

REDESIGN OF MOTORCYCLE TOWING DEVICE FOR COMMERCIALIZATION

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**A thesis submitted in fulfilment of the requirements for the
Bachelor of Mechanical Engineering (with Honors)**

FACULTY OF MECHANICAL ENGINEERING

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2018

DECLARATION

I declare that this thesis entitled “Redesign of Motorcycle Towing Device For Commercialization” is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature :

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Date : 19 May 2018

DEDICATION

I would like to dedicate this project to both of my parents, Nik Hak Bin Nik Mat and Roszaiyusni binti Ibrahim who meant so much to me. This project also dedicated to my supervisor, Dr Shamsul Anuar bin Shamsudin since he has been my mentor during this project. Besides that, I would like to dedicate this project to my friends who helped me throughout this project.

ABSTRACT

Currently, there is no motorcycle to motorcycle towing device available in the market. Most of the motorcycle towing service uses a pick-up truck to pick up the motorcycle. Plus, the towing service price is quite unreasonable. This is because there is no standard price for the service and the service costly for the operator itself. In addition, some of the towing process is done only using a foot to propel the towed motorcycle. The aim of this project to produce a product that can be commercialize and solve the problem. In this project, a prototype is produced after the fabrication process. The prototype seemed to function. The length of the sling successfully retracted for storing, thus the sling retractor is working accordingly.

ABSTRAK

Alat untuk menunda motorsikal masih tiada di pasaran. Tambahan pula, servis menunda motor yang sedia ada tidak menggunakan peralatan untuk menunda motor tetapi mereka menggunakan trak untuk mengangkut motorsikal tersebut. Harga untuk servis menunda ini juga agak mahal. Hal ini kerana kos untuk melakukan servis menunda bagi pengendali servis agak mahal. Selain itu, ada juga yang hanya menggunakan kaki untuk menunda motor. Ini akan membahayakan penunggang dan jugak pengguna jalan raya. Matlamat projek ini adalah untuk menghasilkan produk yang boleh dikomersialkan dan juga mampu menyelesaikan masalahnya. Prototaip telah dihasilkan dan difabrikasi. Prototaip tersebut berjaya menunda dan ini boleh di lihat apabila kepanjangan anduh itu boleh dipanjangkan dan akan ditarik kembali.

ACKNOWLEDGEMENT

The achievement and ultimate result of this task required a great deal of direction and help from numerous individuals and I am to a great degree advantaged to have this up and down the fruition of my undertaking. All that I have done is just because of such supervision and help and I would not neglect to express gratitude toward them. I regard and express gratitude toward Dr Shamsul Anuar, for giving me a chance to enroll in this project and giving every one of us support and direction which made me finish the undertaking appropriately. I am to a great degree grateful to him for giving such a decent help and direction, in spite of the fact that he had occupied calendar dealing with the corporate issues. I would not neglect to recall both of my parents, for keep giving me motivation and support during this project.

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LIST OF ABBREVIATIONS

SYMBOLS	TITLE	PAGE
CAD	Computer Aided Drawing	6, 37, 43, 61, 62
CAM	Computer Aided Manufacturing	37
CAE	Computer Aided Engineering	37
PLM	Product Lifecycle Management	37
OEM	Original Equipment Manufacturer	37
PC	Personal Computer	37

LIST OF SYMBOLS

N	-	Newton
m	-	Mass

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Towing is an act of pulling or dragging a driven object that fastened behind another driver object and by coupling these two objects together it will keep these objects together while in motion. Source of towing can be range from the biggest aircraft to a cow. These may be coupled by a chain, rope, bar, hitch, three-point fifth wheel, coupling, drawbar, tow bar or other means of keeping the objects in motion. The first vehicle that use the application of towing is tow truck which is invented by German automotive pioneer Gottlieb Daimler who also the inventor of the first world gas-powered motorcycle. Towing varies widely in scale and type, on land, water and in the air. The most common form of towing is the transport of disabled vehicle by a tow truck. Other than that, are tractor-trailer combination and cargo or leisure vehicles coupled via trailer-hitches to smaller trucks and car as shown in Figure 1.1(a) and Figure 1.1(b).

Nowadays, the application of towing is used in many types of field and industry especially vehicle recovery industry. Vehicle recovery is towing assistance given to any disabled or broken-down vehicle to place of interest with the help of recovery vehicle like a tow truck. Recovery operators are the people who undertake the recovery service. Early motorists were often capable of carrying out minor repairs themselves but as automobiles became more complicated, this became more difficult to carry out successfully. Thus, towing service is needed to transport the broken vehicle to auto repair shop.

This project was ventured to redesign the device that used for towing between two motorcycles. This project will involve redesigning, analysing and testing process for the improved design of the device for towing motorcycle which is required to fulfil the objective of this project. This device may help users to tow motorcycle by using another motorcycle especially in emergency.

As the title of redesign of a towing device between two motorcycles, the challenge is to redesign and produce an improve device with better mechanism and portability. This mechanism would help people especially for motorcycle user that has the probability to face towing situation of their motorcycle. Commonly, motorcyclist use the vehicle recovery service that use powered vehicle such as truck or trailer to tow their motorcycle which will burden them with the expensive service charge of the vehicle recovery service. Other than that, there is other method for towing motorcycle, but it is not suitable to perform and can cause harm not only to motorcyclist but also to other road users.

Project also involves previous studies involving device for towing motorcycle. The study will cover all the method that suitable and related device that had been use for towing motorcycle. It involves the study of mechanism that commonly for towing device not only for motorcycle but also other vehicle. This will help to generate ideas to invent something new that can be applied into the product.

Having finished product testing and analyse process, conclusions and recommendations can be made. The conclusion of this project is based on research objectives. It is considered successful if all objectives are achieved. The proposal would involve improvements that can be made for the studies that have been done.



Figure 1.1(a): Truck-trailer combination from the source (Houston's Truck, 2015)

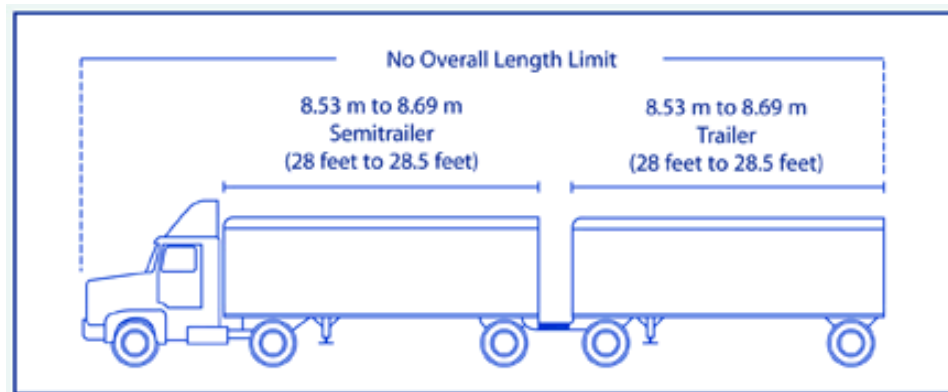


Figure 1.1(b): Trailer-hitcher (U.S. Department of Transportation, 2004)

1.2 PROBLEM STATEMENT

Motorcyclist always have problem towing their motorcycle if their vehicle is broken down by the roadside or on the highway. They either call the highway operator, recovery operator or tow their motorcycle with the help of another motorcyclist. The problem when calling the highway operator or the recovery operator is an expensive service charge. Most of them will avoid calling those operators. They rather ask help from another motorcyclist to tow their motorcycle, but it may harm the motorcyclist and the other road users. It is harmful because the towing process involve physical help from human by using the human leg to push the broken motorcycle with the present of the motorcyclist controlling their driven motorcycle as shown in Figure 1.2. This towing is extremely dangerous and it neglects the safety of the both motorcyclist. Using a motorcycle as towing vehicle with proper attachment towing device can help to improve the method of towing motorcycle which is more affordable and efficient to the road user.



Figure 1.2: Foot as towing device

1.3 OBJECTIVE

The objectives of this project are as follows:

1. To redesign and to propose a new motorcycle towing device design for commercial use using CAD software.
2. To perform analysis on the new and improved design of the motorcycle towing device.
3. To fabricate the new and improved design of the motorcycle towing device.

1.4 SCOPE OF THE PROJECT

The scopes of this project are:

1. Focusing on designing a few improved designs based on the original design of the towing device by decrease the size, increase the portability and user friendliness.
2. Selecting the best design to meet the criteria of the commercial needs and analyzing the design.
3. Fabricating and testing the effectiveness of the device.

1.5 GENERAL METHODOLOGY

The actions that need to be carried out to achieve the objectives of this project are listed below:

1. Literature Review
 - a. Journals, articles, or any materials regarding the project will be reviewed.
2. Conceptual Design
 - a. Sketching a few improved designs from the original to meet the commercial criteria
3. Preliminary Design
 - a. Choosing the best design of the sketches
 - b. Drawing a 3D CAD full assembly model
4. Analyses
 - a. Analyzing the structural force, stress and strain of the design
5. Prototyping
 - a. Fabricate a prototype and test its effectiveness.
6. Final Design
 - a. Improvements applied on the final drawing after the prototype testing.
 - b. Finalized the drawing.
7. Fabricate The Final Design
 - a. Fabricate the improved drawings into a working product.

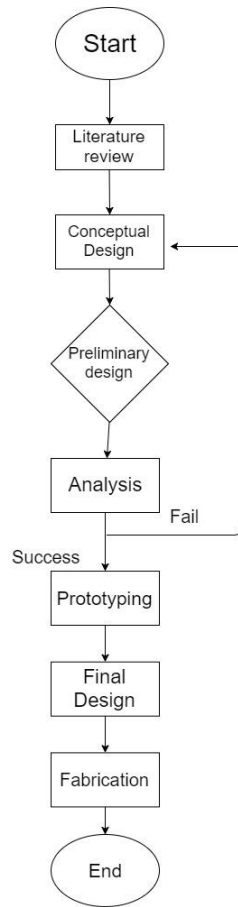


Figure 1.3: Project General Methodology

CHAPTER 2

LITERATURE REVIEW

2.1 PREVIOUS MOTORCYCLE TOWING DEVICE

2.1.1 PORTABLE TOWING SYSTEM FOR A MOTORCYCLE

A portable towing system for a bike or comparable vehicle, for example, a trike, the frame of which can be brought down to ground level to load the bike or comparable vehicle by pushing or riding the vehicle onto the frame without risking the vehicle tumbling off the ramp. The towing system might be reassembled, raised and brought down by a single person. The towing system came with a load box to store the casing when dismantled. The raising and bringing down of the casing is affected by a lifting and bringing down system is connected with wheel assemblies (Khoa, 2015).

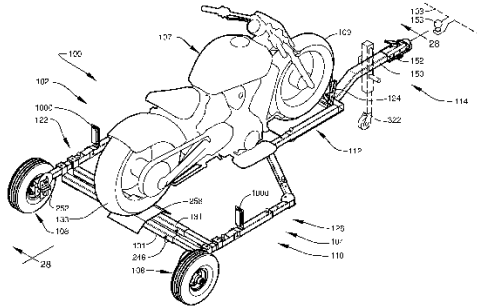


Figure 2.1: Diagram of portable towing system (Khoa, 2015)

2.1.2 TOWING APPARATUS

A towing apparatus for towing a two-wheeled vehicle, for example, a bike behind another vehicle, for example, a car. The apparatus incorporates a wheel bearer distinctly appended to the back of the towing vehicle by methods for a couple of keyed extending sleeves, one of which stays joined to the towing vehicle. The bearer incorporates a support into which the significant controlling wheel of the towed vehicle rides. This apparatus needs two persons to connect the apparatus with the motorcycle. This apparatus came with optional cradles. There are single cradle, two cradles and also three (Fred, 1969).

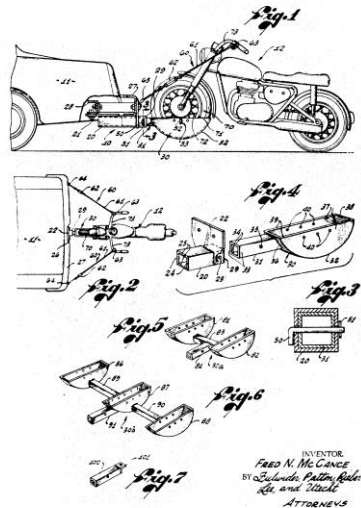


Figure 2.2: Diagram of the towing apparatus (Fred, 1969)

2.1.3 MOTORCYCLE TOWING DEVICE

A motorcycle towing device incorporating a stage part with a front end for connection to the trailer hitch of a land vehicle. An upright part is oppositely joined to the backside of the stage part. A lift is specifically raised and brought down upon the upright part by methods for a jackscrew situated on the stage part. The lift has a head tube and a couple of turn orientation situated at the best and base of the head tube. The head tube conveys a rotate part. The rotate part has a carriage plate and a couple of turn arms expanding forwardly from the best and base thereof for significant engagement