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Multiple Side Dumping Trolley

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Abstract— *Trailer has lots of use in today's world. In industrial and domestic considerations, trolley can haul a variety of products including gravel, igreeculture equipment, grain, sand, stone, compost, heavy rocks, etc. 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 it more efficient. In existing system, trolley can unload only in one side by using hydraulic jack.*

In our project we will use three way trolley mechanisms, which will help the trailer to unload in three directions. We will use pneumatic system and automatic operated solenoid valves for this project.

By using this technique it will be easy for the driver to unload the trailer and also it reduces time and fuel consumption. previous mechanism is an approach to reduce the idle time to settle the dumper. The material is unloaded in Three direction and hence can be boldly stated as "Three way directional Dumper." The major outcomes of Three way directional dumper has overcome space requirement which often result in road blocking. Hence, we have invert in this mechanism providing the unloading in 180 rotations. This mechanism prevents blocking of road, reduce time and increase productivity at lowest cost.

Keywords- solenoid valves, Pneumatics, Universal Joint.

1. INTRODUCTION

A trailer is a vehicle designed for carrying bulk material, repeatedly on building sites. Trailers are prestigious from dump trucks by configuration: a trailer is usually an open four-wheeled vehicle with the load skip in front of the driver, while a dump trolley has its cab in front of the load. The skip can tip to dump the load; this is where the name "trolley" comes from. A trailer is an integral part of any construction work and hence its role is important for completion of any constructional site. One of the problem are cited with trailer in the time and energy for setting the huge trailer in the proper direction to dump the material it in carrying and hence the need of the project work riser which is about 3 way dropping trailer which can dump the material in any direction except the rental one without moving the truck in any direction.

Dumping process has wide applications in areas like agriculture, construction and garbage transportation etc. conventional damping system has limitation of mechanism which do not allows it to dump the material at rear side only.It is highly inconvenient for vehicles to reposition according to dumping side in narrow lanes and limited spaces. This difficulty is overcome by multiple sides dumping mechanism by using single actuator having spherical joints at its ends. The dumper unloads the material in only one direction. But this incapability can be full new method mechanism as the Multidirectional dumper. Gothic mechanism is an approach to reduce the idle time to settle the dumper. The material is unloaded in three direction and hence can be boldly stated as "Three way dumper." The major outcomes of Three way directional dumper has overcome space requirement which often result in road blocking. Hence, we have inversion in the existing mechanism providing the unloading in 180 rotations. This mechanism prevents blocking of road, reduce time and increase productivity at lowest cost.

2. BACKGROUND

After 1901, a four-wheel horse-drawn flatbed wagon with a rectangular body lifted with a hand hoist in the front was employed. In the middle of the 1920s, crawler tractors pulling heavy dump trailers mounted on wheels or tracks were becoming increased popularity. Sometimes crawlers would pull three to six attached trailers. Companies began developed wagons specification and design for attachment to crawler tractors. The first versions were mounted on tracks; however, when speed restrictions posed a problem, the wagons were mounted on wheels to increase speed. Manufacturers of such trailers and haulers included Euclid, James Hagy and Streich and Western By the 1940s the technological development of dump trucks had reached its peak. In the U.S., bottom dump trucks were already dominating earthmoving sites by the 1950s..

3. WORKING PRINCIPALE

This Three Axis Modern Trolley is nothing but one of the Lifting system in automobile. In this Lifting system pneumatically operated. Here the one pneumatic cylinder and Control Valve is provided in our system. In this project, the Control Valve is used to control the Air input. The Valve is "ON" when the trolley is loaded. The compressed air goes to the pneumatic cylinder. Then the compressed air passes through the tube, and then pushes the pneumatic cylinder, so that the Lifting is applied at the time of Valve in "ON" position. The speed of the pneumatic cylinder is varied by using flow control valve. This is the way of controlling Lifting speed of the Trolley when it is necessary In our project, we have to apply this Pneumatic Modern Trolley Mechanism in Load Lifting Vehicles. The Control Valve is fixed in near of the driving persons in the four wheeler. The air tank contains the compressed air already filled. The Valve was ON at the time when it is necessary. then Control Valve was activated. The compressed air flow is controlled by the valve is called "FLOW CONTROL VALVE". This air flow is already set. Then the compressed air goes to the pneumatic cylinders. The pneumatic cylinders piston moves forward direction at the time of compressed air inlet to the cylinder. The pneumatic cylinders moves towards the Lifting arrangement.

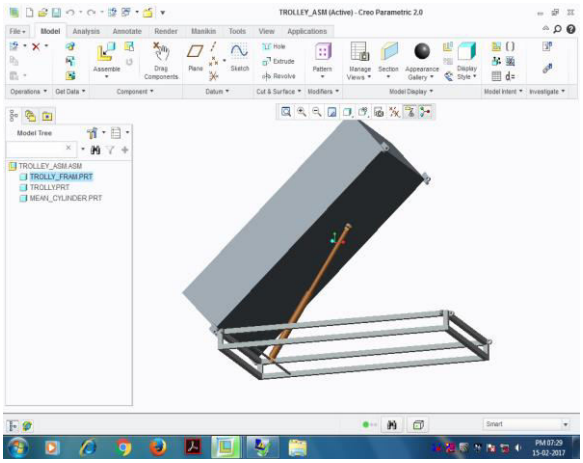
When it is necessary to dump the trolley at rear side of the vehicle, the hinges are engaged automatically by pneumatic locking system pin at rear of the trolley and the trolley is made to lift by an actuator connected to trolley and chassis by a Universal joint. This results in the rotation of trolley about the rear hinge.

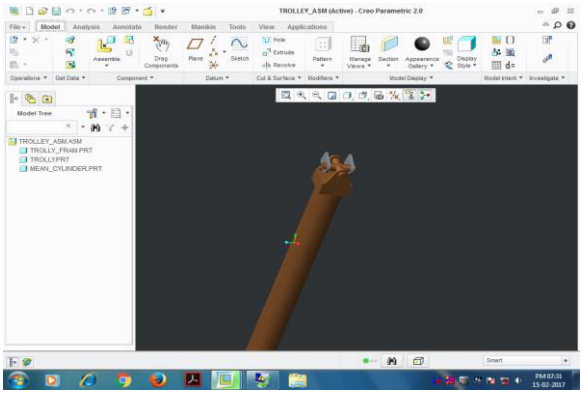
	Rear Side Lock	Left Side Lock	Right Side Lock
Rear Side Dump	Close	Open	Open
Left Side Dump	Open	Close	Open
Right Side Dump	Open	Open	Close

Pneumatic locking system:

When it is required to dump the material at Left or right side of the vehicle, the hinges are engaged automatically by pneumatic locking system pin at respective side of the trolley and the trolley is made to lift by an actuator connected to trolley and chassis by a Universal joint. This results in the rotation of trolley about the left or right hinge as per requirement.

4. CAD MODEL





5. CALCULATION

Frame 1 Design:

Material used –mild steel, square pipe
Area=1*1inch=25.4*25.4=645.16 mm2
Length of link=17 inch=431.8mm
Weight of project=10 kg= 10*9.81 =98.1N
Young's modulus=E=210GPa

Solution:

1**. Effective length**

Effective length, when both end fixed,
Le=L/2=431.8/2=215.9 mm

2. Internal Area

Internal width and depth, which have 3 mm thickness,

d=b=25.4-2*3 =19.4 mm

3. Moment of inertia

I=(BD^3-bd^3)/12=(25.4*〖25.4〗^3-19.4〖*19.4〗^3)/12=22882.048mm4

4. Crippling load by Euler's formula

Pc=(π^2 EI)/〖Le〗^2

=(π^2*210*10^3*22.88*10^3)/〖215.9〗^2 =

=1017.348 kN

Frame 2 Design:

Material used –mild steel, square pipe

Area=1*1inch=25.4*25.4=762mm2

Length of link=24 inch=609.6 mm

Weight of project=10 kg= 10*9.81 =98.1 N

Young's modulus=E=210GPa

Solution:

1. Effective length

Effective length, when both end fixed,

Le=L/2=(609.6)/2=304.8 mm

2. Internal Area

Internal width and depth, which have 3 mm thickness,

d=b=25.4-2*3 =19.4 mm

3. Moment of inertia

I=(BD^3-bd^3)/12=(25.4*〖25.4〗^3-19.4〖*19.4〗^3)/12=22882.048mm4

4. Crippling load by Euler's formula

Pc=(π^2 EI)/〖Le〗^2

=(π^2*210*10^3*22.88*10^3)/〖304.8〗^2 =

=326.68 kN

Pneumatic Cylinder:

Let's assume a weight of 12 kg acts on the piston. For 4 bar pressure how much area will be required can be calculated by the following formulae

Force=pressure *Area

Where area is the cross section of the piston rod, A=π/4D^2

Force=12*9.81=117.72N

Force=pressure *Area

117.72=0.4*π/4D^2

D=19.31 mm

So that we select next standard value of diameter is 20 mm.

6. REFRENCES

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