DESIGN AND FABRICATION OF FOLDABLE MAGAZINE RACK

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ABSTRACT

This thesis is based on the project of designing and fabricating a foldable magazine rack. The 'Foldable Magazine Rack' is a product that is used for storing magazines and newspapers in a tidy manner. The fabrication of this product started with surveying in the market about the product, specification analysis, concept designing, detailed concept designing and fabrication of the product. Four (4) products were selected from the market for the analysis and investigation. One of the products that is suitable and fits all the specification was chosen to fabricate. The investigation was made in scope of the constraints that may occur for the development of the product and the relevance of the product manufacturing processes. This product has been fabricated according to basic manufacturing methods through many fabrication processes such as cutting, drilling, bending, and assembling. For the development of this project in future works, some suggestion was made for upgrading the product. The suggestions are designing a larger base to make it more stable and use a more durable material to make sure this product will be competitive with the existing products in the market.

ABSTRAK

Projek Tahun Akhir ini adalah mengenai "Foldable Magazine Rack" yang merupakan alat yang digunakan untuk menyimpan majalah dan surat khabar dengan tersusun dan kemas. Proses penghasilan produk telah dimulakan dengan membuat tinjauan terhadap pasaran mengenai produk, analisis mengenai spesifikasi produk, reka bentuk konsep, reka bentuk konsep yang terperinci, dan penghasilan produk. ini. Terdapat empat (4) produk di pasaran yang di kenal pasti dan di senaraikan untuk tujuan kajian dan analisis. Setelah dianalisi kesemua produk, satu prouk yang menepati ke semua spesifikasi yang telah ditetepkan telah dipilih. Kajian dibuat dengan melihat kesesuaian produk terhadap proses pengeluaran dan halangan yang akan timbul seperti ketiadaan bahan mentah serta keadaan mesin yang akan digunakan di dalam penghasilan produk ini. Produk ini dihasilkan mengikut asa fabrikasi seperti memotong, menggerudi, membengkok dan memasang. Beberapa cadangan telah di buat untuk menambahbaik produk ini. Diantaranya ialah meluaskan tapak produk supaya lebih stabil dan menggunakan bahan mentah yang lebi teguh supaya produk lebih tegap 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 final year project is one of the subjects for student in Diploma of Mechanical Engineering in University Malaysia Pahang. This project involves designing and fabricating a product. The product should be innovative and useful. As the Diploma final year project allocates the duration of 1 semester, this project requires significant efforts of the students to participate. Basically the entire procedure of this project could be divided into 3 stages, which are concept review and development, designing and fabrication.

1.1.2 Specific Project Synopsis

The project is about Foldable Magazine Rack. This project involves the designing and fabrication of a Foldable Magazine Rack. This project also involves the analysis of the Foldable Magazine Rack developed earlier with concerns regarding strength, material and cost. Modifications are required to produce an outstanding Foldable Magazine Rack that exists in the market. After that, testing is needed to be done to make sure the Foldable Magazine Rack is functional and to determine the strength of the rack. Overall, the project will meet acquire skills of design, analysis and fabrication.

1.2 Project Problem Statement

According to the market, most magazine racks nowadays are not flexible. There are no spaces for separating the magazines, as in sizes. Also, current designs are not user-friendly and very complicated, making it hard to store the magazines. The materials used for magazine racks are usually made out of wood and rattan which are both not durable and are not water resistant. Versatility is very important nowadays, but magazine racks in the current market usually have specific use either only for office use or for home.

1.3 Project Objectives

The purpose of this project is to train the students that have been gathered before in solving problem using academic research and also to gain knowledge and skills. This project is important to train and increase the student capability of practicing the right way to do research, data gathering and then problem solving. The project will also generate students that are capable to make a good research report in thesis form or technical writing. This project also can help train student to be capable of doing work with minimum supervision and more independent in searching and expanding the experiences and knowledge. The main objectives of this project are:

i. Design a magazine rack which has enough space for magazines and newspapers.
ii. Design a magazine rack that is suitable for home and office or versatile.
iii. The product is foldable and easy to be stored.
iv. Minimize the cost of producing the magazine rack by using less material but durable.
v. Fabricate a magazine rack which has aesthetic value as a desired product in the market.

1.4 Project Scopes

This product has several specifications and features. The scopes of the product are:

(i) Designing the rack using solidworks program to visualize the actual size and the suitable material that should be used.

(ii) This rack will be designed using auto-Cad and then will be transferred to a turret punch machine for punching process.

(iii) The product will be very easy to handle and easy to be stored.

(iv) Fabricating the product using basic fabricating methods.

1.5 Project Hypotheses

The Foldable Magazine Rack must have enough space for magazines, newspapers and also portable. In this case, foldable is the answer. Foldable here means the rack can transformed from big to small and from small to be big. This rack has three shelves for magazine and one for newspapers. The design of the rack will make it suitable for anywhere use.

1.6 Project Schedule

Table 1.1: Gantt Chart

Scope	Weeks															
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
Literature Study																
Design & Measurement Consideration																
Acquisition & Material Preparation																
Methodology Study																
Fabrication																
Evaluation & Improvement																
Report Writing																
Presentation																

Planning Progress

Actual Progress

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Magazine rack is a form of furniture composed of a horizontal surface supported by a base. Magazine racks are intended for keeping magazines organized .It is also designed as a part of interior design apparatus to make our periodicals neat and tidy.Some magazine rack have a lot of slot, while others have only one slot. Magazine rack comes in a wide variety of shapes, height, and materials, depending on their origin, style, and intended use. Magazine rack can be freestanding or designed for placement against a wall. Magazine rack can be in virtually any shape, for example, rectangular, square, wire construction, or cylindrical. There is variety of magazine rack which has two legs, three legs and so on. Some racks has wheels so that it is easy to be moved .Others have high quality wood surface,rattan, high quality steel and even plastic for personal use.The basic material used at the early of rack fabrication overall source a wooden as a material. The wooden is still used as the important source for nowadays rack fabrication but it was known as plywood which have more toughness and strength compared with usual wood. Steel and plastic usually used as magazine rack material that make the rack more toughness in stacking although applying over load, lightweight yet strong, portable , and durable.

2.2 Product Review

2.2.1 Kikkerland Adjustable Magazine Rack

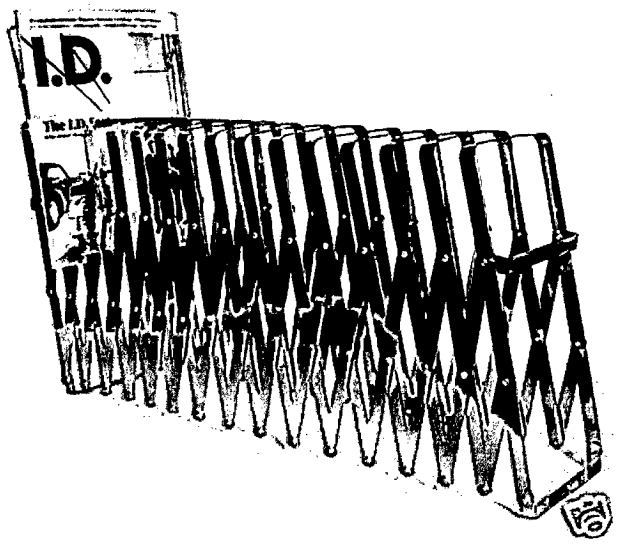

Figure 2.1: Kikkerland Adjustable Magazine Rack

The magazine rack shown above is an adjustable magazine rack that could be either wall mounted or free standing. This product could be expanded up to 5 feet. The material used to fabricate this product is chromed steel. This product is 13 inches high and 14 inches deep.

The advantages of this product is it could be either wall mounted or free standing, and it could also be expanded up to 5 feet. The disadvantages of the product are that the design could cause injury to users and also damage the magazine.

2.2.2 Floor Magazine Rack

Figure 2.2: Floor Magazine Rack

The magazine rack above is a design which has three pockets for magazine storage. The Floor Magazine Rack is a magazine rack that could be folded to be stored when not in use. Materials that are used in this magazine rack are a folding wood frame and cotton canvas for where the magazines are stored. This wooden magazine rack is 23 inches high, 14 inches wide and 11 inches deep.

The advantages of this magazine rack is it is lightweight and cheap, but, it is hard to maintain because the canvas has to be wash clean and the rack is less durable.

2.2.3 News Magazine Rack

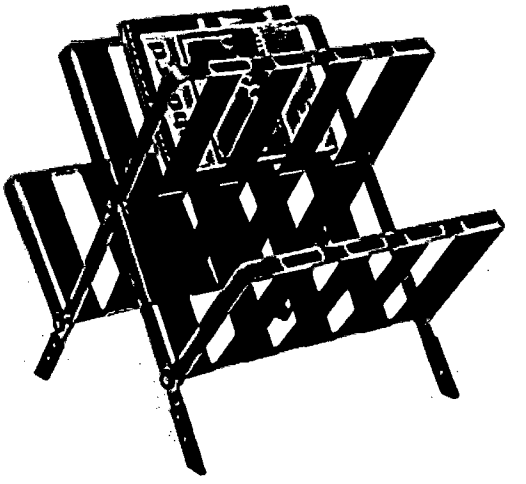

Figure 2.3: News Magazine Rack

The product shown above is a foldable magazine rack designed by News. It has an aluminum frame and supports in matt black or in colored translucent polypropylene.

This magazine rack has four separated space for storing magazines and also, it is light weight and compact therefore making it portable. The disadvantages of this product are it is too expensive and it does not have space for newspapers.

2.2.4 Fold Magazine Rack

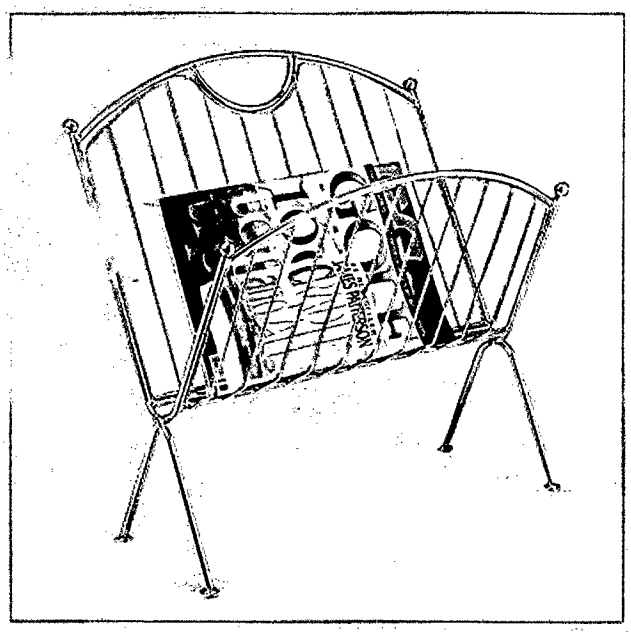

Figure 2.4: Fold Magazine Rack

The product shown above is a foldable magazine rack that has a sleek style with a euro design. It has a chrome metal finish with the height of 17.5 inches, width of 12.5 inches and the depth of 18 inches. Although this product is lightweight and portable, it only has one space for magazines and it is also less durable.

2.3 Press Break Machine

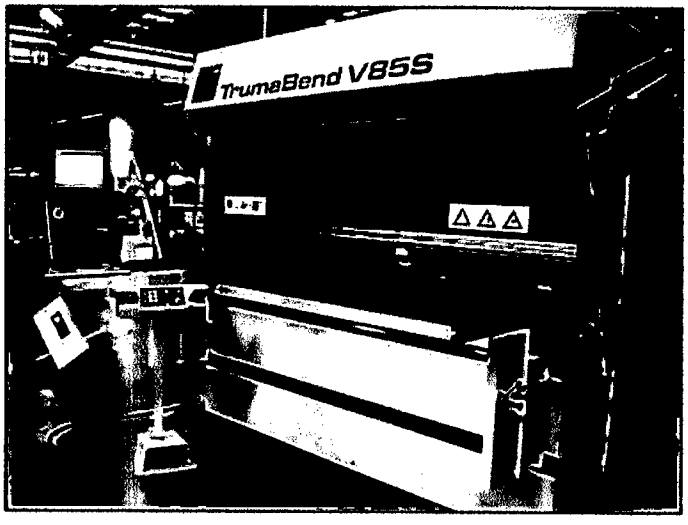

Figure 2.5: CNC Press Break Machine

The Truma Bend V Series above is manufactured by TrumpF .This LQN / LNW model has 007for its SOP number .The main function of TrumaBend Machine of V series is as a CNC controller.

Press brakes and bending machines are used to bend and fold metal by pressing it into a die. There are several types of press brakes and bending machines. Examples include a hydraulic press brake, folding equipment, bending machine, press brake tooling, CNC brake press, and a sheet metal press brake. A hydraulic press brake is designed for both specialized sheet metal work and continuous production applications. A hydraulic press brake is designed to handle tough industrial production jobs from single-cycle operations to automated cell components. Folding equipment can be used to stiffen new metal panels that would otherwise flap around, and to put lips on pieces of sheet that would normally need screws passed through the front face. A bending machine forms angles in sheet metal. Press brake tooling is used in cold-forming metal sheets or strips into desired sections. A CNC brake press is a computer numerically controlled, fully automated brake press with extensive bending capacity and networking function. A sheet metal press brake is used to bend.

Specification for CNC bending;

i. Material - most ductile metals.
ii. Alternative machines - none.
iii. Tooling - CNC Bending requires only software program tooling. Intricate designs may require custom tooling to shape your part.
iv. Reducing costs - reduce the number of bends used in your design. Design parts to pack efficiently. For example, in designing a large box consider making the sides of the box separate with bolted flanges. Avoid complex bend combinations. You can avoid the cost of bending by adding slots in place of the bends. You can then bend the part manually. This lowers cost further because items are flat and take less shipping volume. Such parts also take less storage space.

2.4 Upright Sensitive Drill Press

Figure 2.6: Upright Sensitive Drill Press

The upright sensitive drill press (Figure 6) is a light-duty type of drilling machine that normally incorporates a belt drive spindle head. This machine is generally used for moderate-to-light duty work. The upright sensitive drill press gets its name due to the fact that the machine can only be hand fed. Hand feeding the tool into the workpiece allows the operator to "feel" the cutting action of the tool. The sensitive drill press is manufactured in a floor style or a bench style.

2.5 Tin Snips

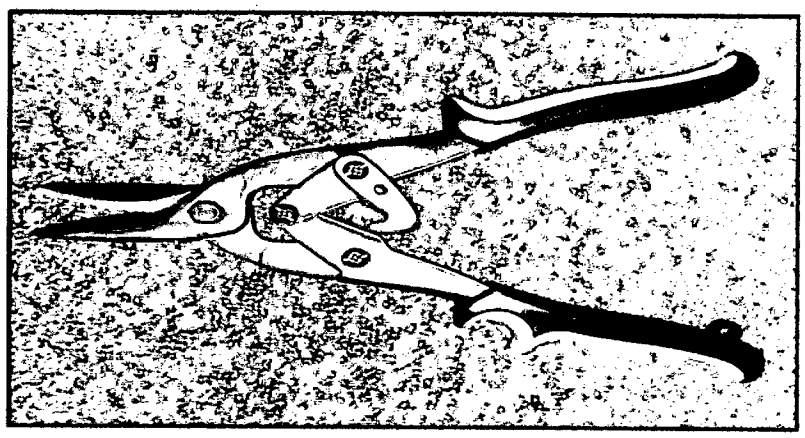

Figure 2.7: Tin Snips

Tin snips are tools used to cut thin sheet metal. They use the same principles as common scissors, but are able to handle thicker and harder material. There are three different types of tin snips; straight cutting, left cutting, and right cutting. Straight cutting in a straight line, left cutting snips (usually red) will cut in a curve to the left, and right cutting snips (usually green) will cut in a curve to the right.

In practical use, the red snips are used in the right hand, for straight or curving cuts, with the base material to the right being cut neatly and the left hand will be pulling away a spiraling offcuts. The green snips work in the opposite fashion in the left hand, with the waste being on the right.

2.6 File

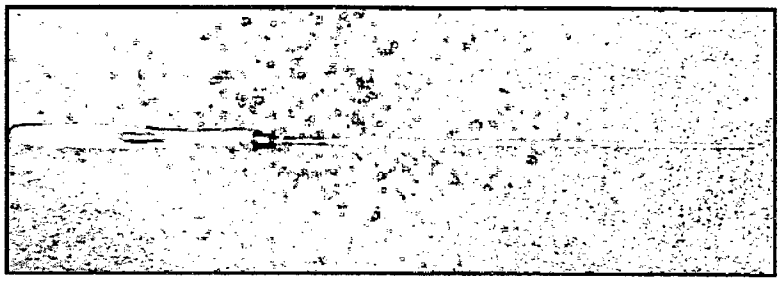

Figure 2.8: File

A file (or hand-file) is a hand tool used to shape material by cutting. A file typically takes the form of a hardened steel bar, mostly covered with a series of sharp, parallel ridges or teeth. Most files have a narrow, pointed tang at one end to which a handle can be fitted.

Files have forward-facing cutting teeth and cuts most effectively when pushed over the workpiece. Drawfiling involves laying the file sideways on the work, and carefully pushing or pulling it across the work. This catches the teeth of the file sideways instead of head on, and a very fine shaving action is produced. There are also varying strokes that produce a combination of the straight ahead stroke and the drawfiling stroke, and very fine work can be attained in this fashion. Using a combination of strokes, and progressively finer files, a skilled operator can attain a surface that is perfectly flat and near mirror finish.

The grooves in a file may become clogged during use, causing the file to lose its cutting ability and trapped shavings can scratch the work surface. A file card can be used to clean the file. Files should always be used with a handle; otherwise the naked tang can injure the operator.