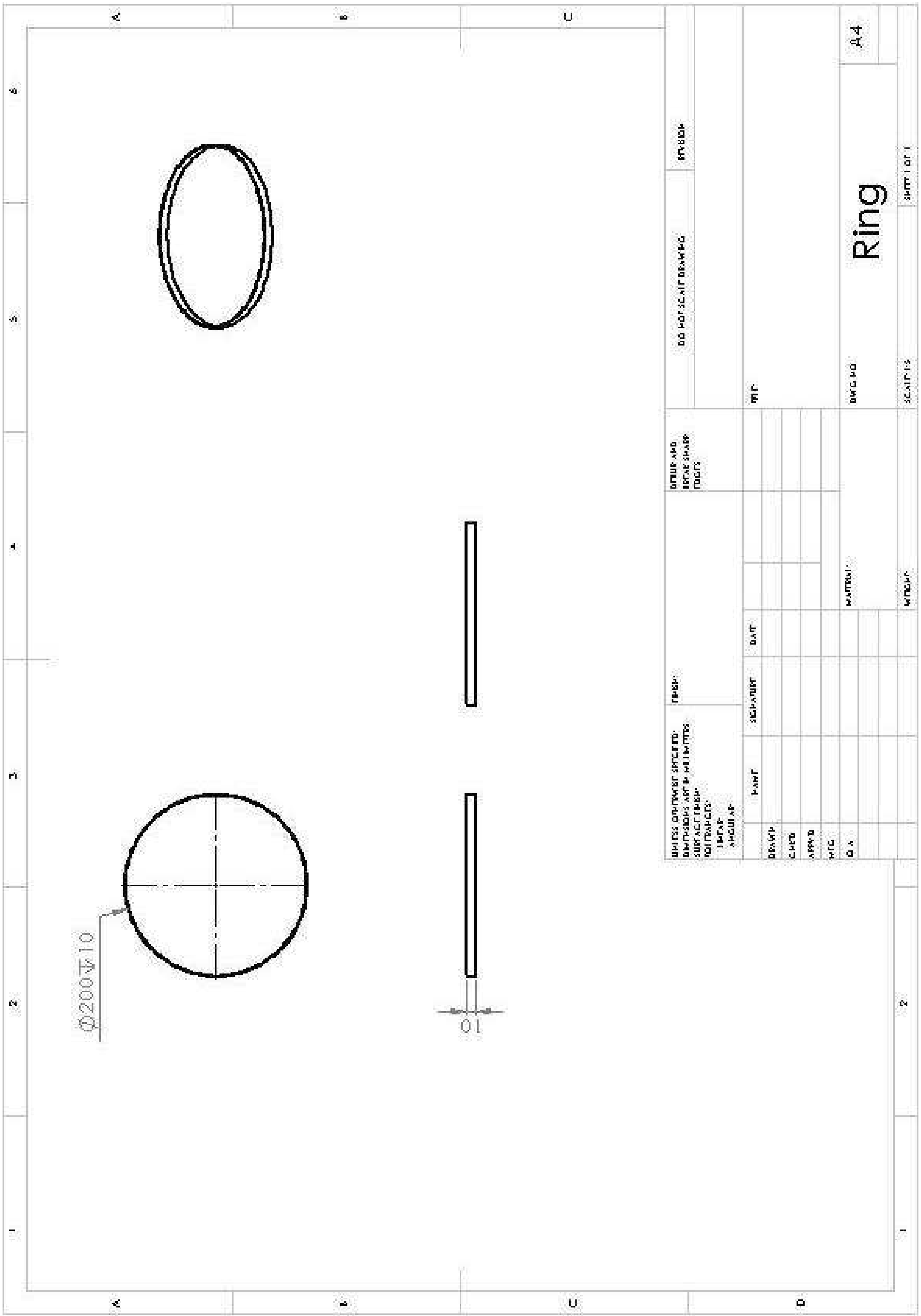
APPENDIX C

Solid Works 2D Drawing



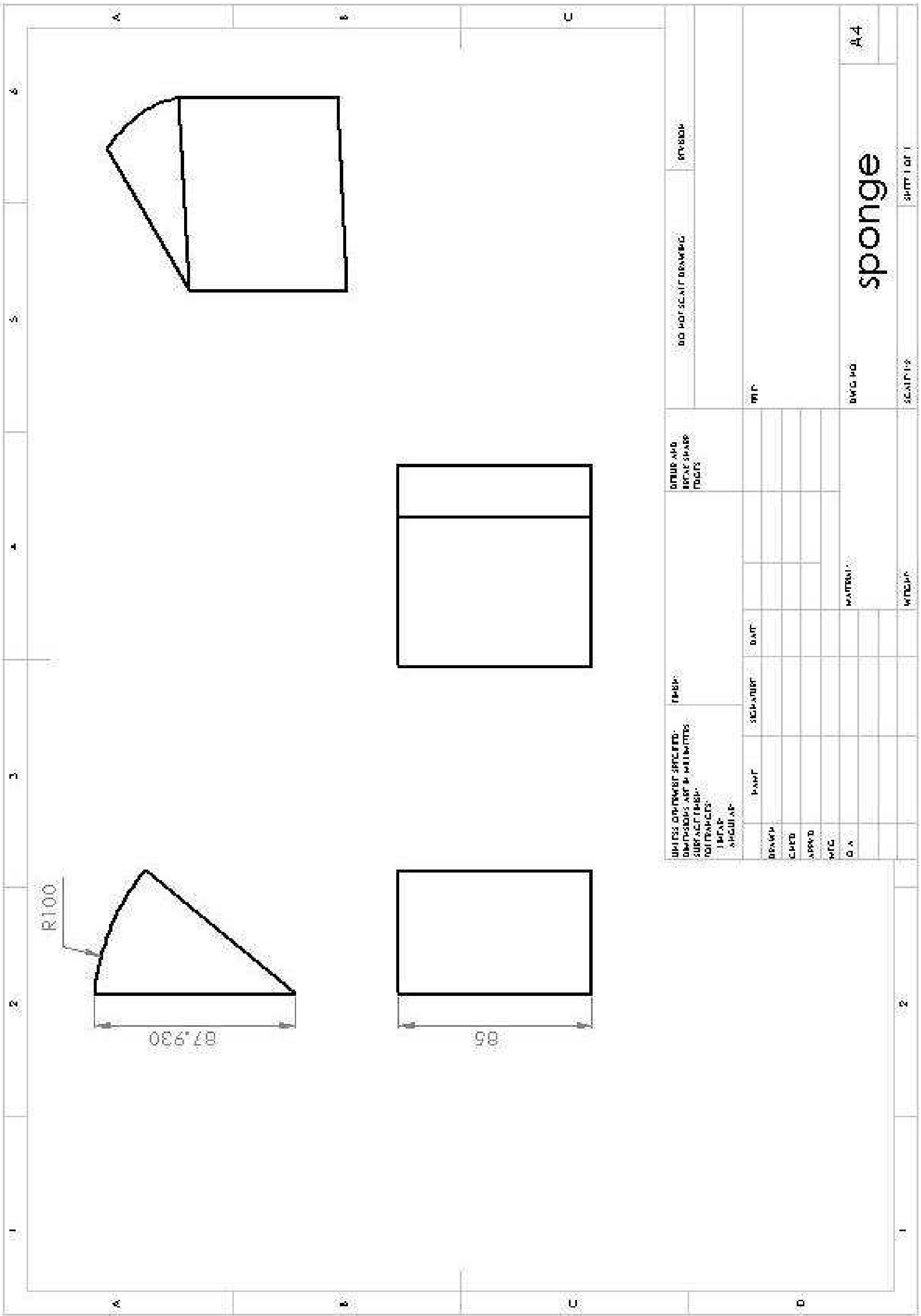
APPENDIX D

Solid Works 2D Drawing



APPENDIX E

Solid Works 2D Drawing



APPENDIX E

Solid Works 2D Drawing