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A Review of Heavy Duty SEGWAY with Forklift

S.Vijay¹, S.Vijaysabarish¹, A.Sundaravaradhan¹, M.Thiruvartselvan¹ K.Robinston²,

S.Joe Patrick Gnanaraj²

Final year students, Department of Mechanical Engineering, Francis Xavier Engineering college, Tirunelveli,

Tamil Nadu, India ¹

Professor, Department of Mechanical Engineering, Francis Xavier Engineering college, Tirunelveli, Tamilnadu, India ²

ABSTRACT: In this project work, two wheeled and two small supporting wheel self-balancing as well as manually balancing Mechanical Segway vehicle is prepared which is also known as a personal transport Segway . The one system is able to operate in transporter mode. The system consist of forward motion and 360 degree rotation movement when the driver operating accelerater in transporter mode in order to stabilize body. This is the general description of normal forklift truck. In Institute of colleges small goods cannot move around easily by any human body, so to fill these need we have purpose a pedal operated forklift to lift and transport such medium weight goods. It is a fast, efficient and low power consumption vehicle that does not require much space to move around.

KEYWORDS: Forklift trucks, Chain drive mechanism, 360 degree rotation, visibility and human safety.

I. INTRODUCTION

In this project, “MECHANICAL SEGWAY” robot has been built as a part of the course applied control and mechanical and electronics fusion. The goal of this project to everyone know about the Segway how is too manufactured or fabrication and how is the working system of the Segway and another one is the how is to ride and balance of the Segway vehicle.

By using switch, controller & control units, and electric supply go forward and move in 360 degree rotation easily with the help of perfect balancing. The forklift is operated by manual chain drive mechanism.

II. EXPERIMENTAL SETUP

Fork

The dimension of fork is 125x18x5mm. The material selected Mild steel. The max load carrying capacity is 50N.

Shaft

The dimension of the shaft is 25 mm diameter and 500 mm length. The material selected is Mild steel. It is an interconnection between primary and secondary chain drive.

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Bearing

SKF 618/6 bearing is selected which is having I.D. 25 mm and O.D. 50 mm.

Spur gear

Two spur gears are used:

1. Spur gear are 22 Teeth
2. Spur gear are 30 Teeth

. Principles of heavy duty Segway with forklift

The main purpose was to design and construct a fully functional two wheeled balancing vehicle which can be used as a means of transportation for a single person. It should be driven by natural movements; forward and 360 degree rotation motion should be achieved by leaning forwards and 360 degree rotation motion.

Turning should be achieved by tilting the handlebar sideways. To provide untethered operation the vehicles' energy source was designed to be a battery. One of the goals was to Implement easy recharging of this battery.

Here we used the forklift by chain drive mechanism to lift up and down. And then we used stopper the load by weight lifting rod. Here no motors were used for weight lifting, only we can apply human force to lift the weight.

Mechanical Segway presents the results of the project. First comes a short discussion on the implementation of the balancing without using any type of programming and sensors. When testing the vehicle for the first time the controller gains were significantly lower as a precaution. This test was mainly performed to see that the system functioned as intended, spinning the wheels in the right and left direction etc. after this was confirmed the first riding test was conducted, and already with this controller the vehicle was drivable. The control strategy with the remaining error serving as a source for speed turned out to be a success and speed control by using DPDT switch forward and backward worked well. It can be used as personal transportation vehicle and forklift vehicles.

By maintaining balancing weight to lift up and moves forward motion by chain drive mechanism by applying a manual power without any motor.



Fig (a). Heavy-duty Segway

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Fig (b). Fork lift with chain drive mechanism

DESIGN & CALCULATION

Design of shaft

Selection of Material C- 40 Mild Steel

$$u=640\text{N/mm}^2 \quad y=380\text{N/mm}^2$$

$$\text{Motor}=10\text{hp} \quad N = 600 \text{ rpm}$$

$$y = 0.5 v$$

$$= 190 \text{ N/mm}^2$$

$$P=2 \text{ NMt}/60$$

$$M_t = 209.64 \times 10^3 \text{ N/mm}^2$$

Factor of safety, $n=3$ Allowable shear stress,

$$\tau_{\text{max}} = 63.33 \text{ N/mm}^2$$

$$\tau_{\text{max}} = 16D[M_t] / (D^4 - d^4)$$

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d=20.63mm standard, d = 22.mm

D = 28.52 mm

Standard, D = 31.5mm

$$\max = 16 \frac{D^4 [M_t]}{d^4}$$

max = 45.87 N/mm² < 63.33 N/mm² so Design is safe.

Bearing basic		Deep bearings groove ball
design No(SKF)		6006
Outer diameter	D	5.5mm
inner diameter	d	30mm
depth	B	13mm
static load	Ca	7100 N
Dynamic load	C	10400 N

Max. Permissible speed - 13000 rpm

Journal paper

From the above practically observed results and the table1 it can be this paper discusses how to integrate Radio frequency identification (RFID) technology into a forklift truck to make it wireless to increase visibility and human safety.

International Journal of Scientific and Research Publications, volume. 3, Issue 4, April – 2014.

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Aashishkumar L Sharnangat. et al.,(2013)

Forklifts are rated for loads at a specified maximum weight and a specified as center of gravity it is widely used in stations, ports, airports, warehouses and other various departments of the national economy. In many jurisdictions, it is illegal to remove or tamper with the name plate without the permission of the forklifts manufacturer.

Dr. K. Rambabu. en tl(2012).

The design of the mechanical assembly is derived from the scaled dimension the forklift named Landoll forklift truck of the Japanese company. The material selected to prepare the prototype model is Mild Steel due to its properties like malleability as it can be hammered and pressed into any shape, ductility as it can be bent easily and versatile and in the last is most common, cheap, strong and stiff.

P. Nikitin and K. Rao en tl (2007)

With electrical motor it gives the motion to the forklift vehicle like forward, back, left turn, right turn and pallet controlling up down motion, which are controlled with remote and which will be transmitting signals to receiver and receiver will convert signals to operation. It's helpful to operator will be situated at only one position and it will operate the forklift from one position and he we monitoring on the neighbor environment due to that he will avoid the accident and operate with vision cameras.

Y. Tikhov, en tl. (2006),

Forklift is totally run on electric motors which are control by a remote operator by means of remote will connected with RFID which fix radio frequency transmit and receives to forklift circuits.

M. Seelinger and J. D. Yoder, en tl ,(2006)

The mechanical system is considered as motion converter, This can be created by implementing electro-mechanical techniques. The concept is to transform the motion from one form to some other required form by using suitable mechanical & electrical devices. In this research work the technique of transform the rotational motion in to linear motion is implemented

.G. Devita and G. Iannaccone, en tl (2005)

For the electrical point of view, we had used an AT89C2051 microcontroller; the output of this controller is fed to the RF transmitter. This transmitter is designed to generate a very high frequency of 433 MHz & it is used as carrier frequency. Electric forklift have got numerous applications. They are used for transmission of materials from one place to another. Forklifts and fork trucks are used to engage, lift, and transfer palletized loads in warehousing, manufacturing, materials handling, and construction applications.

Rangaswamy, T. Vijayrangan S. en tl (2005)

All four motors are driven through a single H- bridge DC motor drive package. All the four wheels are directly coupled to the motor shafts independently. The DC Motors are having reduction mechanism, there by speed is reduced and torque is increased.

The name H-bridge sometimes called a "full bridge" is so named because it has four switching elements at the

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"corners" of the H and the motor forms the cross bar. If the bridge is sufficiently powerful it will absorb that load and your batteries will simply drain quickly.

B.Bhandari et al (2011)

The material selected to prepare the prototype model is Mild Steel due to its properties like malleability as it can be hammered and pressed into any shape, ductility as it can be bent easily and versatile and in the last is most common, cheap, strong and stiff. Chain drive helps to drive the system in both side (one at a time) using electric motor. Two Sprockets with Diameter 25.07mm and 49.77mm is used which have 12 and 24 teeth on it. Chain of length 480mm and 80 links is convenient. The dimension Of fork is 125x18x5 mm. The material selected Mild steel. The max load carrying capacity is 50N. The dimension of the shaft is 5mm diameter and 220 mm length. The material selected is Mild steel. It is an interconnection between primary and secondary chain drive.

P. Nikitin and K. Rao, et al (2006)

Forklift is totally run on electric motors which are control by a remote operator by means of remote will connected with RFID which fix radio frequency transmit and receives to forklift circuits. These motors are constructed with reduction gear mechanism & it is built in with the motor internally. As the machine is designed as prototype module, lowest rating motors are used to drive the mechanism.

Kalaikhathir Achchagam, et al(2007)

Mild Steel due to its properties like malleability as it can be hammered and pressed into any shape, ductility as it can be bent easily and versatile and in the last is most common, cheap, strong and stiff. The design of the mechanical assembly is derived from the scaled dimension the forklift named Landoll forklift truck of the Japanese company. The material selected to prepare the prototype model.

Classification

1. Warehouse Forklift
2. Counterbalance Forklift
3. Industrial Forklift
4. Rough Terrain Forklift

Application

- ❖ Police patrols Assistance for maintenance services (reading of water or electricity meters).
- ❖ Mail transport and delivery.
- ❖ Natural gas pipeline inspections.

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- ❖ Rentals in recreational and tourism areas.
- ❖ Guided tours for tourists and local residents.
- ❖ A solution for people with reduced mobility (trials by an amputee).

Assembly and inspection

Rotary potentiometer is fitted in bottom portion of handlebar. One small wheel is also fitted on back portion of Segway. A DPDT switch is fixing to handlebar. Segway wheels are attached on the motor shaft. Handled bar is fitting in the front side of chassis.

III. RESULTS & DISCUSSION

Mechanical Segway presents the results of the project. First comes a short discussion on the implementation of the balancing without using any type of programming and sensors.

This is followed by some initial driving results and why the vehicle did not behave in satisfactory manner and what was done to improve performance without using programming and sensors.

IV. CONCLUSION & FUTURE WORK

Basically this investigation is successful achieved the objective with the acceptable outcome. The main goal of this project was a build a functional two wheels and one supporting wheels transporter and this goal has been performance. As per the present situation considering the casualty rates we had come up with an enhanced system of fork lifting mechanism which emphasizes over the safety features along with more precise working. Web-cam conciliated with sensors will reduce exertion on operator and reduce the casualties.

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