DESIGN AND FABRICATION OF NOTEBOOK TABLE

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ABSTRACT

This report is based on the study about final year project, design and fabrication of notebook table . 'Notebook table' is equipment for laptop user. The fabrication of this product started with surveying in market about the product, specification analysis, concept designing, detail concept designing and fabrication of the product. Four (3) products were selected from the market for the analysis and investigation. One types of the product that suitable and fit all the specification was chosen to fabricate. The investigation was made in scope of the constraint that may occur for the development of the product and relevance of the product manufacturing processes. This product have been fabricate according to engineering method through many fabrication process such as welding, cutting, drilling and assembling. For development of this project and future works, some suggestion was made for upgrading the product. The suggestion like adjustable for height and more durable of the holder to make sure this product will competitive with the existing products in the market.

ABSTRAK

Projek Tahun Akhir ini adalah mengenai "*notebook table*" yang merupakan alat yang digunakan dalam penggunaan computer riba. Proses penghasilan produk telah dimulakan dengan membuat tinjauan terhadap pasaran, penganalisan spesifikasi produk, reka bentuk konsep, reka bentuk kosep yang terperinci, dan penghasilan produk. Terdapat empat (3) produk di pasaran yang dikenal pasti dan di senaraikan untuk tujuan kajian dan analisis. Setelah dianalisis kesemua produk, satu produk yang menepati kesemua spesifikasi yang telah ditetapkan telah dipilih. Kajian di buat dengan melihat kesesuaian produk terhadap proses pengeluaran dan halangan yang timbul seperti ketiadaan bahan serta keadaan mesin di dalam menghasilkan produk ini. Produk ini dihasilkan mengikut cara kejuruteraan seperti mengimpal, memotong, menggerudi dan mencantum. Beberapa cadangan telah dibuat untuk menambahbaik produk tesebut. Diantaranya ialah kaki meja yang boleh dilaras dan bahagian pemegang bagi memudahkan pengguna membawa product ini.Produk ini akan menggunakan bahan yang lebih tahan untuk memastikan produk ini mampu bersaing dengan produk yang sedia ada di pasaran.

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INTRODUCTION

1.1 Project Synopsis

1.1.1 General Project Synopsis

The project involves designing and fabricating the notebook table. This table would be entirely different from existing notebook table that exist in the market. As the diploma final year project allocates the duration of 1 semester, this large man-hour project therefore requires signification efforts of the student to participate. Basically the entire notebook table could be divided into three stages, which are concept review and development, designing and fabrication.

The notebook table is equipped by using all necessary items and method for instance sheet metal, rectangle shape steel L-shape steel and also skill in manufacturing process by perform MIG welding, drilling, cutting and etc. The advantage of this product is adjustable angle, easy to use, durable and safe.

1.1.2 Specific Project Synopsis

These project titles are design and fabricate a notebook table. The characteristic of this product are adjustable high and user friendly for any laptop model. This notebook table produces by L-shape steel, rectangular shape steel and plywood. These product designs using solid work software and fabricate using MIG welding to joining the part produce by steel, and rivet pop for part using sheet metal. Other machine used in fabricate this notebook table is grinding as a function to grind

the material and hand grinding for drilling to get the hole in rivet process. The concept of the notebook table is to upgraded old notebook table to make user friendly when use this notebook table. Characteristic of this notebook table are safe for all person and it also suitable for any person who use notebook.

1.2 Problem Statement

The problems are common to the below that faces by user who use laptop:

a) No exact place for using their laptop.
b) The current design that exist in the market not durable.
c) Furthermore, the existing product in the market does not have interesting features and looking.

1.3 Project scopes

The scope of the project as limited to the below parameter:

a) Design the notebook table using solid work software.

b) Fabrication the notebook table using metal inner gas (MIG) for welding method and rivet pop.

c) Material to be used is L- shape steel, rectangular steel, plywood,cylindrical rod steel and sheet metal.

1.4 Project objective

1.4.1 General Project Objective

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.

1.4.2 Specific Project Objectives

a) To design and fabricate a notebook table using the knowledge gain while studying at mechanical engineering, University Malaysia Pahang.
b) To produce notebook tables that have advantages such as easy to handle, easy to use, and interesting.
c) Decide the best material and method joining to minimize the manufacturing cost.

1.5 Project Planning

This project is begun with made a research and literature review via internet, books, supervisor, and others relevant academic material that related to the title, this literature review takes about a week. The reviews was not stop. It continues along the way of this project because knowledge is so many to learn. First, discussion with supervisor was done and continue with searching the design for notebook table. After searching, decision should be make to choose a design that suitable and relevant to fabricate by diploma student. At the same week, schedule management for this

project was built up. This is done using Gantt chart system. This also takes a week to accomplish.

In the following week, the sketching process is begun. The sketching of a product takes two week. It is include engineering drawing of a system. A4 paper need for manual sketching. This is started with selecting 5 types of notebook table and then identifies the best product from analysis by using concept generation and evaluation.

Drawing process is start after get the best selection from the sketching process. This task scheduled takes several weeks to finish. The drawing is done using Solid work software. It contains the parts of notebook table. The next task is preparation of progress presentation, this tasks takes one more week to be done. On this particular week, preparation for the presentation slide is conducted by guidance of supervisor.

The fabrication process is schedule to takes on the following week because of fabrication process is having a lot of process to be done. The process is scheduled to take about four weeks. The fabrication process is determined from a literature review. The material that will use must be suitable and ease to get. The specification when choosing a material is includes strength, durability and light. This is important for fabrication process.

Evaluation stage has been implemented after fabrication stage. The evaluation is by considering the strength, durability, safety, and workability of the table. During the evaluation, if problem occur such as malfunction, modification will be done to solve the problem. Next task is the final report writing and final presentation preparation. This take about one week to accomplished. The report is guided by UMP thesis writing guided and also the guidance of the supervisor. All the task is scheduled to take about fourteen week overall.

1.5.1 Gantt Chart

Table 1.1: Gantt chart

Project Activities	Weeks														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Literature Review															
Design & Measurement consideration															
Acquisition & Material preparation															
Methodology study															
Fabrication															
Evaluation & Improvement															
Report writing															
Presentation															

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The new notebook table is designed friendly user for laptop user. It is also light in weight with interesting looking. Nowadays the notebook table is among the important thing in market demand because the notebook table is needed in the business sectors. In market, the notebook tables have variety shape and produced by difference material.

The notebook table rack commonly produces by steel, sheet metal and etc. This items chosen because strength, light in weight, easy to fabricate, long life and etc. The notebook table also commonly fabricates using welding method such as MIG welding to joining part using steel and rivet pop to join steel with sheet metal. This method chosen because can produce the stiff notebook table, clean and interesting.

2.2 Paper Review

2.2.1 Houses

-This notebook table always has been use at the house.

2.2.2 Offices

-In many offices, the notebook table is compulsory furniture for the staffs.

2.2.3 Educational Center

-These notebook tables have been use widely at many educational centers. .....These notebook table use by the lecturers and students.

2.3 Technical review

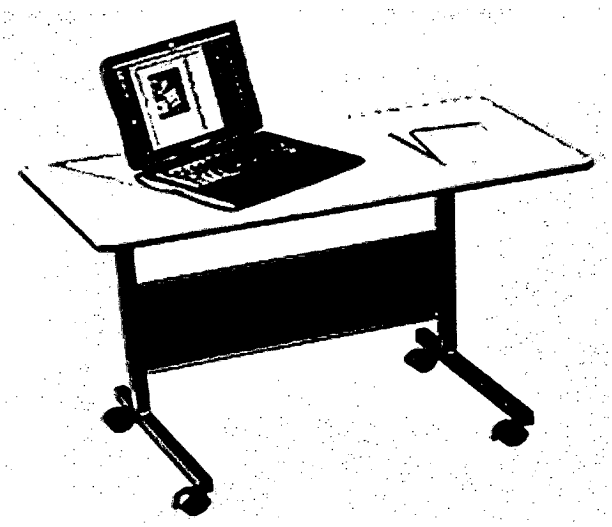

Figure 2.1: Notebook desk

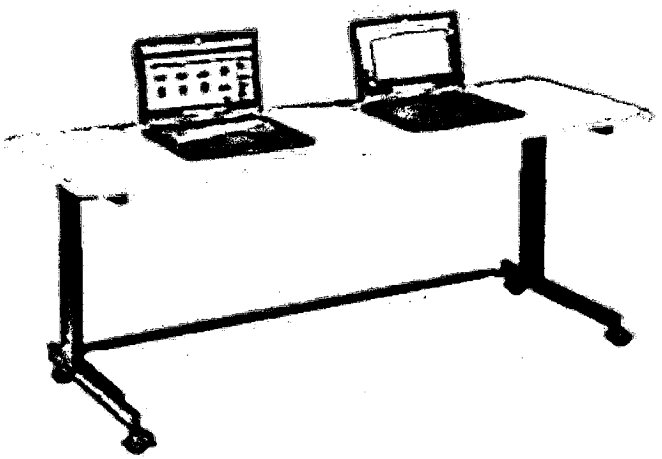

Figure 2.2: Laptop training table

Figure 2.3: Portable desk top

2.4 Basic Part

2.2.1 Frame

The chassis of this notebook table produces by using rectangular steel.

2.2.2 Table Surface

The table surface produces by using the plywood.

2.2.3 Cover of Body

The cover of body produces by sheet metal.

2.2.4 Pocket

The pocket of this notebook table produces by using sheet metal.

2.5 Joining Method of Welding Process

2.5.1 Basic Theory of Metal Inert Gas (MIG) Welding

This clothesline will be joined by using the permanent joint which is welding process. The method joining that be able to fabricate and assembled the frame is Metal Inert Gas (MIG) Welding.

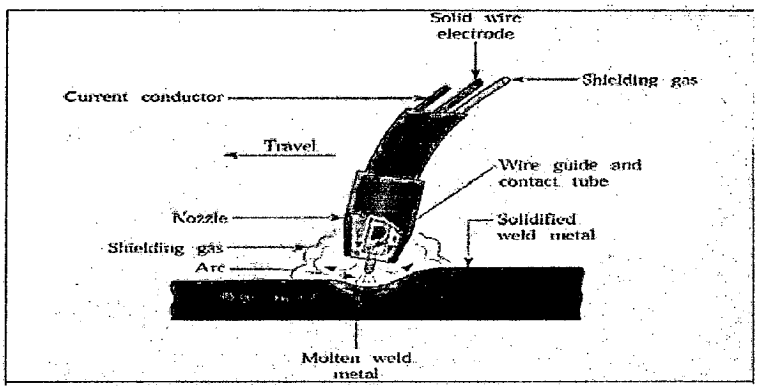

Figure 2.4: Basic structure of metal inert gas (MIG) welding

Metal Inert Gas (MIG) Welding: An arc is struck between a consumable electrode and the sheet metal to be welded. The consumable electrode is in the form of continuous filler metal. An inert gas surrounds the arc and shields it from the ambient to prevent oxidation. Carbon steels, low alloy steels, stainless steels, most aluminum alloys, zinc based copper alloys can be welded using this process.

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. The shielding gas, forms the arc plasma, stabilizes the arc on the metal being welded, shields the arc and molten weld pool, and allows smooth transfer of metal from the weld wire to the molten weld pool. There are three primary metal transfer modes which are spray transfer, globular transfer and short circuiting transfer.

2.5.1.1 The Advantages of MIG Welding

- High productivity, because based on this machine the consumer no need to stop their work to change rods or chip and brush the weld frequently.
- Easy to learn and makes great-looking welds.
- Can weld on stainless steel, mild steel, and aluminium.
- This welding process also can be weld in all positions.

2.5.1.2 The Disadvantages of MIG Welding

- Can not check watch, count money, smoke cigarette, or talk to buddy as often.
- Costs money of consumable, such as tips and nozzles.
- Is not worth a dang on paint, rust, or dirty surfaces.
- No good for thick steel, because it does not get the proper penetration.

2.5.2 Welding Gun and Wire Feed Unit

The Figure 2.5 shown the basic structure on the nozzle of the MIG welding.

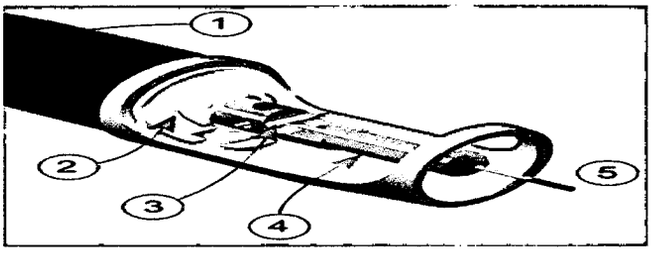

Figure 2.5: GMAW torch nozzle cutaway image
(1) Torch handle,**(2)** Molded phenolic dielectric (shown in white) and threaded metal nut insert (yellow),**(3)** Shielding gas nozzle,**(4)** Contact tip **(5)** Nozzle output face.

2.5.3 Process of MIG Welding

In spray transfer, small, molten metal droplets from the electrode are transfer to the weld area at a rate of several hundred droplets per second. The transfer is spatter-free and very stable. High Direct Current (DC) and voltages and large-diameter electrodes are used with argon or argon-rich gas mixture used as the shielding gas. The average current required in this process can be reduced by using a pulsed arc, which superimposes high-amplitude pulses onto a low, steady current. The process can use in all welding positions.

In globular transfer, carbon-dioxide-rich gases are utilized, and globules are propelled by the forces of the electric-arc transfer of the metal, resulting in considerable spatter. High welding currents are used, making it possible for greater weld penetration and higher welding speed than are achieved in spray transfer. Heavier sections commonly are joined by this method.

In short circuiting, the metal is transferred in individual droplets (more than 50 per second), as the electrode tip touches the molten weld metal and short circuits. Low currents and voltages are utilized with carbon-dioxide-rich gases and electrodes made of small-diameter wire. The power required is about 2 kW.

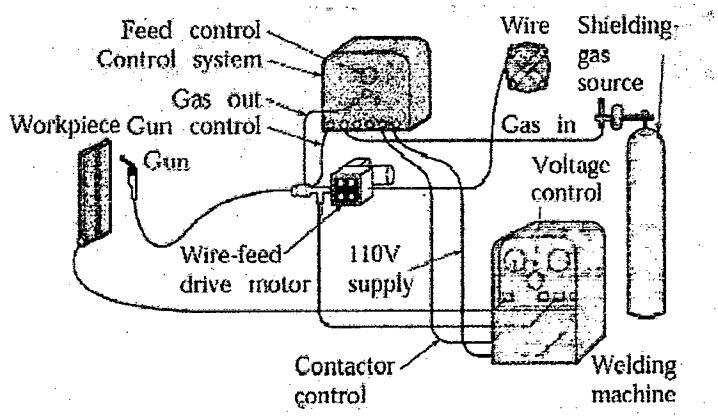

Figure 2.6: Basic equipment used in MIG operations

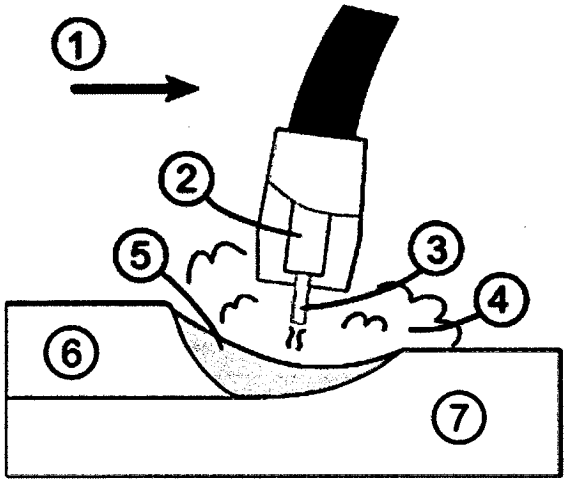

Figure 2.7: GMAW weld area
(1) Direction of travel, **(2)** Contact tube, **(3)** Electrode, **(4)** Shielding gas, **(5)** Molten weld metal, **(6)** Solidified weld metal, **(7)** Work piece.

In most of its applications, gas metal arc welding is a fairly simple welding process to learn, requiring no more than several days to master basic welding technique. Even when welding is performed by well-trained operators, however, weld quality can fluctuate, since it depends on a number of external factors. And all GMAW is dangerous, though perhaps less so than some other welding methods, such as shielded metal arc welding.

2.6 Rivet

2.6.1 Introduction

A rivet is a mechanical fastener. Before it is installed it consists of a smooth cylindrical shaft with a head on one end. The end opposite the head is called the buck-tail. On installation the rivet is placed in a pre-drilled hole. Then the tail is "upset" (i.e. deformed) so that it expands to about 1.5 times the original shaft diameter and holds the rivet in place. To distinguish between the two ends of the rivet, the original head is called the factory head and the deformed end is called the

buck-tail. Because there is effectively a head on each end of an installed rivet it can support tension loads (loads parallel to the axis of the shaft); however, it is much mre capable of supporting shear loads (loads perpendicular to the axis of the shaft). Bolts and screws are better suited for tension applications. Fastenings used in traditional wooden boat building like copper nails and clinch bolts work on the principle of the rivet but they were in use long before the term rivet was invented. So, where they are remembered, they are usually classified among the nails and bolts respectively.

2.6.2 Solid Rivet

Solid rivets are one of the oldest and most reliable types of fasteners, having been found in archaeological findings dating back to the Bronze Age. Solid rivets consist simply of a shaft and head which are deformed with a hammer or rivet gun.

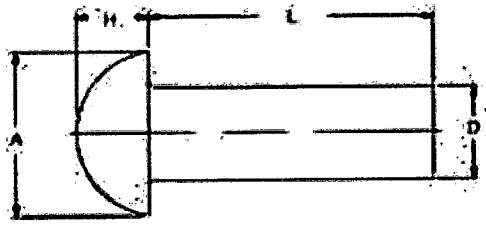

Figure 2.8: A typical technical drawing of a universal head solid rivet

Solid rivets are used today in applications where reliability and safety count. A typical application for solid rivets can be found within the structural parts of aircraft. Hundreds of thousands of solid rivets are used to assemble the frame of a modern aircraft. Such solid rivets come with rounded (universal) or countersunk heads. Typical materials for aircraft rivets are aluminum alloys (2017,2024, 2117, 7050, 5056,55000,V-65), titanium, and nickel based alloys. Steel rivets can be found in static structures such as bridges, cranes, and building frames.The setting of these

fasteners requires access to both sides of a structure. Solid rivets are driven using a hydraulically, pneumatically, or electromagnetically driven squeezing tool or even hand held hammers. Applications in which only one side is available require the use of blind rivets.

2.6.3 Blind Rivet

Blind rivets (also known as Pop Rivets) are tubular and are supplied with a mandrel through the center. The rivet assembly is inserted into a hole drilled through the parts to be joined and a specially designed tool used to draw the mandrel into the rivet. This expands the blind end of the rivet and the mandrel snaps. This gives the rivets their common name of pop rivet. Blind rivets are often avoided for critical structural joints because they generally have less load carrying capability than solid rivets. Furthermore, because of the mandrel they are more prone to failure from corrosion and vibration. A blind rivet consists of the rivet body and the setting device or the mandrel (sometimes called the nail or stem).

Prior to the adoption of blind rivets, installation of a solid rivet typically required two assemblers: one person with a rivet hammer on one side and a second person with a bucking bar on the other side. Seeking an alternative, inventors such as Carl Cherry and Lou Huck experimented with other techniques for expanding solid rivets. Unlike solid rivets, blind rivets can be inserted and fully installed in a joint from only one side of a part or structure, "blind" to the opposite side.

Due to this feature, blind rivets are mainly used when access to the joint is only available from one side. The rivet is placed in a pre-drilled hole and is set by pulling the mandrel head into the rivet body, expanding the rivet body and causing it to flare against the reverse side. As the head of the mandrel reaches the face of the blind side material, the pulling force is resisted, and at a predetermined force, the mandrel will snap at the break point of the mandrel. A tight joint formed by the rivet body remains, the head of the mandrel remains encapsulated at the blind side, although variations of this are available, and the mandrel stem is ejected.

The rivet body is normally manufactured from one of three methods:

- Wire, the most common method
- Tube, common in longer lengths, not normally as strong as wire
- Sheet, least popular and generally the weakest option.

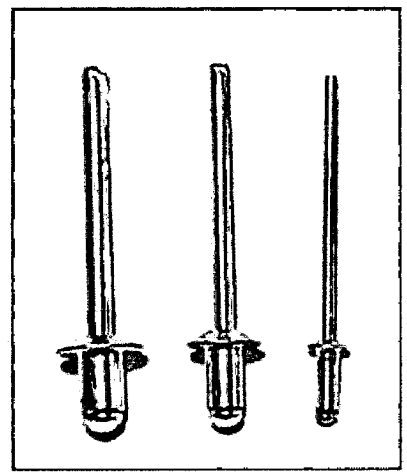

Figure 2.9: Three aluminum blind rivets: 1/8", 3/32", and 1/16"

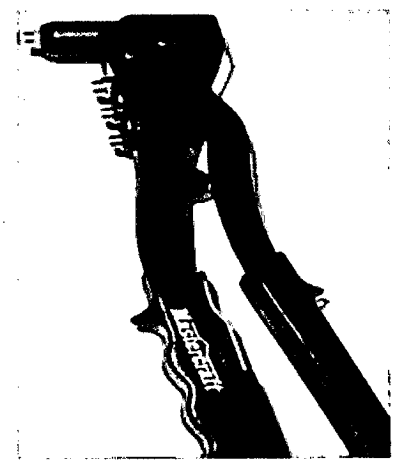

Figure 2.10: A blind riveting tool