

## DECLARATION

“I hereby declared that I have read through this thesis and found that it has comply the partial fulfillment for awarding the Degree of Bachelor Mechanical Engineering (Design & Innovation)”

Signature : .....

Supervisor's Name : Mr. Razali Mohd Tinth.

Date :

Signature : .....

Second Supervisor's Name : Prof. Madya Ir Mustapha

Date :

DEVELOPMENT OF PORTABLE HEAD MASSAGER CONCEPT DESIGN

MOHD NAQIB BIN DERANI

This thesis is submitted to the Faculty of Mechanical Engineering, in partial of the partial requirement for the Bachelor of Mechanical Engineering (Design & Innovation)

FACULTY OF MECHANICAL ENGINEERING  
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

MAY 12, 2009

## DECLARATION

“I hereby declared that this thesis is my original work except for question and citations,  
which have been duly acknowledgement”

Signature : .....

Name : Mohd Naqib Bin Derani

Date :

For my beloved lovely mother, father and family

Hj. Derani Bin Seman

Hjh. Ismarani Binti Daud

Mr. Mohd Iswady Bin Derani

Mr. Ahmad Izzat Bin Derani

Mr. Muhammad Afifi Bin Derani

I love you so much...

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## ABSTRACT

Headache is defined as pain in the head or upper neck. It is one of the most common locations of pain in the body and has many causes. It ranks amongst the most common local pain complaints and may be frequent for many people. <sup>(1)</sup> This is the research for the treatment of tension-type headache by systematically designing a portable head massager which is ergonomics, portable, reliable user friendly, affordable and practical. Tension-type headaches account for nearly 90% of all headaches. Approximately 3% of the population suffers from chronic-tension type headache. <sup>(2)</sup> The head finite symptoms or headache normally can be solved through massaging process. Massage can bring about improvements in the health of people with a wide range of problems including stress-related conditions such as headaches. <sup>(3)</sup> The research scope will be until a stage of concept design, complete with 3D solid modeling data developed using CAD tools. Primary outcome from this research was the concept design of portable head massager complete with proposed and selected mechanical element inside it.

## ABSTRAK

Sakit kepala boleh didefinisikan sebagai kesakitan di bahagian kepala ataupun atas leher. Sakit kepala adalah salah satu daripada kesakitan yang sering dialami oleh tubuh badan dan mempunyai banyak sebab. Sakit kepala berada dalam kedudukan yang paling tinggi dalam rungutan kesakitan biasa dan besar kemungkinan terjadi kepada ramai orang.<sup>(1)</sup> Kajian ini adalah penyelidikan untuk rawatan *tension-type headache* secara sistematik dengan mereka bentuk *portable head massager* yang ergonomik, mudah alih, mesra pengguna, mampu milik dan praktikal. *Tension-type headache* merangkumi 90% daripada sakit kepala yang dialami pesakit. Hampir 3% dari populasi menderita *tension-type headache* yang kronik.<sup>(2)</sup> Gejala sakit kepala biasanya boleh diselesaikan melalui proses mengurut. Mengurut boleh membawa kebaikan kepada kesihatan manusia merangkumi masalah yang bersangkutan paut dengan tekanan seperti sakit kepala.<sup>(3)</sup> Skop penyelidikan akan dijalankan sehingga ke peringkat mereka bentuk konsep, lengkap dengan data lukisan 3D yang dibangunkan menggunakan CAD. Hasil utama kajian ini adalah reka bentuk konsep *portable head massager* lengkap dengan cadangan dan elemen mekanikal di dalamnya.

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## LIST OF SYMBOLS

R = Radius (cm)

H = Height (cm)

W = Width (cm)

L = Length (cm)

T = Torque

F = Force

$\mu$  = Coefficient of friction

$\theta$  = Angle of tooth face (in degrees)

$\Phi$  = pressure angle (in degrees)



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## CHAPTER I

### INTRODUCTION

#### 1.1 Background of project

There is only a few product in market that been sold to solve the head finite symptoms or headache. Headaches can be triggered or made more severe when sufferers are exposed to specific environmental factors, such as strong odors like cigarette smoke or perfume. Specific aspects of one's diet (beverages, meals, snacks) also may trigger headache. As an example, low blood sugar as seen with prolonged fasting or extensive dieting may lead to increased headaches. Changes in hormone levels in some women are associated with increased headaches.

Usually when headache occur, people tend to massage their head themselves or ask someone to massage their head. This research is to design a new portable headache massager for the use of the headache people. This research is conduct to produce one of the solutions to the headache. But we need to remember that this research only focusing on tension type headache which mean it cannot be used for the secondary headache.

With this research it is hope that people does not need to ask for other people to massage their head. Let the machine doing it for them. This research includes the statement from the view of health to ensure that the portable head massager is safe to be used.

## **1.2 Problem Statement**

Headache and head finite symptoms usually happen while we are in stress conditions or stay in one position at long hours. This incomfortability resulting the conditions such as feel sleepy and unfit to attend any activities, especially the activities that need us to concentrates and thinks. As an example, the situations is normally happen when we were driving at long distance or hours, stress or tired resulted from daily office workload, and headache occur during fever. Normally people will ask for help from the others around them to massage their head, or in worst case situation they will massage their head themselves. There is no mechanism or product can massage our head anywhere, anytime when we want it to be, without using hand as the movement mechanism. This research is responsible to come out with the concept design of portable head massager which is structured base on the true scenario faced by the people or prospect user. It is targeted that the product can be put at our head like a cyclist or safety helmet, then switch on the related switch on the massager body to let batteries-powered mechanism doing the massaging works.

### **1.3 Objective of Project**

The objectives of this research is to design the portable head massager which is ergonomics, portable, user friendly, affordable and practical to solve the head finite symptoms or headache which is normally can be solve through massaging process. The research scope will be until a stage of concept design, complete with 3D solid modeling data developed using CAD tools. The concept design should equip with the proposed and selected mechanical element inside it. All the design of mechanism and casing must be practical and manufacturable although still not in the form of detail design. The design should be resultant from the consideration of important factors such as practicality, ergonomics, and safety.

## 1.4 Scope of Project

### 1. Literature on :

- To studies about headache, massaging and all the process of development of portable head massager that related to the health science
- To studies on related existing mechanism designs and patents
- Studies on current problems and gain a feedback from related stakeholders associated with this design development.

### 2. Design :

- To establish the engineering design specifications for above concept design
- Establishment of complete concepts design base on finding above, and development of 3D solid modeling concept design.

### 3. Analysis :

- Evaluate and analysis of concept design has been developed, come out with the conclusion and design recommendation (for further future development).

### 1.5 Planning and Execution

No	Task	PSM I															PSM II														
		W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15
1	Choosing Title																														
2	Literature review																														
3	Data Collection																														
4	Questionnaire																														
5	Analyse questionnaire																														
6	Other Research (Patent Search)																														
7	Concept Design																														
8	Concept Design Development																														
9	Establish of Real Concept Design																														
10	Detail Design																														
11	3D solid modelling Data																														
12	Product Documentation																														
13	Preparation for PSM presentation																														
14	PSM presentation																														
15	Submission of technical report																														

Table 1: Planning and Execution

## CHAPTER II

### LITERATURE REVIEW

#### 2.1 Headache

Headache (cephalalgia in medical terminology) can be defined as the pain at the head that are located behind the head (occipital), above the eyes or the ears, or in the back of the upper neck. Headache is the result of pain signals caused by interactions between the brain, blood vessels, and surrounding nerves. During a headache, the pain does not come from the brain contrary to what many sufferers believe. Rather, the pain comes from activated nerves surrounding the skull, blood vessels, and head muscles. The reasons-why these nerves in the head are activated-are not understood. However, activation of specific nerves in the head sends pain signals to the brain that are interpreted as a "headache." <sup>(4)</sup>

### **2.1.1 Common cause of Headache**

The vast majority of headaches are benign and self-limiting. Common causes are tension, migraine, eye strain, dehydration, low blood sugar, and sinusitis. Much rarer are headaches due to life-threatening conditions such as meningitis, encephalitis, cerebral aneurysms, extremely high blood pressure, and brain tumors. When the headache occurs in conjunction with a head injury the cause is usually quite evident. A large percentage of headaches among women are caused by ever-fluctuating estrogen during menstrual years. This can occur prior to, or even during midcycle menstruation. <sup>(5)</sup> There are two different categories for headaches: primary and secondary headaches.

### **2.1.2. Primary Headache**

Primary headaches are not associated with (caused by) other diseases. Primary headache is an actual clinical condition and not a symptom of or caused by another disorder. Examples of primary headaches are migraine headaches, tension-type headaches, and cluster headaches. Secondary headaches are caused by associated disease or other medical conditions. The associated disease may be minor or serious and life threatening. <sup>(6)</sup>

Migraine headaches are the second most common type of primary headache. Migraine headaches affect children as well as adults. Before puberty, boys and girls are affected equally by migraine headaches, but after puberty, more women than men are affected. An estimated 6% of men and up to 18% of women will experience a migraine headache. <sup>(7)</sup>