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A Stacking Mechanism for Physically Challenged People

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Abstract: ***Disability refers to a physical, sensory or mental limitation that interferes with person's ability to move, to see, to hear or to handle equipment. This Study deals with specially challenged people with disabilities in lower limbs. To minimize this limitation, A Stacking Mechanism can be introduced. This Mechanism can be either call it by Stacking Machine or for specified purposes like a Book Stacker or Household Kitchen, etc. This study uses different gears for the process. A Platform will be provided to perform linear horizontal and vertical movement and for stacking purposes. Both of the gear can be simply operated by a handle. So the person who can't reach on a certain height can easily access that location manually. The Purpose of this research is to provide the accessibility for a disabled person on some extend using Mechanical Engineering Concepts and Electrical Engineering Concepts. Further on his can be automated so that human handling can be avoided.***

Keywords: Disability, Gears, Mechanical Engineering

1. Introduction

From the 17th century to the 21th century, Research has been done for physically disabled people has limited to the semi-automatic wheel chair to the fully Automatic wheel chair and exo-skeleton. The intension of work is basically concentrated to move the physically challenged people. The intention of our work is to help physically challenged people by creating equipment which can move for them when they cannot. So the research done here is basically concentrating to provide them the power to physically challenged people to move object from a certain height to certain height. Research done here concentrates on providing the physically challenged with an additional aid to help them to move object to heights. This will provide them greater opportunities to tackle things easily. This will also help in increasing job opportunities for them. This machine will lead to handicapped person to a new step. And as disability refers to physical limitation and by this research limitation is minimized.

Figure 1

2. Experimental Overview

Apparatus and materials used:

Gears used in this experiment are Rack and pinion, spur gears, screw lift and worm wheels.

Wooden sheets for supporting and building platform.

Gears are the toothed wheel that works with others to alter the relation between the speed of a driving mechanism (such as the engine of a vehicle) and the speed of the driven parts (the wheels).

Figure 1.1

Since Gears are of different types:

1. Spur Gear
2. Helical Gear
3. Herringbone Gear
4. Bevel Gear
5. Worm Gear
6. Rack and Pinion
7. Internal and External Gear
8. Face Gear
9. Sprockets

1) Spur Gear: Parallel and co-planer shafts connected by gears are called spur gears. The arrangement is called spur gearing. Spur gears have straight teeth and are parallel to the axis of the wheel. Spur gears are the most common type of gears. The advantages of spur gears are their simplicity in design, economy of manufacture and maintenance and absence of end thrust. They impose only radial loads on the bearings. Spur gears are known as slow speed gears. If noise is not a serious design problem, spur gears can be used at almost any speed.

2) Rack and Pinion: A rack is a toothed bar or rod that can be thought of as a sector gear with an infinitely large radius of curvature. Torque can be converted to linear force by meshing a rack with a pinion: the pinion turns; the rack moves in a straight line. Such a mechanism is used in automobiles to convert the rotation of the steering wheel into the left-to-right motion of the tie rod(s). Racks also feature in the theory of gear geometry, where, for instance, the tooth shape of an interchangeable set of gears may be specified for the rack (infinite radius), and the tooth shapes for gears of particular actual radii then derived from that. The rack and pinion gear type is employed in a rack railway.

3) A screw: is a mechanism that converts rotational motion to linear motion, and a torque (rotational force) to a linear force. It is one of the six classical simple machines. The most common form consists of a cylindrical shaft with helical grooves or ridges called threads around the outside. The screw passes through a hole in another object or medium, with threads on the inside of the hole that mesh with the screw's threads. When the shaft of the screw is rotated relative to the stationary threads, the screw moves along its axis relative to the medium surrounding it; for example, rotating a wood screw forces it into wood. In screw mechanisms, either the screw shaft can rotate through a threaded hole in a stationary object, or a threaded collar such as a nut can rotate around a stationary screw shaft. Geometrically, a screw can be viewed as a narrow inclined plane wrapped around a cylinder.

3. Calculations

Gear tooth Vernier caliper used to measure the depth of tooth.

LC: 0.02mm

Pitch Diameter= (AD+DD)/2

Table 1

Gear Used	AD	DD	Tool Width	Tool Depth
Rack and Pinion	G3: 139.9 S: NA	G3: 122.3 S:NA	G3: 3.3 S: 3.2	G3:2.3 S:2.3
Spur Gear	G1: 51.6 G2: 16.7	G1: 43.58 G2: 15.9	G1: 3.3 G2: 3.2	G1: 2.2 G2: 1.7

Table 1.1

Gear Used	AD	DD	Tool Width	Tool Depth
Rack And Pinion	G3: 139.9 S: NA	G3:122.3 S: NA	G3: 3.3 S: 3.2	G3:2.3 S:2.3
Screw Lift	13.76	11.32	NA	NA

Depth of tooth is measured from Pitch circle.

** Module = (Pitch circle) / (Tooth circle)
Module is the cutter thickness which cut the slots in the material to make it gear.
*Profile Projector is used to get the pitch of Screw lift.

Table: 1.2

Gear Used	No. Teeth	Pitch Circular Diameter	Module Pitch
Rack and Pinion	G3: 63	G3: 127.3	G3: 2.02
Spur Gear	G1: 26 G2: 90	G1: 47.59 G2: 163	G1: 1.83 G2: 1.81
Screw Lift	NA	Pitch= 1.90	NA

4. Experimental Procedure

The ninety percent (90%) of this world is totally dependent upon gears. from car to aircraft. From a machine used in home to machine installed in industries. This Machine is also fully dependent on gears. Several gears are used for several processes. A platform is provided is to reserve the object on it and place it to any certain height safely without any damage.

A Handle (1) is provided downward to control the movement of platform in the vertical position. This handle (1) is attached to spur gear which is then attached to worm lift which fixed to platform.

As shown in Figure (1.2) and Figure (1.3) On operating the handle (1), spur gears are moved which result in rotating the worm lift, which in turn results in the platform moving vertically.

The Handle (2) provided is used to control the movement of the platform in the horizontal position. Handle (2) is attached to a triangular shaft which is fixed with the Rack and Pinion gear.

On rotating the handle (2), the shaft heading to the rack rotates moving the pinion horizontally with the platform as shown in figure 1.4.

Figure 1.2

Figure 1.3

Figure 1.4

5. Uses and Application

This Machine can be installed at:

1. Library
2. Kitchen
3. Godowns
4. Workplace

6. Research and Scope

For further research, gap is provided

1. To make the machine fully automatic,
2. Introducing the camera,
3. Removing the object from certain height.

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