

Review of Three Way Unloading Mechanism in Trailer

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Abstract —Trailer had many of applications in day to day life. In industrial and domestic uses, trailer can transfer a variety of products including, rice, bricks, sand, fertilizer, wood, rocks, etc. By considering wide scope of the topic, it is necessary to study and project on the topic of trailer mechanism in order to make it more economical and efficient. In existing system, trailer can unload one side only by using hydraulic jack. By this project we can apply three way unloading mechanism, it is easy for the driver during unload the material and also it decreases time and fuel consumption. This paper has mainly focused current difficulty in unloading mechanism.

Keywords —Ball roller, Hydraulic jack, Double acting cylinder

I. INTRODUCTION

Material handling in building and civil works is one of the basic necessities. The material supply to construction is provided through trucks, trailer etc. In most cases where road size is not enough to unload the material in right place. It takes a lack of time to unload a material and material cannot be unloaded at same place and also we need to turn of vehicle in highly rushed area. In the trailer load is to be unloaded in only one direction only. To avoid this type of problems and reduce manpower requirement we introduce our new invention of three way unloading mechanism. We are sure that our project three way unloading tipper vehicle will help us to unload in three directions easily without the help of any labor or any other mechanical support.

II. BASIC CONCEPT

The thought we got, when we visited to an agricultural farms. There we found that a trailer was unloaded the dung fertilizer its back side only. One thing that was find difficult to unloading the fertilizers in other sides (include left and right) trailer. It consumed lot of time to complete the process.

III. LITERATURE REVIEW

Ganesh Shinde, Prachi Taweale, Laukik Rau “Design and Development of 3-Way Dropping Dumper” ISSN 2250-2459, ISO 9001:2008 Certified Journal, Volume 4, Issue 9, September 2014.[13] Modern 3 ways dipping dumper has been envisage by observing the complexity in unloading the materials. The survey in this regards in several automobile garages, exposed the details that mostly some difficulty methods were adopted in dispatch the materials from the trailer. This paper has mainly focused on above difficulty. Hence a example of suitable arrangement has been planned. The vehicles can be unloaded from the trailer in three axes

devoid of appliance of any impact force. The Direction control valves which activate the ram of the hydraulic cylinder which elating the trailer cabin in require side. Additional modifications and working restrictions will put this work in the main confederation of use. This conception saves moment & power which leads to efficient working.

Ahmad O.Moaaz, NoubyM.Ghazaly, “The Fatigue Analysis of Heavy Duty Truck Frames” American Journal of Engineering Research (AJER), e-ISSN: 2320-0847 p-ISSN: 2320-0936 Volume-3, Issue-10, pp-01-06(2014).[1] Heavy job motor vehicle plays a more important role in highway transportation. The major focal point in the automobile manufacturing industries is design of truck frame with more compensate load capacity and possible less weight. An essential aspect of chassis design and analysis is the hassle distribution and fatigue life of prediction process. Fatigue is one of the most imperative 13 parameters to consider when designing truck components. The components are naturally subjected to active loads when in service. In this paper, an effort is made to review the investigations that have been made on the different weariness analysis techniques of weighty duty truck frames. A number of systematic and numerical techniques are existing for the fatigue analysis of the weighty duty truck frames has been reported in literature.

RavindranK.Achhari studied the “Design of a tipper with Improved Functionality and Ergonomics for Indian market” Which has massive development in infrastructure , buildings , bridges multi-stored apartments , houses etc have taken place in recent years .Tipper , Dumpers ,trucks ,Earth movers ,excavators etc are used for construction work.These vehicles perform various tasks like loading unloading materials ,transferring material from one place to another place, digging earth and many more. In city junction and building area , road are congested and it is very difficult for construction vehicle tipper /dumper to park and dump the materials .sometimes this will occupy a lot of space and become obstruction for other vehicles to pass.The present work is an attempt to address and solve the problem of unloading in congested areas by redesigning the tipper with better functionality.

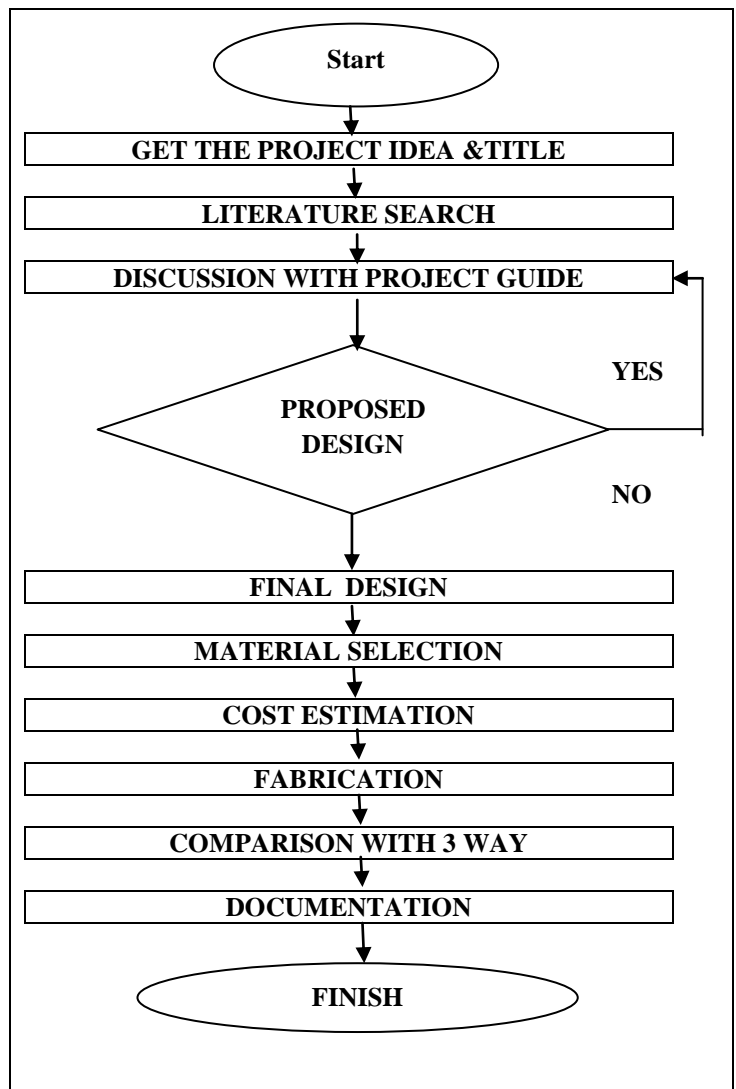
Hemant A. Gaikwad, Nilesh P. Awate invented “Design of Multiside Tipper Tilting Mechanism”Truck, tipper, dump truck are used to transport slack material from one place to another place at building site in mine or in dump yards to get done the actual site requirement. If one can understand the

ground situation and availability of space in mines and on building site, it is very hard task to unload loose material at proper place, adjustment of truck is required which take sizeable time and exertion to deliver loose material. As everybody knows that tipper is mostly used for unloading loose material on building site, mines and dump yards. The presented system available is to unload material on rear side. As considering the mines space availability very take away due to which unloading material on left or right area is not probable, to take this as a trouble Multiside tipper tilting is the need of moment .To beat one side tilting of trolley, multiside tilting system is come into focus. This will help to reduce the hard work to unload loose objects one side of tipper. Recommend work is on placing three hydraulic cylinders each on front side, right side and left side of trolley to unload the material on rear side, left and right side of trolley correspondingly. Some design amendment is needed in presented system to work on multi side tipper tilting mechanism.

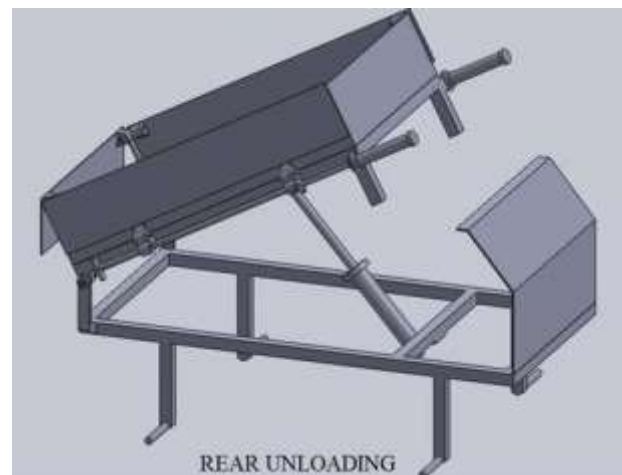
Sanjaykumar A. Borikar, Hemant V. Karkade, Pramod G. Pokley invented “Development, Testing and Monitoring of the Movement of Three Directional Tipper Mechanism ” Conventional tipper mechanism an drop materials only at the backside of the tipper using hydraulically operated boom which may root the problems of road jam in the restricted space area. The archetype model of three direction movement tipper overcomes the problem of unloading the dumper side way by using BOOM (D.C. Motor operated). By using Boom the bits and pieces can be unloaded in all three directions as for every necessity. The model is developed and tested for its movement in all three possible directions to unload the material in the tipper trolley and watch the inclinations for its gradualism. The results of inclination of the tipper in all three directions are obtained with admiration to time stage with objects and without material as 22.80^0 and 23.24^0 for 100 seconds of function of tipper respectively

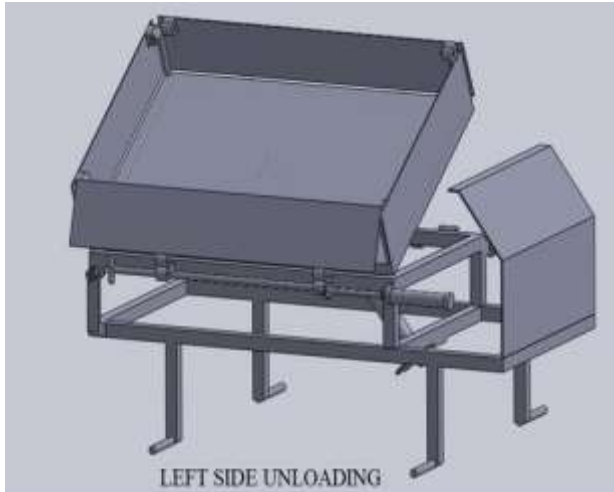
DeepeshGarg, Dr. R S Bindu “Design Optimization of Truck Body Floor for Heavy Loading” *IOSR Journal of Engineering (IOSRJEN) ISSN: 2250-3021 Volume 2, Issue 8 (August 2012)*. Building and mining section in India has chosen up pace in recent years. Due to this, equipments such as tippers and loaders are in great stipulate. purpose of tipper trucks is to combine the two errands of dumping and transport. Truck Body Floor which is used for this purpose has been planned in a conventional way since its commencement. Ordinary conservative technique of floor construction is a sandwich floor with layers of steel floor on top and bottom and a layer of wood in among. Scope of this paper is to optimize the design of conservative truck body floor design considering heavy & shock loading in mines which damages the floor. Thus this demands the need of heavy duty impact resistance floor which replaces the normal conventional sandwich erection. Hence new concept of single layer weighty duty floor has been embarked upon with high strong material which will be able to resist vicious contact loads and also results in weight lessening with various other compensation.

IV. METHODOLOGY

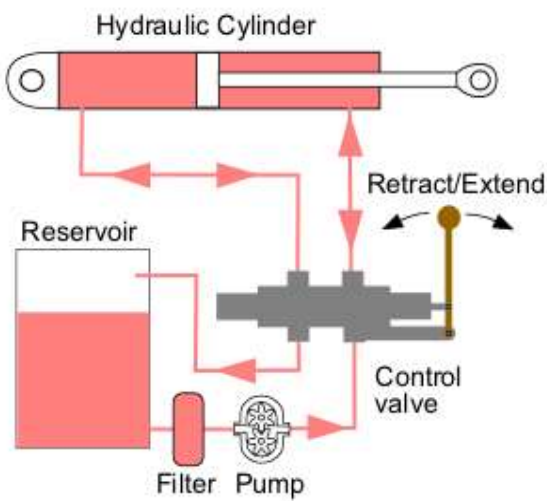


V. DESIGN OF TRAILER MECHANISM





VI. WORKING OF HYDRAULIC CYLINDER



Hydraulic system is the heart of the trailer mechanism for lifting or unloading the materials. It consists of hydraulic cylinder, control valve, reservoir, filter, and pump. The reservoir contains the hydraulic oil and filter is provided to clean the dust in the hydraulic fluid. Pump is used to pump the oil to the control valve when the valve is operated. The 2 way direction control valve (DCV) is connected to the hydraulic cylinder, which moves the piston forward and backward. Hydraulic cylinder is fixed between the chassis and trailer, piston is connected to the trailer which is movable and cylinder is fixed to the chassis. When the direction control valve is operated forward, the oil from the reservoir is pumped to cylinder through DCV, it extends the piston and lifts the trailer to the corresponding side which ever we required. The lever is operated to the backward, oil from the cylinder is pulled back to the reservoir and piston comes back to its original position.

VII. DESIGN OF HYDRAULIC CYLINDER

In this project, the hydraulic jack did a major role. Therefore, the design of hydraulic oil and piston rod is necessary. In this hydraulic jack SAE40 grade oil is used.

According to the AISI CODE, material used for the piston rod is MS SA3 Grade A material and its permissible stress value is, $\sigma=407.7$ Mpa, then

$$\sigma = 407.7 \text{ Mpa}$$

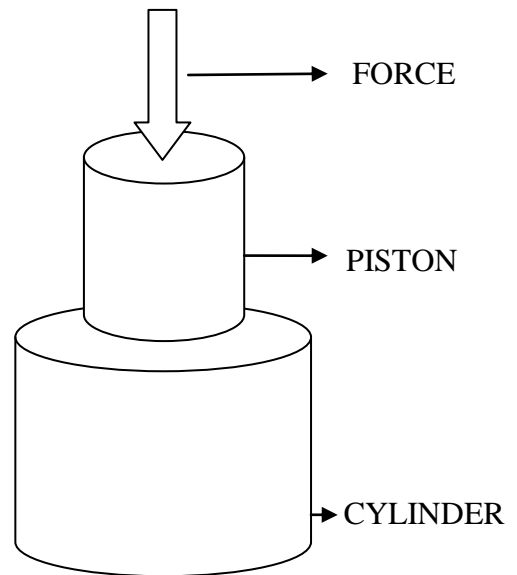
$$= 407.7 \text{ N/mm}^2$$

Let, piston diameter = 30 mm

Stress = vertical load on piston / Cross section area of piston

$$\text{Stress, } \sigma = F / A$$

$$\text{Force, } F = \sigma \times A$$



$$\text{Area, } A = \pi/4 \times (D)^2$$

$$A = \pi/4 \times (30)^2$$

$$A = 706.8583 \text{ mm}^2$$

$$F = \sigma \times A$$

$$= 407.7 \times 707.6$$

$$= 2881866.1289 \text{ N}$$

Since, 1 Kg = 9.81 N

$$F = 288186.12899 / 9.81$$

$$= 29376.77115 \text{ Kg}$$

We Know that,

$$1 \text{ ton} = 1000 \text{ Kg}$$

$$\therefore F = 29376.715 / 1000$$

$$F = 29.37 \text{ ton}$$

The value of force calculated above represent the maximum limit of load that can be lifted by the piston rod without failure

VIII. PEAK INSIDE PRESSURE OF CYLINDER

Consider the 7 tones acting on the piston. Therefore, the pressure created by the piston in the cylinder or the barrel are calculated by the following formula.

$$\text{Pressure, } P = F/A$$

Where ,

$$\text{Area of piston, } A = \pi/4 \times (D)^2$$

$$A = \pi/4 \times (30)^2$$

$$A = 706.8583 \text{ mm}^2$$

\therefore we know that ,

$$1 \text{ ton} = 1000 \text{ Kg}$$

$$\text{Force, } F = 7000 \text{ Kg}$$

And

$$1 \text{ kg force} = 9.81 \text{ N}$$

$$\text{Force, } F = 9.81 \times 7000$$

$$F = 68670 \text{ N}$$

Therefore ,

$$\text{Pressure, } P = \text{Force} / \text{Area}$$

$$P = 68670 / 706.8583$$

$$P = 97.148 \text{ Mpa}$$

IX. CONCLUSION

The developed prototype model exhibits the expected results. Next further changes and working limitations will put this work in the main league for use. This concept saves energy & time which leads to proficient working. This further line should be modeled using equations and an investigational agreement. The constructional work or the infra structural work demands proficient and user responsive machinery which will lead to more and more use of three way unloading trailer.

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