UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DESIGN AND FABRICATION OF THREE-WHEEL TRANSPORTATION

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Mechanical Engineering Technology (Maintenance) with Honours.

By

MUHAMMAD ROZHAN BIN ROSDIN

B071610363

941213-14-7159

FACULTY OF MECHANICAL AND MANUFACTURING ENGINEERING TECHNOLOGY

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ABSTRAK

Ringkasan untuk projek ini adalah satu project basikal bermotor tiga roda yang di reka khas bagi kegunaa orang tua yang kurang keupayaan. Sebab utama projek ini terhasil adalah bagi membantu dan memudahkan kepada golongan kurang keupayaan mudah bergerak dari satu tempat ke satu tempat. Kita sering di maklumkan bahawa golongan-golongan seperti mereka ini susah untuk bergerak kerana faktor kesihatan yang tidak mengizinkan. Oleh itu, projek ini di cipta untuk mengatasi masalah-masalah mereka. Selain itu juga, di antara faktor-faktor lain ialah dari segi faktor alam sekitar. Masalah alam sekitar yang semakin tercemar adalah salah satu faktor projek ini di hasilkan. Basikal ini sepenuhnya bergerak menggunakan sistem elektrik yang terjana daripada batteri. Oleh itu, sedikit sebanyak dapat mengurangkan masalah alam sekitar yang sering bermasalah kebelakangan ini. Untuk menghasilkan projek ini, basikal bermotor ini terlebih dahulu dilukis dengan menggunakan perisian seperti *"Computer Aided Design (CAD)"*. Selepas itu, proses fabrikasi akan di jalankan. Di antara proses-proses fabrikasi yang akan dilakukan adalah seperti proses pengukuran, proses kimpalan, proses penggerudian, proses pemotongan, proses pemasangan, proses brek keselamatan, proses pemasangan gear.

ABSTRACT

A summary for this project is a project of electric motor three wheel bike that is designed specifically for the elderly that has a low ability. The main reason for this project is to provide facilities to the elderly group to be easily move from one place to another. We often informed that they are difficult to move because of health factors. Therefore, the custom electric motor bicycle is design to solve their problems. In addition, among the other factors in term of environmental factors. Environmental problems are increasingly polluted is one of the factors of this project is derived. This bike is fully powered by electric motor that supply by battery. Thus, to some extent can reduce environment problems often troubled lately. Process of this project are firstly to drawn the design by using software such as "Computer Aided Design (CAD)". After that, the fabrication process will be performed. Among the fabrication process are included measuring process, welding process, drilling process, cutting process, wiring, setup brake system, touch-up process, gearing process and installation process.

DEDICATION

To my beloved parents,

Zaidah Binti Zainal Abidin and Rosdin Bin Abd Wahid

Thank you for all the support, encouragement, enthusiasm, patient and willingness.

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CHAPTER 1

INTRODUCTION

This chapter provides the background to the problem statement and the main objective for entire project and the scope of study, which has clearly defined the boundaries or the limits of this study. The report structure in this chapter also provides a general description of the section, the related content as well as the chapter itself. In overview, the progress of the whole project is summarized and described how the entire project was done.

1.1 Background

Electric bicycles are an electrical vehicle powered by electricity. Also known as an e-bike. Some other countries have been using different power sources of the electric motor because it is dependent on the legislation of the country. Batteries that can be charged between 15 and 20 mph are mainly used for the e-bike and can travel between 24 and 32kph. The invention of the electric bike is proof that engineering continues to make improvement, the invention of the electric bike replaces the old bicycle.

While the electric bikes use the electric motor, instead of a motorcycle they still call this a bicycle or a scooter. This is because the bicycle still has a fixed identity, which is mostly part and framework of the bicycle. The law on transport requiring the certification and functioning of good motor vehicles is therefore not included. There's no need a license to ride the electric bicycle.

This electric bike uses NiMH, a common power supply for electric bicycles. This battery type can be recharged and it is more handy to design an electric bicycle with light and thicker battery capacities. Electric bicycles are not like a motorcycle in many concepts, either they are designed or powered. In addition, the electric motor uses lower power than the motorcycle which the rider still needs to pedal. Some electric bicycles are frequently used by all people in terms of weight and frame style.

In bicycle speed, bicycle weight also plays an important role. The weight of the bicycle depends on the purpose, it is either 2 for the tournament, so the weight of the bike is not very common. The weight of the old bicycle is approximately 35 or 40 pounds, this type of weight was older than the day before bicycle technology was not yet improved. Now, the weight of the bike has been improved and the weight of the bike has been reduced to around 15 and 25 pounds. Bicycle weight improvement is for bicycle handling and cycling speed. Weight are mostly come from the bike frame, there are few materials which develop the bicycle frame to lighten and strengthen the bike. The types of materials used for bicycle frame development are carbon fiber and steel.

Carbon fiber is the most widely used material for bicycle frame development. The term carbon fiber describes this material as having various composites, including different polymers, carbon and graphite, which are bound by a matrix of epoxy resin that sometimes contains metals or ceramics fiber also called material whiskers, used to help stabilize a static degree and direction of dynamic forces at different parts of the bike framework.

Next is steel, it is also usually used to develop the bicycle frame. Steel is the materials used for many bicycle frames. Many bicycle designers have used their long experience to refine the design of steel bicycles. Steels provides a comfortable roll and

frame of steel that can be a source of energy for the cyclist to bend the frame in different sections of the pedal stroke. The steel frame may be repaired at low cost and may show or detect a frame stress to the breaking frame, if damaged. Another part of the pedal stock can emit the stored energy to move forward from steel. Compared to the aluminum frame that suddenly breaks when the frame fail, the steel frame of the bike is slowly breaking.

1.2 Problem Statement

The natural habit of movement is the essence of life. Every living thing kept moving for it on interest, such as animal they move to attack their preys, snake slide, caterpillar crawls, kangaroo hops and men walk. Human beings move the most of all. Kilometers of human travel have gone back and forth every day (Gupta 2015). But the movements for the elderly are not quite consistent as long as a teenager because the muscle and bones doesn't last long after a while working.

This project lies in the fact that the elderly have various problems with long distances movement. Most of the bicycles that are invented are intended to cycle wheels for ordinary and healthy people to move with usage of energy. This transport has been modified with the purpose of making it easy for older people to travel. The elderly suffer from weaknesses that reduce the movement in their lower part of the body. Thus, the seat and driver design is extremely important. One of the problems that has occurred is environment issues. Therefore, by using the electric system, this bicycle can be automatically classified as green transportation. In Figure 1.1 shows examples of electric bicycle.

Figure 1.1: Examples of electric bicycle

1.3 Objective

The objective based on the introduction and problem statement of this study above are as follow:

- To design the electric bicycle suitable for elder person.
- To produce and fabricate design that has been drawn into real product.

1.4 Scope

The project subjected to the following scope:

I. Designing the frame body using CAD software (CATIA).

II. Electric bicycle suitable for elder person and lower limb disabilities.

III. An electrical system application is applied in the bicycle for movement.

IV. Three-wheel transportation and suitable for one passenger only.

V. Suitable only for weight below than 80kg.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

There are numerous angles that should be considered and deliberately assessed before starting a project to ensure that a project runs smoothly. The review included web-based reference books, perceptions, speeches and assets. The project will be well updated based on the data obtained to continue running as a manual to complete the project with a specific end goal. The review was thinking of collecting each of the information or data obtained from a variety of sources in order to obtain the project's best results. This is to ensure that the project is delivered in order to achieve the goal and work legally.

2.2 Bicycle

A bicycle is a single-way vehicle filled with human-fueled and pedals that is connecting to a chassis with two wheels, one behind the other. A rider on a bike is known as a cyclist. In many districts, they are the main methods of transportation. They like wise giving a well-known things for fun and have been modified for use as children's toys, general wellness, military and police applications, dispatch administration, and motorcycle dashing. Since the main chain-driven model was produced around 1885, the essential shape and setup of a regular upright or "wellbeing bike" has changed little.

2.2.1 History

Leonardo da Vinci had imagined a machine which was remarkably similar to the modern bicycle as far back as 1490. Unfortunately, no attempt was made by Da Vinci to build the vehicle and his sketches were not discovered until the 1960s. In the late 1700s, the Celerifere was invented by a Frenchman named Comte de Sivrac, a crude wooden hobby horse made up of two wheels with a beam. The rider would sit on top of the beam and pushing thier feet against the ground to propel the contraction.

In Figure 2.1 shows a steerable hobby horse was designed by the German Baron Karl von Drais in 1816, and hobby-horse riding in Europe was a fashionable pastime within a few years. Riders also found that they were able to ride the device without losing their balance with their feet off the ground. A few decades later, Ernest Michaux known as Frenchman has designed a hobby horse with cranks and pedals connected to the front axle. The Velocipede was named the boneshaker, made out by wood wheels, iron frame and tires.

Figure 2.1: Hobby Horse, 1816's

Around 1866 James Stanley created an unusual version of the Velocipede in England. It was called the Ordinary, or Penny Farthing, and it had a huge front wheel and a small back wheel as shown in Figure 2.2. Soon, in 1885, the Rover Safety was created

by another Englishman, John Kemp Starley, so-called because it was safer than bicycles can be classed by function, number of riders, overall design, gearing, or propulsion in many different ways. The Ordinary, which tended to cart the rider on the huge front wheel unexpectedly. The safety featured solid rubber wheels, a chain-driven rear wheel and a sized diamond-shaped frame.

Figure 2.2: The Ordinary or Penny Farthing, 1870's

Charlie Kelly and Gary Fisher, from California, invented mountain bikes, combining the wide tires of older balloon tire bikes with the lightweight racing bikes technology. Mountain bikes has higher rate than racing bikes within 20 years. An evolution of bicycle has shown below in Figure 2.3.

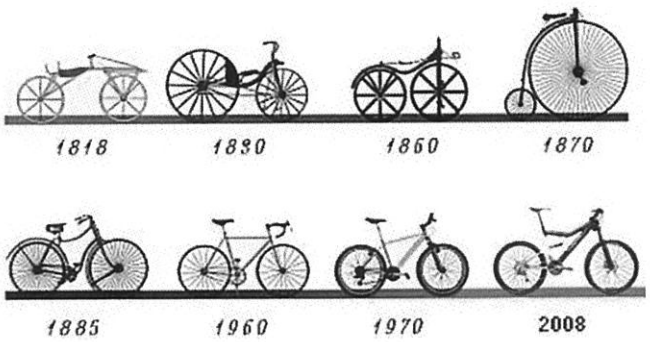

Figure 2.3: Evolution of bicycles.

2.2.2 Types

Bicycles can be classified in many different ways depending on their function, number of riders, general construction, gear or propulsion. Common types are including utility bicycles, mountain bike, racing bikes, hibrid bikes, cruiser bikes and BMX bikes. Low riders are less common, including fixed gear, tandems, folding models, tall bikes, amphibious bikes and electric bicycles. Unicycles, tricycles and quadricycles aren't strictly bikes because they are one, three and four wheels, but are often informally called "bikes."

2.2.2.1 Mountain Bike

A mountain bike or mountain bicycle is an off-road cycling bicycle. Mountain bikes share similarities with other bicycles, but have features designed which improve durability and performance of rough terrain. Typically, this includes front or full suspension, large knobby tires, longer durability wheels, stronger brakes, direct steering lines and lower gear ratios. Mountain bikes are generally specialized for use on mountain tracks, single trails and other off-road areas, although most of them can never be used off-road and hybrid road bikes are commonly found for sale on the basis of mountain bike frames.

Mountain biking originated as a fringe sport for the first time in the 1970s in California. Velo Club Mount Tamalpais, California first set up mountain biking as a sport and began regularly organizing downhill mountain biking races from 1976 to 1979, attracting public and media attention. Mountain biking was included in the Olympics for the first time in the Atlanta Games with a cross country event for both main and female riders. Example of mountain bike are shown in Figure 2.4.