

WHEEL CHAIR CUM STRETCHER IN HOSPITAL

Harishkumar .M¹, Mukilan .M², Lokeshwaran .R³

^{1,2}

UG Student, Bannari Amman Institute of Technology, Sathyamangalam, Erode638401India

³ Assistant Professor, Bannari Amman Institute of Technology, Sathyamangalam, Erode638401 India

Abstract: The main aim of our project is to build an automatic wheel chair cum bed which acts as both wheel chair and when as stretched it can be used as a bed. The wheel chair cum bed model is a mechanism which is used for moving the bed up and down. This is used for handicapped person for in order to lead a normal life as other persons do. For making the handicapped person's job easy (i.e., they can move bed up and down). Switches are used to control the wheel chair.

The wheel chair is particularly used for the physical disabled persons. It can be used for taking books from the self, taking dress from the self's and this also can be used for cooking. The stretching movement of the wheel chair is done by and a motor mechanism. This arrangement is fixed in the wheel chair bed. The power supply to the motor is given by using battery. Also the movement of the wheel chair automated by delivering motion to the wheels of the chair with the help of the motor operated by a battery and by using the screw rod sprocket and the chain drive mechanism.

Keywords: screw rod, screw rod sprocket and chain drive mechanism.

1. INTRODUCTION

In this the first wheel chair which was identified was for moving bed manually or by the other person. At present, it is need for advanced in this type because physical disabled person cannot depend on mostly others to help him.

So far they have adapted moving in this. But to find a change in this system we have introduced our projects the requirements are fulfilled in our project thus the requirement of the handicapped is solved through this project. That is why we have chosen the wheel chair cum bed for handicapped as our project. The project which we have selected is to reduce the human needs for the physical disabled person. For the person sitting on the chair should have to move bed in the constant speed. By using the wheel chair cum bed we can move bed the handicapped person easily. The cost this wheel chair costs a little bit higher than the wheel chair has facility of moving bed.

2. LITERATURE REVIEW

[1]The problem of transfer patients exists from ancient times. People who got seriously injured or ill, were carried by others by means of wooden stretcher with cloth or leather tied to it. Later they were carried on wheels which reduced the effort of the people carrying them. Today the problem still exists. Though we have evolved in the field of healthcare and technology we are not yet able to address the problem efficiently.

3. COMPONENTS AND DESCRIPTION

The major parts that are effectively employed in the design and the fabrication of the automatic wheel chair cum bed are described below:

- Battery,
- Motor,
- Frame,
- Sprocket and the chain drive.
- Wheel chair setup,
- Lead screw.

3.1 Battery

In isolated systems away from the grid, batteries are used for storage of excess solar energy converted into electrical energy. The only exceptions are isolated sunshine load such as irrigation pumps or drinking water supplies for storage. In fact for small units with output less than one kilowatt. Batteries seem to be the only technically and economically available storage means. Since both the photovoltaic system and batteries are high in capital costs. It is necessary that the overall system be optimized with respect to available energy and local demand pattern. To be economically attractive the storage of solar electricity requires a battery with a particular combination of properties:

- (1) Low cost
- (2) Long life
- (3) High reliability
- (4) High overall efficiency
- (5) Low discharge
- (6) Minimum maintenance
 - (A) Ampere hour efficiency
 - (B) Watt hour efficiency

We use lead acid battery for storing the electrical energy from the solar panel for lighting the street and so about the lead acid cells are explained below.

3.1.1 lead-acid wet cell

Where high values of load current are necessary, the lead-acid cell is the type most commonly used. The electrolyte is a dilute solution of sulfuric acid (H₂SO₄). In the application of battery power to start the engine in an auto mobile, for example, the load current to the starter motor is typically 200 to 400A. One cell has a nominal output of 2.1V, but lead-acid cells are often used in a series combination of three for a 6-V battery and six for a 12-V battery.

The lead acid cell type is a secondary cell or storage cell, which can be recharged. The charge and discharge cycle can be repeated many times to restore the output voltage, as long as the cell is in good physical condition. However, heat with excessive charge and discharge currents shortens the useful life to about 3 to 5 years for an automobile battery. Of the different types of secondary cells, the lead-acid type has the highest output voltage, which allows fewer cells for a specified battery voltage.

3.2 Motor

An electric motor is a machine which converts electrical energy to mechanical energy. Its action is based on the principle that when a current-carrying conductor is placed in a magnetic field, it experiences a magnetic force whose direction is given by Fleming's left hand rule.

When a motor is in operation, it develops torque. This torque can produce mechanical rotation. DC motors are also like generators classified into shunt wound or series wound or compound wound motors.

3.2.1 Fleming's Left Hand Rule

Keep the force finger, middle finger and thumb of the left hand mutually perpendicular to one another. If the fore finger indicates the direction of magnetic field and middle finger indicates direction of current in the conductor, then the thumb indicates the direction of the motion of conductor.

3.2.2 Principle Of Operation Of Dc Motor

Figure I show a uniform magnetic field in which a straight conductor carrying no current is placed. The conductor is perpendicular to the direction of the magnetic field.

In figure II the conductor is shown as carrying a current away from the viewer, but the field due to the N and S poles has been removed. There is no movement of the conductor during the above two conditions. In figure III the current carrying conductor is placed in the magnetic field. The field due to the current in the conductor supports the main field above the conductor, but opposes the main field below the conductor.

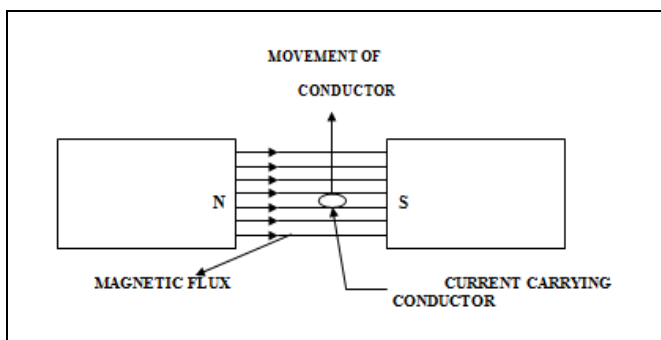


Fig -1: Principle Of Operation Of Dc Motor

3.3 Frame

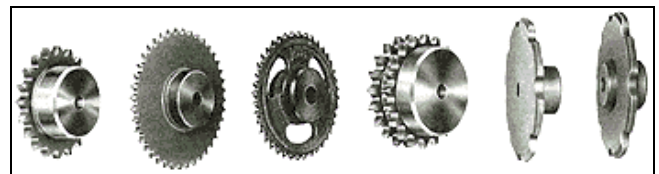
This is made of mild steel material. The whole parts are mounted on this frame structure with the suitable arrangement. Boring of bearing sizes and open bores done in one setting so as to align the bearings properly while assembling. Provisions are made to cover the bearings with grease.

3.4 Sprocket and the Chain Drive

This is a cycle chain sprocket. The chain sprocket is coupled with another generator shaft. The chain converts rotational power to pulling power, or pulling power to rotational power, by engaging with the sprocket.

The sprocket looks like a gear but differs in three important ways:

- Sprockets have many engaging teeth; gears usually have only one
- The teeth of a gear touch and slip against each other; there is basically no slippage in a sprocket.
- The shape of the teeth is different in gears and sprockets.



Engagement with Sprockets

Although chains are sometimes pushed and pulled at either end by cylinders, chains are usually driven by wrapping them on sprockets. In the following section, we explain the relation between sprockets and chains when power is transmitted by sprockets.

Back tension

First, let us explain the relationship between flat belts and pulleys. Figure 2.5 shows a rendition of a flat belt drive. The circle at the top is a pulley, and the belt hangs down from each side. When the pulley is fixed and the left side of the belt is loaded with tension (T_0), the force needed to pull the belt down to the right side will be:

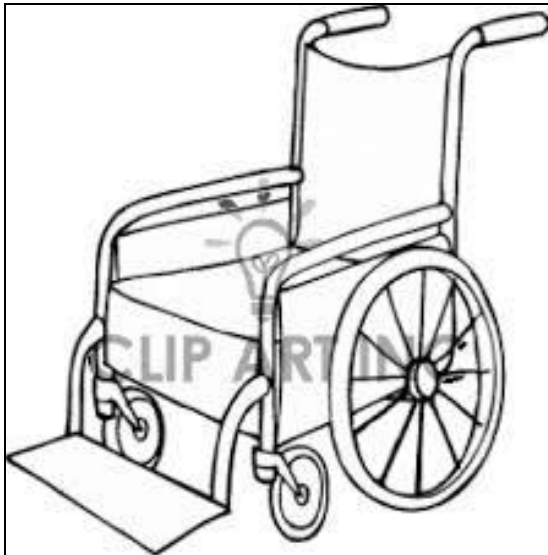
$$T_1 = T_0 e^{\mu \theta}$$

For example, $T_0 = 100 \text{ N}$; the coefficient of friction between the belt and pulley, $\mu = 0.3$; the wrap angle $\theta = \frac{1}{4} (180)$.

$$T_1 = T_0 e^{3 \cdot 2.566} = 256.6 \text{ N}$$

In brief, when you use a flat belt in this situation, you can get 256.6 N of drive power only when there is 100 N of back tension.

3.5 Wheel Chair Setup



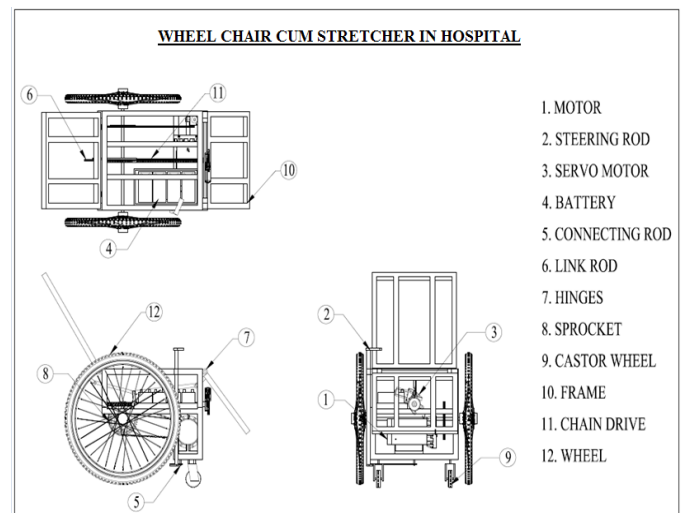
A wheelchair is a chair with wheels. The device comes in variations allowing either manual propulsion by the seated occupant turning the rear wheels by hand, or electric propulsion by motors. There are often handles behind the seat to allow it to be pushed by another person. Wheelchairs are used by people for whom walking is difficult or impossible due to illness, injury, or disability. People who have difficulty sitting and walking often make use of a wheel bench.

A basic manual wheelchair incorporates a seat, foot rests and four wheels: two, castor wheels at the front and two large wheels at the back. The two larger wheels in the back usually have handrims; two metal or plastic circles approximately 3/4" thick. The handrims have a diameter normally only slightly smaller than the wheels they are attached to. Most wheelchairs have two push handles at the top of the back to allow for manual propulsion by a second person.

Other varieties of wheelchair are often variations on this basic design, but can be highly customised for the user's needs. Such customisations may encompass the seat dimensions, height, seat angle (also called seat dump or squeeze), footrests, leg rests, front castor outriggers, adjustable backrests and controls. Everyday manual wheelchairs come in two major designs—folding or rigid. The rigid chairs, which are increasingly preferred by active users, have permanently welded joints and many fewer moving parts. This reduces the energy required to push the chair by eliminating many points where the chair would flex as it moves. Welding the joints also reduces the overall weight of the chair. Rigid chairs typically feature instant-release rear wheels and backrests that fold down flat,

allowing the user to dismantle the chair quickly for storage in a car.

3.6 Lead Screw



A lead screw, also known as a power screw or translation screw, is a screw used as a linkage in a machine, to translate turning motion into linear motion. Because of the large area of sliding contact between their male and female members, screw threads have larger frictional energy losses compared to other linkages. They are not typically used to carry high power, but more for intermittent use in low power actuator and positioner mechanisms. Common applications are linear actuators, machine slides (such as in machine tools), vises, presses, and jacks.

Lead screws are manufactured in the same way as other thread forms (they may be rolled, cut, or ground).

A lead screw is sometimes used with a split nut which allows the nut to be disengaged from the threads and moved axially, independently of the screw's rotation, when needed (such as in single-point threading on a manual lathe).

We use lead screws in this project for achieving the vertical and horizontal movement of the tools. Also is used for fixing and releasing the tool in the vice.

4. WORKING PRINCIPLE

The advanced wheel chair for handicapped consists of a screw rod arrangement. This arrangement is used for stretching and retracting the wheel chair. A motor which is coupled with screw rod transmits power to the screw rod.

The wheel chair can be used as conventional wheel chairs which has rollers at the bottom for moving from one place to other which is operated by a motor and chain drive mechanism. When it is to be stretched, the button is activated which powers the motor and the motor delivers power to the screw rod. The motor drives the screw rod arrangement which is coupled to the upper and lower bed of the wheel chair which stretches as a bed and it can be used for sleeping and other purposes. When the motor is rotated in the opposite direction, the stretcher retracts and acts as a normal wheel chair. The steering controlling of the movement of the wheel chair is done with the help of the handle which is connected to the front wheels of the wheel chair.

5. Applications

These types of automatic wheel chair cum beds have a wide range of applications in the fields like,

- All physically challenged people.
- Highly useful for senior citizens.

6. PRODUCT DESCRIPTION

SPECIFICATION

6.1D.C MOTOR

- ✓ VOLT: 12V D.C
- ✓ WATTS: 90W
- ✓ RPM: 60 RPM

6.2BATTERY

- Material : Lead-Acid Free maintenance Battery
- Output Voltage : 12 V D.C
- Output Power : 40 Ampere-Hour

7. Conclusion

The present study was intended to develop a concept for a automatic wheelchair- cum- stretcher, with the motivation of saving space and precluding exertion by the patient. By provide remote control for the ease of patient to move without being dependent on anyone or applying extra force for movement. Also to remove difficulties for shifting patients from stretchers to wheelchair.

8. REFERENCE

- [1]An Integrated Decision Making Model for Evaluation of Concept Design:<http://ctn.cvut.cz/ap/>, ActaPolytechnica Vol. 44 No. 3/2004, Czech Technical University Publishing House
- [2]Bariatric Bed: <http://www.camtecproducts.com/3954b.html>, Camtec
- [3]Dr. S. Ray, "Disabled Persons in India",
- [4]Spinal Cord Injury; Available from: www.apparelyzed.com, August 2007
- [5]Guidelines & Space Standards for Barrier Free Built Environment for Disabled & Elderly People" By Central Public Works Department of India

BIOGRAPHIES



Harishkumar.M currently pursuing BE Mechanical Engineering at Bannari amman Institute of Technology.



Mukilan.M currently pursuing BE Mechanical Engineering at Bannari amman Institute of Technology.



Lokeshwaran R received his B.E. degree in Mechanical Engineering from Jansons Institute of Technology in 2013 and M.E. degree in Heat Power Engineering from Coimbatore Institute of Technology in 2016.He is presently working as an Assistant Professor in the Department of Mechanical Engineering at Bannari Amman Institute