Design & Fabrication of 2700 Rotating & Tilting Trolley

Praful B. Dukare[1], Ajay G. Kawate[2], Hemant V. Selote[3], Priyanka S. kohpare[4], Prof. Dhanraj Raut[5]
[1, 2, 3, 4, 5] Dept of Mechanical Engineering Department
[1, 2, 3, 4, 5] Vidarbha Institute of Technology, Nagpur

Abstract- *The older trolley has been conceived by observing the difficulty in unloading the material in every direction. The survey in this regard's serval automobile garages, revealed the facts that the mostly some difficulty methods were adopted in unloading the material from the trolley. This project has mainly focused on above difficulty. Hence a prototype of suitable arrangement has been designed. The trolley can unload the material in any direction by the use of spiral bevel gear and power screw with the assembly of universal coupling helps to rotate and lifting the trolley. This concept saves time which lead to efficient working.*

Keywords- Spiral Bevel Gear, Power Screw, Unloading material, Rotation in all direction.

I. INTRODUCTION

Trolley has lot of applications in today's world. In domestic consideration trolley can pull a variety of products including gravel, grain, sand, fertilizer, rocks & bricks etc. an older trolley has been conceived by observing difficulty for unloading the materials. The facts that mostly some difficult methods were adopted in unloading the material from the trolley by considering wide scope of the topic, it is necessary to do study and research on the topic of trolley mechanism in order to make more economical and efficient

This rotating and tilting trolley mechanism can do a great job for unloading the material in any direction as now-a-days trolley unloads material in only one direction. Existing trolleys requires more space, time and fuel so to overcome these problems we want to introduce the 270° rotating and tilting trolley mechanism so that the device is economical and efficient. In this mechanism the spiral bevel gear is used for provide rotary motion to the trolley and the power screw is connected to the universal coupling is attached below trolley to tilt the trolley for unloading material.

This trolley mechanism can be applied to both domestic as well as industrial applications. The proposed mechanism used for unloading purpose is safe and efficient and could be used safely in different areas.

II. METHODOLOGY

- Problem identification
- Field survey
- Literature review
- Survey of components in market
- Calculations
- Fabrications
- Testing of projects

III. LITERATURE REVIEW

REVIEW ON MODERN THREE-WAY DROPPING TROLLEY

Ganesh Shinde studied the Modern 3 Ways dropping dumper which has been conceived by observing the difficulty in unloading the materials. The survey in this regard in several automobile garages, revealed the facts that mostly some difficult methods were adopted in unloading the materials from the trailer. They have mainly focused on above difficulty. Hence a prototype of suitable arrangement has been designed. The vehicles can be unloaded from the trailer in three axes without application of any impact force. The Direction control valves which activate the ram of the hydraulic cylinder which lifting the trailer cabin in require side. Further modifications and working limitations will put this work in the main league of use. This concept saves time & energy which leads to efficient working.

REVIEW ON TIPPER

Amboji R Sudhakar studied that Tipper has lots of applications in today's world. In industrial and domestic considerations, tippers can haul a variety of products including gravel, potatoes, grain, sand, compost, heavy rocks, etc. By considering wide scope of the topic, it is necessary to do study and research on the topic of tipper mechanism in order to make it more economical and efficient. In existing system, tipper can unload only in one side by using hydraulic jack or conveyor mechanism. By this research it is easy for the driver to unload the trailer and also it reduces time and fuel consumption. For making tipper mechanism with such above

conditions both mechanisms namely hydraulic. jack and conveyor mechanism can be used. But eventually it comes with question that how both systems can arrange in single set up? Answer to this question is nothing but this research work.

Euclid Dump Trucks:

Euclid was one of the first to create dump trucks.

George Armington Jr., the son of the company's founder, was a hydraulics designer who made two key contributions to the dump truck industry. The wheel tractor bottom dump wagon and the contemporary heavy duty off-highway vehicle were among them. In 1934 the company introduced its 10/11-ton dump truck called the "Trak Truck."

Euclid Dump Trucks:

Euclid was one of the first to create dump trucks.

George Armington Jr., the son of the company's founder, was a hydraulics designer who made two key contributions to the dump truck industry. The wheel tractor bottom dump wagon and the contemporary heavy duty off-highway vehicle were among them. In 1934 the company introduced its 10/11-ton dump truck called the "Trak Truck."

IV. TROLLEY

Trolleys are very popular and cheaper mode of goods transport in rural as well as urban area. Trolleys are widely used for transporting agriculture product, building construction material and industrial equipment. The main requirements of trolley manufacturing are high performance, easy to maintain, longer working life and robust construction. In this work, the tractor trolleys are used for the agriculture work and sometimes used for transporting building construction material. These trolleys are divided into two types such as two-wheeler trolleys and four-wheeler trolleys. The varieties of trolleys are available and use of particular trolleys depends upon their application.

They are available in various capacities like 3 tons, 5 tons, 6 tons, 8 tons etc.

V. CALCULATION FOR POWER SCREW

• Given data: -

d = 10 mm p = 2 mm
W = 10 kg = 10 x 9.81 = 98.1 N
μ = 0.15
μC = 0.18
P (Effort) = 25 N

• Total Effort = 2P

= 2 × 25
Total effort = 50 N … i.e. (by each hand)

• To find lead

For single start square thread Lead of screw = P
Lead of screw = 2 MM

• To find α

$\alpha = tan\text{-}1\ (P/\pi d)$
$\alpha = tan\text{-}1\ (2/\pi \times 10)$
α = 3.640

• To find $\boldsymbol{\phi}$

For square thread
$\phi = tan\text{-}1\ \mu$
$\phi = tan\text{-}1\ (0.15)$
ϕ = 8.530

• Torque required to raise the load

T = W tan (ϕ + α) x d/2
T = 98.1 tan (8.53 + 3.64) × 10/2 T = 105.78 N-mm

• To find T2

Torque required to lowering the load T2 = W tan (ϕ + α) x d/2
T2 = 98.1 tan (8.53 - 3.64) × 10/2
T2 = 41.96 × 103 N-m

• Efficiency of screw

ηs = tan $\alpha/tan(\phi + \alpha)$
ηs = tan (3.64) / tan (8.53 + 3.64)
ηs = 29.57 %

VI. APPLICATION

- It is use as a material handling equipment.
- It is used in constructional field.
- It is used for industrial application.
- It is also used as a material handling equipment in agricultural field.
- Necessary solution for lessening the risk of physical injuries.
- For mechanically handling bulk or packaged items.
- Typically, in storage, shipping or production facility.
- It can be customized in any form or shape to suit different applications.
- After the completion of the production processes the finished goods have to be transported from the production site or machinery to the ware house for storage.

VII. ADVANTAGES

- Installation is simple & easy to construction. Unloading the material in any direction.
- Less skill operator is sufficient to operate.
- Required less effort.
- Improve customer services by supplying materials in a manner convenient for handlings.
- Increase efficiency and sale ability of plant and equipment with integral materials handling features.
- Cut down indirect labor cost.
- Improve efficiency of a production system by ensuring the right quantity of materials delivered at the right place at the right time most economically.
- Reduce damage of materials during storage and movement.
- Reduce overall cost by improving materials handling.

VIII. CONCLUSION

Our 270° rotating and tilting trolley has been fabricated, all the parts in it are manufactured. Analysis of the model has to be done when developing a life size model. As the life size model involves huge money, proper design and advance methods are to be used to meet the requirement of the costumer.

Although we develop a working model of the original one, we tried maximum to develop an alternative of original and we are compromised only in those stage where the work cannot be completed by assuming or neglecting few factors.
As we provide the spiral bevel gear for rotation of the trolley, the trolley rotates smoothly over the gear.

Also, we provide the power screw for the tilting of trolley, power screw is also tilting the trolley and helps to unload the material from trolley.

The unloading of material is achieved in any direction by providing the entire system arrangement.

REFERANCES

[1] R.S Khurmi and J. K. Gupta, “Design of machine”
[2] International Research Journal of Engineering and Technology (IRJET) Volume: 03 issue: 04| Apr-2016
[3] International Journal of Emerging Technology and advance Engineering, 4(9),2014,2250-2459
[4] Design and Fabrication of Three-Way Tipper Mechanism International Research Journal of Advent Technology, 2(4),2014,2321-9637
[5] R.S Khurmi and J. K. Gupta, 14Th Edition. Machine Design.