FOLDABLE SINGLE BED

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ABSTRACT

This report presents about bed that always been used especially in bedroom has a small space. This bed is a device which is important in order to ease keep any closet and to save the space. The idea of the fabricating of this bed is based on student's creativity. The selection of suitable materials in the fabricating of this bed is a loaded material which has minimum weight, long life-span and can detain heavy load. Materials are proposed for the fabrication of the bed is mild steel material. In this report, we'll also be having more to the fabrication of this bed. There are several processes involved during the design and fabrication of this foldable single bed which are consisted in this report. Variety of process used in making this bed as material selection, cutting, joining, and others.

ABSTRAK

Laporan ini membentangkan tentang katil yang sering kali digunakan terutamanya di dalam kawasan bilik yang kecil. Katil merupakan suatu perkakas yang penting untuk keselesaan setiap orang bagi merehatkan badan dan tempat melelapkan mata. Idea pembentukan katil ini berdasarkan kreativiti pelajar sendiri. Pemilihan bahan yang sesuai untuk digunakan bagi pembentukkan katil ini merupakan bahan yang mempunyai berat yang ringan, jangka hayat yang tahan lama dan boleh menahan beban yang berat. Bahan yang dicadangkan untuk pembentukkan katil ini merupakan material jenis steel. Dalam laporan ini juga akan lebih memfokuskan kepada pembentukkan katil. Dalam laporan ini juga akan lebih memfokuskan kepada pembentukkan katil.perlbagai proses digunakan dalam pembuatan katil ini seperti pemilihan material, pemotongan, pencantuman, dan lain-lain lagi.

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LIST OF SYMBOLS

P	Pressure
A	Area
σ_y	Yield stress
σ_{cal}	Calculated stress
τ_{cal}	Calculated sheer stress
τ_y	Yield sheer stress
F	Force
RM	Ringgit Malaysia

LIST OF ABBREVIATIONS

APPENDIX	TITLE
AISI	American Iron and Steel Institute
ASTM	American Society for Testing and Materials
CAD	Computer Aided Design
TIG	Tungsten Inert Gas Welding
MIG	Metal Inert Gas Welding
PPE	Personal Protective Equipment
SMAW	Shielded Metal Arc Welding
MMA	Manual Metal Arc
UMP	Universiti Malaysia Pahang

CHAPTER 1

INTRODUCTION

1.1 Project Name

The title of this project is Foldable Single bed. The bed is designed as multifunction bed, strong, comfort, light, safe and foldable. The bed are suitable for anyone especially who have the limited space in bedroom.

1.2 Project Synopsis

As we know, bed it is very important thing to humans. Bed is a piece of furniture (or a location) used as a place to sleep and as a primary place for relaxation. Bed usually consists of a mattress placed on top of a box spring Inner-sprung Base. The box spring is a large mattress-sized box containing wood or steel and springs that provide additional support and suspension for the mattress. Foldable bed is the new creation that design to compete with the other common bed in the current market and help the human body to relax.

1.3 Project Background

Since the Ancient World, beds become the common facilities for human. Beds were little more than piles of straw or some other natural material. An

important change was raising them off the ground, to avoid draughts, dirt, and pests. For example, Egyptians had high bedsteads which were ascended by steps, with bolsters or pillows, and curtains to hang round. The elite of Egyptian society such as its pharaohs and queens even had beds made of wood and gilded with gold. Often there was a head-rest as well, semi-cylindrical and made of stone, wood or metal. Ancient Assyrians, Medes and Persians had beds of a similar kind, and frequently decorated their furniture with inlays or appliqués of metal, mother-of-pearl and ivory.[1]

Nowadays, there are many type of beds in the world wide market like air bed, box-bed, bunk bed, state bed, Murphy bed, iron bed and others. The main purpose of the beds invention is used as a place to sleep and as a primary place for relaxation.

As the result for the needed in community there are various type of foldable or multi use beds had been invented. Multifunction bed can be used and to use as a place to sleep. It is a luxury to have our own bed with lots of other purpose not just as a bed. It also comes in much type of beds and design. From the advantages and disadvantages of the beds in the current market, one new product will be developed to follow the specific and customer need.

1.4 Problem Statement

There are many types and design of beds in the market. Every bed has different design, types and size but how far the variety of these common designs may help the customer or users effectively. There are some common problem can be detect at the beds nowadays such as big, heavy, only suitable for bedroom , not suitable for small area, hard to manufacturer, not luxury and not flexible, but rigid. To reduce this problem, one new bed will be development that has multi function, with lots of other purpose not just as a bed, light, comfort, and more safe and foldable.

The design process enables us to follow a systematic approach to design. The most important step of the design process is identifying the customer need. Nowadays, the current type of beds in the market does not fulfill the customer needs in overall. For example, we are required to design a bed that can be used for adult. Clearly, all of us know how to sleep on a bed, so in that perspective, we know how a bed works. A bed is used for sleep. Unfortunately, the description does not state how the bed is made. There are some questions that try to be answers though this project which are:

(a) What material is used?
(b) Is the bed flexible or rigid?
(c) Does the bed rotates or fixed?
(d) What does it mean that the bed is to be used for adult?
(e) Is safety a biggest concern?
(f) How much the cost of bed?

1.5 Objective of the Project

The objective of this project is to design fabricate a foldable bed that not only as a bed but more than that. One new bed will be develop as multifunctional bed complete with the variety of purpose which is light, comfort, more safe and foldable.

1.6 Scope of the Project

This project is about design and fabricate a new bed that has multi function and foldable. The bed must foldable, light, safe, multi use and friendly user. This new design may reduce the weaknesses of the bed in the current market.

The scope of this project includes:

(a) **Literature Review:** Valuable data are searched and gathered. About shape of the bed and include of type of bed. The manufacturing process also includes.

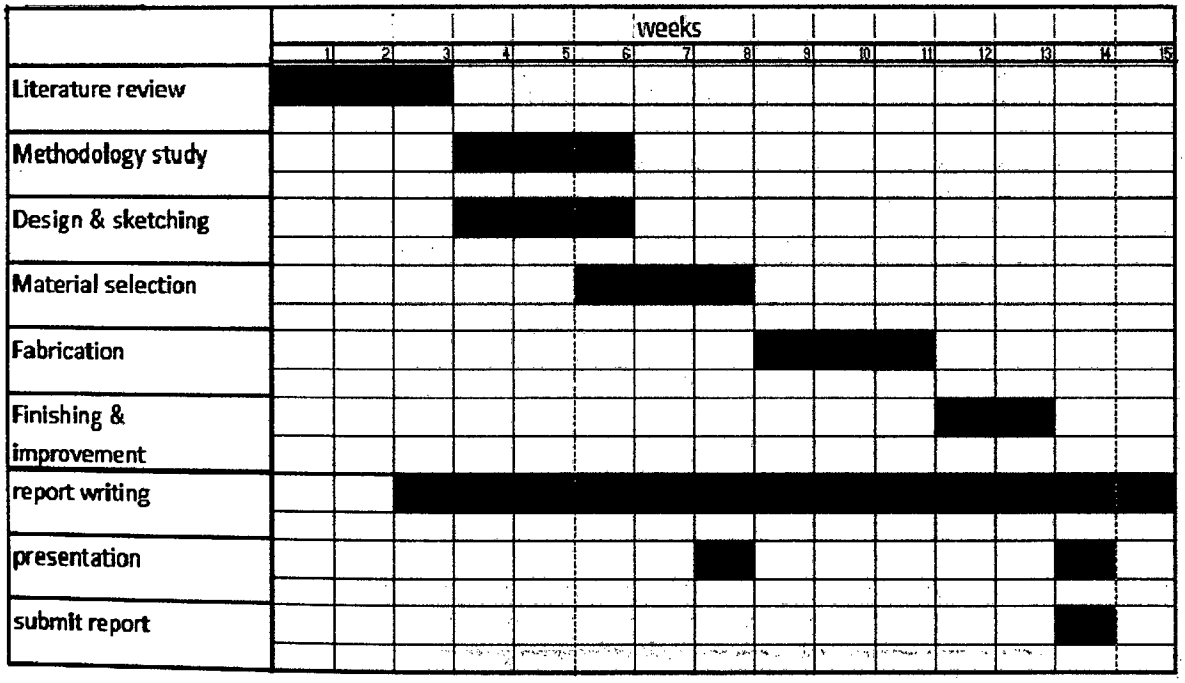
(b) **Sketching & Designing**: Sketching and designing using Solid work software in creating the design of the bed.

(c) **Fabrication**: Fabricate and produce the bed by using all necessary manufacturing process such as welding, cutting, grinding and etc.

(d) **Testing & Evaluation**: Simulate the mechanism of the bed produce is in line with the expected function to be.

1.7 Project Gantt chart

Table 1.1: Project Gantt chart



CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The purpose of this chapter is to explain about the design process required for making a product. Chapter Two also discusses about the material used, techniques or machines used and advantages of my project.

2.1.1 Introduction of Product

Definition of bed according to Wikipedia, the famous encyclopedia website is a piece of furniture (or a location) used as a place to sleep and as a primary place for relaxation. Another definition is a piece of furniture upon which or within which a person sleeps, rests, or stays when not well.

The portable single bed, that design are simple, easy to use, small, compact for a great space, saving solution, sets up easily, folds down in and stores in most any closet. The advantages of my foldable single bed are the beds have multi function, with lots of other purpose not just as a bed, light, comfort, and more safe and foldable.

2.1.2 Design, Materials Selection and Marketing of Successful Products

There are many things that make products successful in the market place. This paper is a comprehensive tool for understanding how to develop products with special respect to integrated product development. Materials selection, marketing and design analysis in the form of a design manual are presented as a tool for the product developer. Many different methods for materials selection and design have been presented over the last couple of decades. However, most methods have been limited to the material as a physical entity to give shape for a product.

Every design requires the selection of a suitable material and a decision regarding the methods of manufacturing to be used in producing the element. The two factors are closely related, and the choice will affect the shape, appearance, cost and marketing. It may also determine the different between a commercial success and a commercial failure.

As the design becomes more complex and involves more elements, the selection of suitable materials and methods of production becomes more difficult. The design engineer must be sufficiently familiar with the characteristics and properties of the materials and the way in which they can be shaped to ensure that his/her decisions are well made.

From the experience in using beds, there are many types of materials involved in producing a bed. Wood and metals are the most common materials used to fabricate a bed. Manufacturers can build up a bed with only one material, like metal beds and can also develop a bed using two or more materials, as used in the bedroom. The best way to produce the new improved design is know the disadvantages of bed design and upgrade the design with lots of other purpose not just as a bed.

2.2 Paper Review

2.2 Bed Types and Functions

When we enter into someone's bedroom, the first thing that catches our attention is, undoubtedly, the bed. In fact, it is the focus of the bedroom. Moreover, the décor of the bedroom also depends upon the type of the bed, apart from its positioning, color, design and size. You can create a lot of difference to the décor of your bedroom, by choosing the right size and type of the bed that fits perfectly into place. The different types of bed available in today's market are designed to provide you ultimate level of comfort, every time you trudge into your bed.

Apart from giving you the desired level of comfort and coziness, the beds available today, provide you a touch of flair to the décor of your bedroom, thereby enhancing the appearance of the room. In the present times, the furniture stores are stacked with several types of beds, thus providing you the flexibility to choose as per your personal preferences and the décor of your bedroom. There is a wide variety of beds to choose from, which cater to the varying needs of people. You can get the traditional range of beds, as well as those that fit into the contemporary home décor. In this section, we have given information on the various bed types.

(a) **Air bed** in accordance with the change in lifestyle, there has been tremendous changes in the pattern of furniture items being used. The air bed is one such item that suits to the current necessity of portability

(b) **Adjustable bed** the era of large, open, spacious homes are almost gone. Due to lack of space, society comfort, security, budget and many other reasons people feel better to opt for flats within the residential complexes.

(c) **Bunk bed** a bunk bed consists of a set of two or three beds, each one placed on top of the other. It is specially designed with the help of a bed frame. It is best suited for a small bedroom

(d) **Canopy bed** truly adds class and elegance to the bedroom. Well, if you were of the opinion that creating canopy bed was difficult, you are in for surprise.

(e) **Iron bed** Market is flooded with varieties of beds. Apart from design and motifs experiments have been done with the raw materials of the bed. Apart the traditional wooden beds.

(f) **Murphy bed** named after its inventor, William Murphy, Murphy bed is also known as wall bed, or fold away bed. The idea behind designing such a bed was to make provision for more space in the small room.

(g) **Sofa bed** the latest style in the world of furniture has come in the form of the modern sofa bed. A sofa bed, serving multiple purposes, comes across as a very versatile piece of furniture.

(h) **Waterbed** when talking about comfortable bed, waterbed is one name that needs to be mentioned in the list. Water beds, once a rare phenomenon, are becoming a common occurrence in homes now-a-days.

2.3 Technical Review

2.3.1 Types of Beds in Common Market Place

There are several types of beds in market place such as Air bed, Bunk bed, Water bed and Canopy bed.

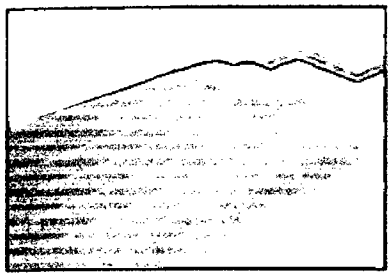


Figure 2.1: Air bed

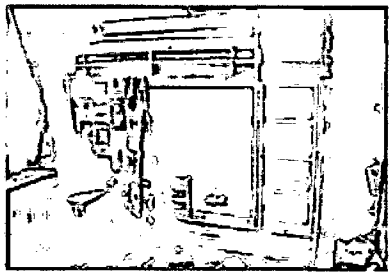


Figure 2.2: Bunk bed

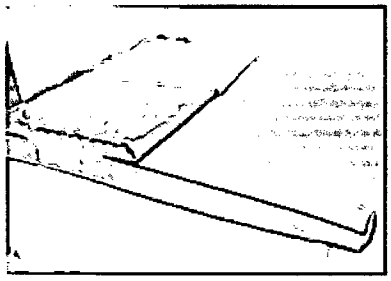


Figure 2.3: Water bed

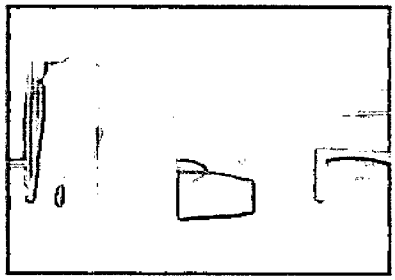


Figure 2.4: Canopy bed

Source: Wikipedia 2003

2.3.2 Materials Used

There are many types of materials involved in producing a bed. Wood and metals are the most common materials used to fabricate a bed. Steel and iron also include by metal. Steel is an alloy consisting mostly of iron, with carbon content between 0.2% and 2.1% by weight, depending on the grade.

Carbon is the most cost-effective alloying material for iron, but various other alloying elements are used such as manganese, chromium, vanadium, and tungsten. Carbon and other elements act as a hardening agent, preventing dislocations in the iron atom crystal lattice from sliding past one another. Varying the amount of alloying elements and form of their presence in the steel (solute elements, precipitated phase) controls qualities such as the hardness, ductility, and tensile strength of the resulting steel. Steel with increased carbon content can be made harder and stronger than iron, but is also more brittle.

Steel is also distinguished from wrought iron, which can contain a small amount of carbon, but it is included in the form of slag inclusions. Two distinguishing factors are its increased rust-resistance and better weld ability.

Though steel had been produced by various inefficient methods long before the Renaissance, its use became more common after more efficient production methods were devised in the 17th century. With the invention of the Bessemer process in the mid-19th century, steel became a relatively inexpensive mass-produced material. Further refinements in the process, such as basic oxygen steelmaking, further lowered the cost of production while increasing the quality of the metal. Today, steel is one of the most common materials in the world and is a major component in buildings, infrastructure, tools, ships, automobiles, furniture, machines, and appliances. Modern steel is generally identified by various grades of steel defined by various standards organizations.

2.3.3 Techniques or Machines Used

Have many techniques use to fabricate. One of the techniques is welding. Welding is a process critical to our present state of civilization and technical advancement. Unless exposed to the building, machinery or automotive trades, the average person never realizes how much we depend on the welding process. This is a fundamental part of the process of building most of what we depend on daily, including vehicles, buildings, appliances, bridges and much more.

The simple definition of welding was "joining metals through heating them to a molten state and fusing them together". The types of welding are Oxy-acetylene gas welding, Arc welding, MIG (wire-feed) welding and TIG (heli-arc) welding.

Shielded metal arc welding (SMAW), also known as manual metal arc (MMA) welding or informally as stick welding, is a manual arc welding process that uses a consumable electrode coated in flux to lay the weld. An electric current, in the form of either alternating current or direct current from a welding power supply, is used to form an electric arc between the electrode and the metals to be joined. As the weld is laid, the flux coating of the electrode disintegrates, giving off protect the weld area from atmospheric contamination.

2.3.4 Joining Method

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

Figure 2.5: Metal Inert Gas (MIG) Welding

Source: Wikipedia 2004

2.4 The Design Process

Creating solutions to problems involves the process of designing. The design process is a way of devising innovative solutions to problems that will result in new products or systems. Engineering graphics and descriptive geometry are excellent tools for developing designs from initial concepts to final working drawings. Initially, a design consists of sketches and ultimately becomes precise detail drawings and specifications.

At first glance, the solution of a design problem may appear to involve merely the identification of need and the application of effort toward its solution, but most engineering design are more complex than that. The engineering and design efforts may be the easiest parts of a project.

2.5 Finishing Process

Paintwork accomplishes two things, namely the preservation and the coloration of the material painted. The compounds used for painting, taking the word as meaning a thin protective or decorative coat, are very numerous, including oil paint of many kinds, distemper, whitewash, tar; but the word paint is usually confined to a mixture of oil and pigment, together with other materials which possess properties necessary to enable the paint to dry hard and opaque. Oil paints are made up of four parts, the base, the vehicle, the solvent and the driers. Pigment may be added to these to obtain a paint of any desired color. There are several bases for oil paint, those most commonly used for building work being white lead, red lead, zinc white and iron oxide.