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Modification of the Two Wheeler Vehicle for Physically Challenged Persons

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ABSTRACT: According to the census of 2001, in India the population of physically challenged people was about 21,906,769 which are about 2.1 Percent of the total population out of which 12.6 million are males and 9.3 million are females. In this the people who have disability in movement makes up to 6,105,477 which is about 0.6% of the total population. People with disability in their legs are able to drive a physically challenged vehicle designed with dummy rear axle. It is not possible for a person with disability in their hands to drive such a vehicle as the vehicle's control system is present in the hands. For a hand disabled person driving a vehicle is possible by legs will be possible if the entire vehicle's control is transferred to legs. The leg-operated vehicle is fabricated by using simple mechanisms for steering, acceleration and braking which will enable the person to drive the vehicle.

KEYWORDS:Two-wheeler, Leg-operated vehicle, Steering, Physically challenged vehicle.

I. INTRODUCTION

Disability in humans may be caused during birth which may be of physical, cognitive, mental, emotional and developmental. The disability in humans may be a physical disability, sensory disability, and vision impairment, olfactory and gustatory impairment. According to a survey conducted by the National sample survey Organization conducted during the period of July–December 2002, it was found that the number of people having locomotion disability alone was found to be 23,557 in the rural areas and 14099 in the urban areas. The people with disability in movement are able to travel from one place to another by driving a vehicle tri-cycle designed for physically challenged or a two-wheeler vehicle with Continuously Variable Transmission with dummy rear axle which will give a balance for the driver

II. MATERIAL SELECTION AND DESIGNING OF PARTS

Material selection are the important parameter for designing a Vehicle.AISI 1018 mild steel has excellent weldability and it is considered to be the best steel for carburised parts. It offers a good balance of toughness, strength and ductility. AISI 1018 hot rolled steel also includes improved machining characteristics and Brinell hardness. AISI 1018 mild/low carbon steel can be instantly welded by all the conventional welding processes. Welding is not recommended for AISI 1018 mild/low carbon steel when it is carbonitrided and carburized.The Ultimate tensile Strength of Mild steel is 440N/mm^2 yield stress is 250N/mm^2[7]

The type of welding employed is Arc welding. It uses an welding power supply to create an electric arc between an electrode and the base material to melt the wetals at the welding point. The welding region is protected by shielding gas, vapour, or slag.[8] This type of welding is cheaper and the equipment cost is low. This welding is best suited for mild steel AISI 1018.

AISI 1018 mild/low carbon steel has excellent weldability and produces a uniform and harder case and it is considered as the best steel for carburized parts. AISI 1018 mild/low carbon steel offers a good balance of toughness, strength and ductility. Provided with higher mechanical properties, AISI 1018 hot rolled steel also includes improved machining characteristics and Brinell hardness.

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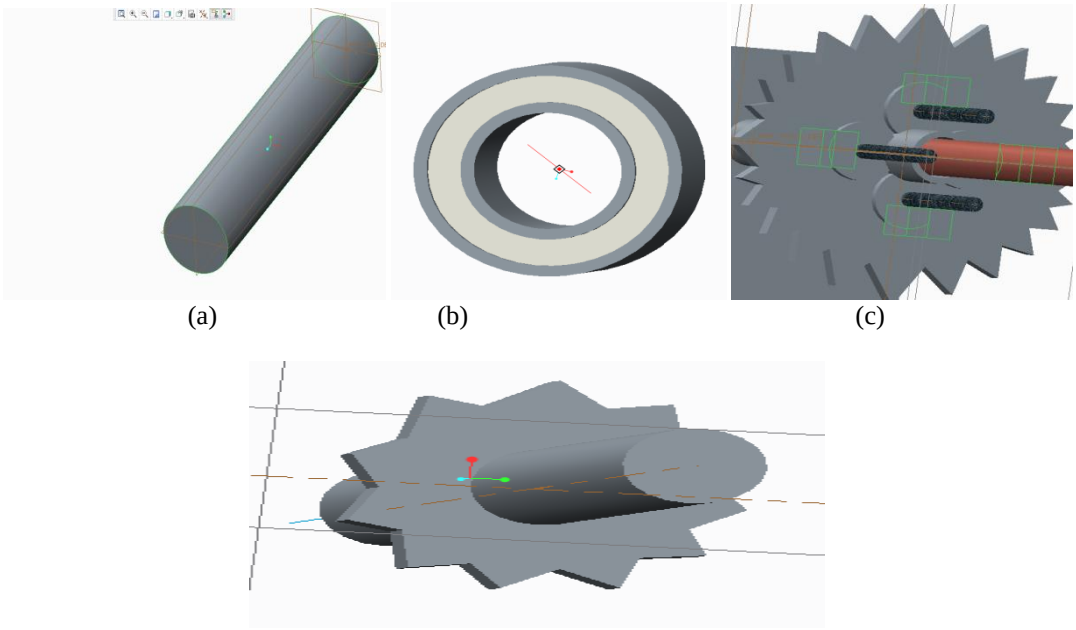
Before fabricating a two wheeler vehicle the components which are used for fabrication are designed using CREOsoftware. Solid shaft is generally used for transmitting the power. The shaft is a rigid component and is capable of withstanding heavy loads. It finds wide use in automotive industry in the transmission unit. The solid shaft is attached to the base of the vehicle and it is mounted in the vertical direction.The ball bearings are a rolling element bearing. Its purpose is to reduce the friction. One race is stationary and the other is a rotation element.The gear used is spur gear. The gear is used for the transmitting the motion from one element to other. The gears are used for the purpose of obtaining the speed variations.The smaller gear used is a spur gear. The smaller gear is used for transmitting the motion. The pitch of the larger and the smaller gear is the same. This gear due to its smaller size completes the rotation faster when compared to a larger gear.A rack is a type of linear actuator which converts the rotational motion into a linear motion. The rack having the uniform pitch as that of the gears is chosen. All the components are successfully designed using CREO Software and they are analyzed whether it is suitable for fabricating Vehicle.



(a) (b) (c)

(d)

Fig. 1.Parts Designed using CREO Software (a) Solid shaft(b)Ball bearing(c) Larger gear(d) Smaller gear

III. MODIFICATION OF TWO WHEELER VEHICLE

This section depicts the Cad model of the mechanism which was done using CREO Parametric 2.0 software. The figure 3 depicts the proposed design of the mechanism.

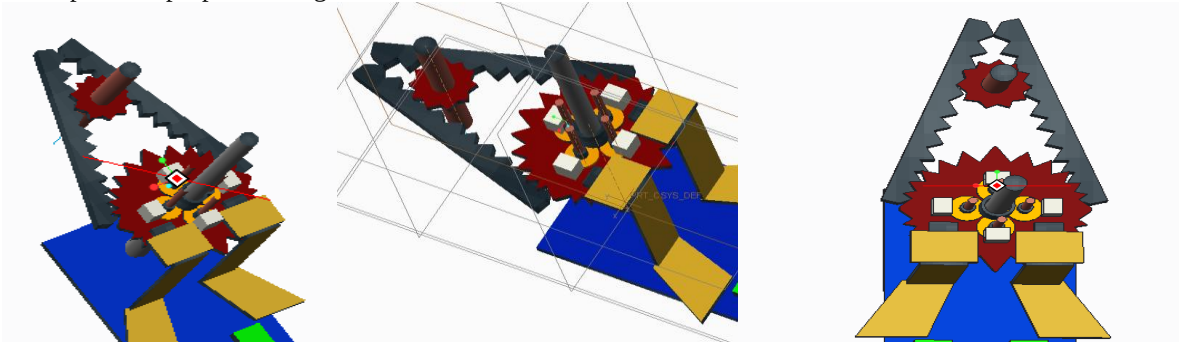


Fig. 2. Proposed Design Fig. 3. Oblique view Fig. 4. Top view

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The two-wheeler vehicle chose which is having a continuously variable transmission. The vehicle is fitted with dummy rear axles by means of angle plates and shaft bolts. The suspensions are fitted on either side of the vehicle for enabling the dummy wheels to withstand the dynamic loading conditions. The solid shaft which is made of mild steel material is taken and it is welded to the base of the vehicle. The shaft is mounted in the perpendicular direction. The shaft is checked for the uniformity in cross section and it is subjected to turning operation and it is finished by polishing with abrasive sheets.

This is done so that the outer diameter of the shaft fits tightly to the inner diameter of the ball bearing. The outer race of the ball bearing is now fixed. The outer race of the ball bearing is fitted tightly with the inner side of the larger gear. Now when the larger gear is rotated the bearing rotates along with it. The smaller gear which is having the same pitch of the larger gear is chosen. It is welded on the fork of the front wheel. The two gears are aligned in such a way that they are in straight line. Two racks having the same length and pitch as that of the gears are chosen. The racks are made to contact with the two gears at an angle such that they mesh with the larger and smaller gear.

The gears and the racks are mounted on a sheet of mild steel of 14" gauge and it is cut into the required shape using oxy-acetylene gas such that it supports the gear and the rack. The rack is welded with plates to arrest its movement and to avoid the mechanism from moving out of place. Two hex key bolts are taken and they are welded on their bolt heads on the larger gear. The threaded side of the bolts is facing the upper side. Two angular plates having the same length and thickness are bent in uniform shape. The ends are drilled to the diameter of the hex bolt and are inserted in the bolts and tightened with the help on nuts. The angular plates now act as the foot rest for the driver. The acceleration and braking pedals are fabricated on the foot rest. The pedals are fitted with springs so that they have easy retraction when they are subjected to movement. The braking and acceleration lines are given to the braking and acceleration pedals mounted on the left and right sides respectively. A circular plate is fitted with the switches and the plate is drilled to fit in the hex bolts. This means that the entire control system of the vehicle is now transferred near the foot of the driver.

Fig. 5. Fabrication of the shaft to the base

Fig. 6. Mounting of the rack on the gear

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IV. WORKING AND CONCLUSION

The driver is seated in the vehicle with the foot on the foot rest on the either direction. The driver will be able to accelerate the vehicle by his right foot and the braking is done using the braking pedal with his left foot. To control the direction of motion when the driver steers the vehicle, he turns the foot rest which is mounted on the larger gear by means of bolts. The larger gear rotates the rack on both the sides. The rack turns the smaller gear which is welded on the fork of the vehicle. The fork of the vehicle turns the wheel to the direction of motion. This method is advantageous than a manual chain drive as it does not get loosened over a period of time. The physically challenged vehicle for disabled was fabricated using a two wheeler CVT vehicle. The vehicle was designed for driving with legs so that a person with the disability in their hands could control the vehicle.

(a)

(b)

(c)

Fig. 7.Prototype (a) Side view of the prototype(b)Base and brake pedal(c) Gear meshing with the rack

REFERENCES

1. V.B,Bandari "*the design of machine elements"*. 3rd edition, Publisher, Tata McGraw-Hill reprinted in 2010.
2. PSG College Of Technology "Design Data ", publisher, Kalaikathir Achchagam, reprinted 2012.
3. Travel Patterns of Older Americans with Disabilities, United States department of transportation, BTS publications.
4. Transportation Availability and Use Study,(for Persons with Disabilities), U.S. Department of Transportation,Bureau of Transportation Statistics2002.
5. National Sample Survey Organization Ministry of Statistics and Programme Implementation Government of India December 2003.
6. khk 3010 catalog gear guide gear technical reference.
7. en.wikipedia.org/wiki/Strength_of_materials.
8. en.wikipedia.org/wiki/Strength_of_materials