UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOP STRETCHABLE WHEELCHAIR AND ANALYSIS

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Engineering Technology (Department of Mechanical Engineering Technology) (Hons.)

by

MOHD NIZAM BIN MOHD ZIN
B071210172
880421-03-5809

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Cop Rasmi:

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Jurutera Pengajar
Jabatan Teknologi Kejuruteraan Mekanikal
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I declare that this thesis entitled "Develop Stretchable Wheelchair and Analysis" 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.

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APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Engineering Technology (Department of Mechanical Engineering Technology) (Hons.). The member of the supervisory is as follow:

MOHD SULHAN BIN MOKHTAR
Jurutera Pengajar
Jabatan Teknologi Kejuruteraan Mekanikal
Fakulti Teknologi Kejuruteraan
Universiti Teknikal Malaysia Melaka

(Project Supervisor)

ABSTRACT

What do we know, the number of individuals with disabilities is increasing every year. Mobility aids helpful for patients to transport and replacement for walking, especially in the internal and external environment. Wheelchairs and stretchers are the most common equipment used for transporting medical patients. Transferring patients from wheelchair to stretcher or bed is always an issue for the medical attendants or nurses. In addition, the risk of another injury to the patient during the process of moving patients from wheelchair to bed will also apply. Understanding the various issues regarding mobility equipment and introducing better design will be an asset to the medical field and helping hand to individuals with disabilities. Transferring patients from wheelchair to bed is a difficult task in the hospital. Which is currently used wheelchairs and stretchers design does not meet the needs of users.

To solve this problem, a wheelchair that can be deformed and merged with the bed has been created. Wheelchair invention is designed to reduce the risk of another injury to the patient, allowing the patient to move to a place and to facilitate the transfer of patients from wheelchair to bed. The original concept of wheelchair was taken from the designs already existing before, and this latest design concept has made improvements in terms of form and function for easy and comfortable to use by patients.

ABSTRAK

Apa yang kita ketahui, bilangan individu kurang upaya semakin meningkat setiap tahun. Alat bantuan pergerakan berguna untuk pesakit untuk pengangkutan dan gantian untuk berjalan terutamanya dalam persekitaran dalaman dan luaran. Kerusi roda dan pengusung adalah peralatan yang paling biasa digunakan perubatan untuk mengangkut pesakit. Memindahkan pesakit dari kerusi roda untuk pengusung atau katil perubatan sentiasa satu isu untuk atendan atau jururawat. Selain itu juga, risiko kecederaan lain kepada pesakit semasa proses pemindahan pesakit dari kerusi roda ke katil juga akan berlaku. Memahami pelbagai isu-isu mengenai peralatan mobiliti dan memperkenalkan reka bentuk yang lebih baik akan menjadi aset untuk bidang perubatan dan membantu tangan untuk individu kurang upaya. Memindahkan pesakit dari kerusi roda ke katil adalah tugas yang sukar di hospital. Yang pada masa ini digunakan kerusi roda dan reka bentuk pengusung tidak memenuhi keperluan pengguna.

Bagi menyelesaikan masalah tersebut, sebuah kerusi roda yang dapat diubah bentuk dan dicantumkan dengan katil telah dicipta. Ciptaan kerusi roda ini dibuat untuk mengurangkan risiko kecederaan lain kepada pesakit, memudahkan pesakit untuk bergerak ke sesuatu tempat dan untuk memudahkan proses semasa pemindahan pesakit dari kerusi roda ke katil. Konsep asal kerusi roda ini di ambil dari rekaan-rekaan yang telah sedia ada sebelum ini, dan konsep rekaan terbaru ini telah dibuat penambahbaikkan dari segi bentuk dan fungsi bagi memudahkan serta selesa untuk digunakan oleh pesakit.

DEDICATIONS

To my beloved parents of my life,

Mohd Zin Bin Mohamed and Saniyah Binti Mahmod,

for the great supports that both of you give for me.

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CHAPTER 1
INTRODUCTION

1.0 Background

The aim of this project is to study on transformation of wheelchair and extend the capability and usage of wheelchair. The wheelchair can be used as a bed for a patient called 2 in 1. The use of a wheelchair is suitable for patients who cannot stand disability and cannot walk to move from place to place. If the patient is to move the patient can make the bed into a wheelchair. In addition, it can reduce labour nurses to move the patients to beds. The task of transferring the patient needs a strong energy and sometimes it will give other risk of injury to the patient.

The main objective of this project is to create a wheelchair that can be changed and merged with the bed. This invention is easy to use by patients and did not need a strong energy during the transfer process from a wheelchair to a bed. While the patient is sitting in a wheelchair and he'd moved to the bed, the maid just has to change his wheelchair to the bed and pushed for inclusion on the other bed. The invention is very simple and safe to use and can avoid the risks of other injuries to the patient.

1.1 Problem Statement

The process for transferring patients who are unable to walk requires a wheelchair to facilitate the transfer. In addition, wheelchairs are also used to help patients to move from one place to another as to the toilet and widely available as in hospitals and at home. Wheelchair existing today may cause other injury risk to the patient during the transfer process performed by nurses. This is because the transfer process involves using a wheelchair for more than one person or need a lot of energy and will provide the strain on the patient.

The tasks of handling the transfer of patients sometimes occurs in a narrow environment and this will be a hard and uncomfortable to the patient. There are also several factors that cause difficulty in the transfer process as the patient's weight, standing on a narrow bed, a transplant and the patient's behaviour cannot be predicted. Another risk of injury to the patient will usually occur during the transfer of patients being transferred to stand for bed and wheelchair.

Risk of injury may also occur during surgery in the operating room at the hospital, a nurse while lifting a patient from a stretcher to be transferred to the surgical bed. The environment there is a lot of equipment operation will also cause difficulties discomfort for managing the transfer of patients.

1.2 Objective

The objective of this project is:

i. Design mechanism of the stretchable wheelchair for the patient.
ii. To fabricate the prototype.

1.3 Work Scope

i. To design of the stretchable wheelchair by using technical drawing software such as catia, solid work and auto cad software.
ii. To fabricate small scale prototype and the prototype is function.
iii. Semi-automation this project.
iv. For patients who cannot stand, disability and running.
v. Analysis

CHAPTER 2
LITERATURE RIVIEW

2.0 Introduction

Before starting a project, there are many aspects that need to be considered and reviewed carefully to ensure that a project is running smoothly. The study included from reference books, observations, discussions, and resources of the Internet. The project will be implemented based on the information obtained in order to run as a guide for carrying out the project. The study should be collected all the data or information obtained from a variety of sources to get the best results of the project. This is to ensure that the project will be produced to achieve the objectives and functioning properly.

2.1 Wheelchair

Wheelchair is equipped with a wheel. It comes in two types, namely manual and automatic movements. For manually, it is equipped with two large wheels at the back where the patient will turning the wheel to move his wheelchair. It also comes with a handle at the back to allow it to be rejected by others. For this type of automatic, it is equipped with an electric motor to drive the wheelchair. Wheelchairs are typically used by people who are difficult to walk because of illness, injury or disability to move.

Figure 2.1: A modern lightweight rigid-frame manual wheelchair.

2.2 History of Wheelchair

The discoveries of the earliest wheelchairs were found on the wall paintings in China in the 5th century BC. The first recorded using of a wheelchair was found in China in the third century later, where they use a wheelchair to move people and moved heavy objects. Around 525 CE, the image of a wheelchair used as a work of art by the Chinese people. After the arrival of Europeans to China, they used this technology during the German Renaissance.

In 1887, Atlantic City was introduced to wheelchair rolling as the vehicle used by tourists to enjoy the Boardwalk. In 1933, Harry Jennings and her disabled friend, Herbert Everest, who suffered spinal injuries during the accident mining work. Both are mechanical engineers, they have created a folding wheelchair made of mild steel. After his wheelchair ready created, they feel they have the potential to be sold to the public. They have conspired to make it more wheelchair as a business opportunity for them.

2.3 Types of Wheelchair

A basic manual wheelchair it combines a seat, rests legs and four wheels, two castor wheels at the front and two large wheels at the back. The two larger wheels on the rear hand rims usually have two metal or plastic circles about 3 or 4 inch. The hand rims has a diameter that is usually only slightly smaller than the wheel they are

placed. Most wheelchairs have two handles on the upper reaches back to allow the manual propulsion by someone else.

Other types of wheelchairs are often variations on this basic design, but can be highly customized to the needs of users. The upgrade includes seat dimensions, height, seat angle is also known as a place to sit, footrests, adjustable backrests and controls. Every manual wheelchairs available in two designs, namely folding or rigid. Type Rigid wheelchairs are growing in favor active users, has been permanently welded joints and many fewer moving parts. This reduces the energy needed to push the seat by removing the seat that will flex as it moves. Welding joints also reduces the overall weight of the chair. Rigid seat normally produce immediately release the wheel back and backrests that fold down flat, allowing users to quickly remove the seat for storage in the car.

Many models are rigid at this time created with ultra-light materials such as aluminum and titanium. One of the major manufacturers, Tilite, built solely ultra-lights. Another innovation in the style of rigid chairs is that the shock absorber assembly compound. The shock absorbers can also be in addition to the front wheels or to the rear wheel, or both. Rigid seat even have the option to have a camber his rear wheel. Wheels will have a camber, or tilt, the angle of made hit wheel in the direction of the chair. This allows for higher propulsion by users who desire long-term users. Wheelchair sports have massive camber angle for improved stability.

Various accessories are offered, such as anti-tip bars or wheels, safety belts, adjustable backrests, tilt and or recline features, extra support for limbs or neck, mounts or carrying devices for crutches, walkers or oxygen tanks, drink holders, and protective clothing were brought. Wheelchair with four small wheels, this chairs are designed to be pushed by a caregiver to provide mobility for patients to use at hospitals or outside the home. Experiments have also been made with unusual variant wheels, like the omniwheel or the mecanum wheel. These allow for a broader spectrum of movement.

Figure 2.2: Wooden wheelchair dating to the early part of the 20th century.

2.3.1 Manually Propelled of Wheelchair

Type of manual wheelchair is driven by manpower where it is pushed in the back by someone. There are many types of wheelchairs kind of manual that can be folded for easy it is stored. It also can be powered solely by the patient by turning the two large rear wheels which usually measures 24 inches to 60 inches and it resembles a bicycle wheel. Users will confuse the two large wheels that are handrims to him, it is made from round tube attached to the outside of the big wheels and in doing other than their metal and plastic. The handrims size slightly smaller than the size of the rear wheels.

To move the wheelchair forward or backward, the patient must hold both sides of the handrims. If the patient wants to turn right or left, the patients only have to turn one of the handrims either right or left. In addition, there are also some types of wheelchairs are designed to allow patients to move it using only one or both feet instead of using the rim.

2.3.2 Electric-powered of Wheelchair

Electric wheelchairs are generated by using an electric motor to turn the wheels to move it. This type of wheelchair is easy to use and it does not need others to push from behind. To control its movement, patients only need to use a joystick mounted on the armrest.

For this type of wheelchair, the price is more expensive compared to a manual type. In addition, the cost to use it is also very high because we must always maintain the motor that turns the wheels from damage.

2.3.3 Other Variants of Wheelchair

A dynamic tilt wheelchair seating surface that can be tilted to various angles. It was developed by an orthotics, Hugh Barclay, who works with disabled children and found postural defects such as scoliosis can be supported or partially corrected by enabling wheelchair users to rest in an inclined position. Created in Kingston, Ontario, Canada in the early 1980s, the dynamic type of tilt wheelchair is now manufactured by several companies and used globally. This revolutionary design adapted wheelchairs provide individuals with complex health needs the opportunity for increased mobility.

Fixed a wheelchair is one that supports the user in an almost standing position. They can be used as both a wheelchair and a standing frame, which allows the user to sit or stand in a wheelchair they want. They often go from sitting to standing with hydraulic or electric powered pumps help. Several options are available with the manual model and boost the standing of power, while others have full power, tilt, recline and variations of existing power stand function as a means of rehabilitation medicine. The benefits of such a device include, but are not limited to helping independence and productivity, improve self-esteem and psychological well-being, while enhancing social status, expanding access, relieve stress, decrease pressure sores, outreach work, breathing better, reduce the occurrence of UTI,

flexibility better, helps maintain bone mineral density, improved passive range of motion, reduction in abnormal muscle tone and spasticity, and skeletal defects.

2.3.4 Sports Variants of Wheelchair

Disabled athlete uses a wheelchair sports for disabled sports that require speed and agility, such as basketball, rugby, tennis, racing and dancing. Each wheelchair sport tends to use a particular type of wheelchair, and no longer look like their everyday cousins. They are usually not as much to improve rigidity, with significant negative camber to the wheels that provide stability during a sharp turn and made of composite, lightweight materials. Wheelchair sports are not generally to be used every day, and often the two seats specifically for use in sports, although some users prefer the sport of choice for every day.

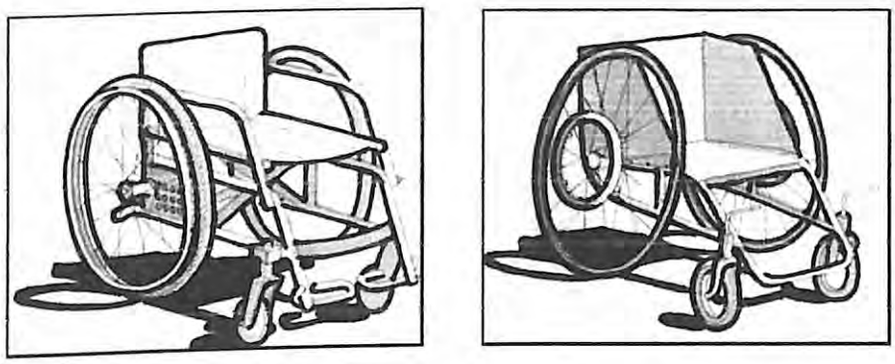

Figure 2.3: Two Designs of Sports Chairs.

A feature found on most sports seats, but not on other types of easy adjustment of seat height and wheelbase extended by positioning plate to the rear wheels. In many models caster wheel position can also be adjusted. These adjustments are, of course, allows the user to sit in a position that puts the muscles in your legs and shoulders above the optimum setting for maximum biomechanical efficiency.

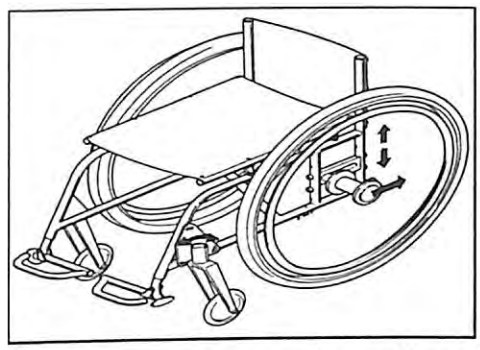

Figure 2.4: Schematic Showing Adjustability Often Found in Sport Chairs.

2.3.4.1 Power chair Football or Power Soccer

The new venture has been developed for users power chair or power chair football is called soccer. It is the only competitive team sports for power chair users. Federation International de Power chair Football Association (FIPFA) regulate the sport and is located in Paris, France with allied countries throughout the world.

Figure 2.5: US versus France, FIPFA World Cup, Tokyo, Japan, October 2007.

2.4 All Terrain Variants of Wheelchair

All terrain wheelchairs that allows the user to enter the water and provide better mobility in the sand on the beach and uneven, and even snow. Adjustment common in different designs is that they have a wider wheel or tire, to increase stability in the region is uneven or unsteady. Tire width in wheelchairs snow, for