

Design and Fabrication of Three Way Tipper Mechanism

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Abstract— in industrial and domestic considerations, tippers can pull a variety of products including gravel, grain, sand, fertilizer, heavy rocks, etc. The older dropping trolley or dumper has been conceived by observing the difficulty in unloading the materials. The survey in this regards in several automobile garages, revealed the facts that mostly some difficult methods were adopted in unloading the materials from the trolley. The three way mechanism is more efficient and economical, and it is easy to unload the materials in three ways or sides.

I. INTRODUCTION

A dump trolley is a trolley used for transporting materials (such as gravel, potatoes, grain, sand, compost, heavy rocks, etc.) for construction. A typical dump trolley is equipped with an open-box bed, which is hinged at the rear and equipped with hydraulic pistons to lift the front, allowing the material in the bed to be deposited ("dumped") on the ground behind the trolley at the site of delivery. In our project we are eliminating the need of manually unloading the construction materials and industrial. For this purpose we are designing three way unloading tipper vehicle controlled three individual lever type solenoid valves. In the available methods of materials unloading man power and fuel power Vehicle's is used. The existing vehicle's pallet trucks, trolley's uses Petrol or diesel as fuel for running and for operating them we use the manpower. These types of vehicles consume liter of fuel for a period of one hour. By the end of 2020 fuel deposit in the world will completely depleted. To avoid this type of problems and reduce manpower requirement we need other type of invention that is three way unloading vehicle. So, 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 labour or any other vehicles.

The hydraulic power used for lifting of the vehicle container. The speed of unloading is controlled by the lever type solenoid valve manually. Pneumatic power assembled on the vehicle is easily replaceable and detachable. The vehicle is having a inbuilt compressor which is used for pneumatic air consumption.

II. LITERATURE REVIEW

Ganesh Shinde, Prachi Taweale and Laukik Raut et. Al.

Three way tipper can unload materials in all three sides. Also we require special types of hinge joints in this case. It will be having three hydraulics piston cylinder one on cabin side (as in existing system). One each on lateral sides, six hinge two on each side to give degree of motion on that side. The framing will be rigid enough to sustain the reactive forces generated, refer the attached picture of three way tipper.

N. Eswara Prasath, S. Shanmugan, C. Mathalai Sundaram studied the three way lifting mechanism by observing the difficulties in unloading the material from trailer. In an existing system tipper can unload only in one side by using conveyor mechanism. They mainly focus on the difficulties. Hence suitable arrangement for unloading the materials in different direction is developed. In their system they uses single hydraulic cylinder for lifting the trolley.

III. MECHANISM

A) Three way tipper mechanism: A three way tipper can unload materials in all three sides. To control the sides of

tipping the main hydraulic cylinder is required, and also need hinge joints. The main hydraulic cylinder is placed at four corners of the chassis. Each of the four corners of the body is connected by a cross joint with the hydraulic cylinders. The cross joint allows the joining members to tilt with respect to two perpendicular axis. The side of cylinder 3&4 is rear of the vehicle, then operating cylinder 1&2 will cause right side tipping

B) Hydraulic system: Hydraulic systems possess numerous advantages over other systems of power operation. They are light in weight; they are simple and extremely reliable, requiring a minimum of attention and maintenance. Hydraulic controls are sensitive, and afford precise controllability. Because of the low inertia of moving parts, they start and stop in complete obedience to the desires of the operator, and their operation is positive. Finally, hydraulic units are relatively quiet in operation, an important consideration when detection by the enemy must be prevented.

IV.COMPONENTS

- Hydraulic cylinder
- Hydraulic pump
- Trolley
- Chassis (Base frame)
- Connecting hoses
- Wheel arrangement
- Vehicle model frame

1 Hydraulic Cylinder

A Hydraulic cylinder (also called a linear hydraulic motor) is a mechanical actuator that is used to give a unidirectional force through a unidirectional stroke. It has many applications, notably in construction equipment (engineering vehicles), manufacturing machinery, and civil engineering. Hydraulic cylinders get their power from pressurized hydraulic fluid, which is typically oil. The hydraulic cylinder consists of a cylinder barrel, in which a piston connected to a piston rod moves back and forth. The barrel is closed on one end by the cylinder bottom (also called

the cap) and the other end by the cylinder head (also called the gland) where the piston rod comes out of the cylinder. The piston has sliding rings and seals. The piston divides the inside of the cylinder into two chambers, the bottom chamber (cap end) and the piston rod side chamber (rod end / head end).

Flanges, trunnions, clevises, and lugs are common cylinder mounting options. The piston rod also has mounting attachments to connect the cylinder to the object or machine component that it is pushing or pulling.

A hydraulic cylinder is the actuator or "motor" side of this system. The "generator" side of the hydraulic system is the hydraulic pump which delivers a fixed or regulated flow of oil to the hydraulic cylinder, to move the piston. The piston pushes the oil in the other chamber back to the reservoir. If we assume that the oil enters from cap end, during extension stroke, and the oil pressure in the rod end / head end is approximately zero, the force F on the piston rod equals the pressure P in the cylinder times the piston area A .

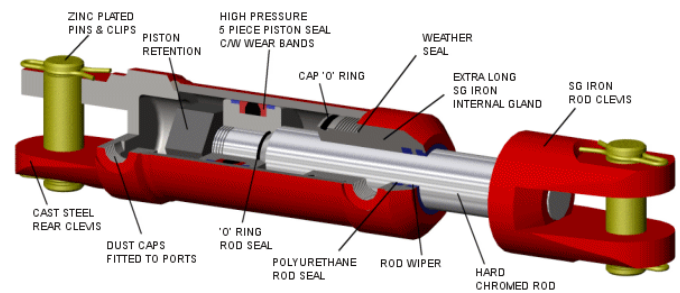


FIG:1 HYDRAULIC CYLINDER

2 Trolleys:

Tractor 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.



FIG:2 TROLLEY

3 Chassis:

A chassis is one of the key components of the trolley. It consists of an internal frame work that supports the container of tractor trolley in its construction and use. It is a dead vehicle which is connected to the tractor to carry the load. It serves as a frame work for supporting the body. It should be rigid enough to withstand the shock, twist, and other stresses & its principle function is to carry the maximum load for static and dynamic condition safely.

4 Connecting Hoses:

A hose is a flexible hollow tube designed to carry fluids from one location to another. Hoses are also sometimes called pipes (the word pipe usually refers to a rigid tube, whereas a hose is usually a flexible one), or more generally tubing. The shape of a hose is usually cylindrical (having a circular cross section)

To achieve a better pressure resistance, hoses can be reinforced with fibres or steel cord. Commonly used reinforcement methods are braiding, spiralling, knitting and wrapping of fabric plies. The reinforcement increases the pressure resistance but also the stiffness.

Hoses can be used in water or other liquid environments or to convey air or other gases. Hoses are used to carry fluids through air or fluid environments, and they are typically used with clamps, spigots, flanges, and nozzles to control fluid flow.

V. FACTORS DETERMINING THE CHOICE OF MATERIAL

The various factors which determine the choice of material are discussed below.

A) Properties:

The material selected must possess the necessary properties for the proposed application. The various requirements to be satisfied can be weight, surface finish, rigidity, ability to withstand environmental attack from chemicals, service life, reliability etc.

The following four types of principle properties of materials decisively affect their selection

- Physical
- Mechanical
- From manufacturing point of view
- Chemical

The various physical properties concerned are melting point, thermal conductivity, specific heat, coefficient of thermal expansion, specific gravity, electrical conductivity, magnetic purposes etc.

The various Mechanical properties Concerned are strength in tensile, compressive shear, bending, torsional and buckling load, fatigue resistance, impact resistance, elastic limit, endurance limit, and modulus of elasticity, hardness, wear resistance and sliding properties.

The various properties concerned from the manufacturing point of view are

- Cast ability
- Weld ability
- Surface properties
- Shrinkage
- Deep drawing etc.
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B) Manufacturing case:

Sometimes the demand for lowest possible manufacturing cost or surface qualities obtainable by the application of suitable coating may demand the use of special materials.

C) Quality Required:

This generally affects the manufacturing process and ultimately the material. For example, it would never be desirable to go casting of a less number of components which can be fabricated much more economically by welding or hand forging the steel.

D) Availability of Material:

Some materials may be scarce or in short supply. It then becomes obligatory for the designer to use some other material which though may not be a perfect substitute for the material designed. the delivery of materials and the delivery date of product should also be kept in mind.

E) Space consideration:

Sometimes high strength materials have to be selected because the forces involved are high and space limitations are there.

F) Cost:

As in any other problem, in selection of material the cost of material plays an important part and should not be ignored. Sometimes factors like scrap utilization, appearance, and non-maintenance of the designed part are involved in the selection of proper materials.

VI. WORKING PRINCIPLE

“MODERN THREE WAY DUMPING TROLLEY” is nothing but one of the Lifting system in automobile at the time of emergency. In this Lifting system hydraulic operated one. Here the additional hydraulic cylinder and Control Valve is provided in the automobile itself. In this paper, the Control Valve is used to activate/deactivate the oil input.

The Valve is „ON“ at the time of emergency; the pressurized oil goes to the hydraulic cylinder. Then the pressurized oil passes through the tube, and then pushes the hydraulic cylinder, so that the Lifting is applied at the time of Valve in “ON” position (i.e.-Emergency time). The speed of the hydraulic cylinder is varied by using flow control valve. This is the way of controlling Lifting speed of the Trailer at the time of emergency. In our project, we have to apply this hydraulic Modern Trailer Mechanism in Load Lifting Vehicles.

The Control Valve is fixed in near of the driving persons in the four wheeler. The oil tank contains the pressurized oil

already fill The pressurized oil flow is controlled by the valve is called “FLOW CONTROL VALVE”. This oil flow is already set. Then the pressurized oil goes to the hydraulic cylinders. The hydraulic cylinders piston moves forward at the time of pressurized oil inlet to the cylinder.

VII. MERITS AND DEMERITS

MERITS:

- Lifting cost will be less.
- Free from wear adjustment.
- Less power consumption
- Less skill technicians is sufficient to operate.
- Installation is simplified very much.

DEMERITS:

- Need separate oil tank

VIII. CONCLUSION

Design of multiside tipper tilting mechanism is done to help unloading loose material on three side of the tipper as per the availability of space. The design is safe for the maximum load of 16 MT which is rigid enough to transport loose material from one site to another site. Design of hinge is the most important part for side tilting of the trolley. Selection of material is also important factor for design of pin ,EN8 material is selected which is having tempered and hardened capacity which is reducing the size of pin for The narrow work space and insufficient loading access restricted the parking position of the tipper. Design and development of mining operations should take into consideration the safe positioning of tipper vehicles on soft or undermined benches particularly where risks are increased by the loading operations. The construction truck with the three way tipper mechanism helps unloading easier. The benefits of 3D CAD and FEA packages can be taken for designing of three way tipper construction trucks. Three way tipper can unload materials in all three sides. To control the sides of tipping there needs to be required one more pneumatic cylinder apart from the main hydraulic cylinder. Also we require special types of hinge joints in this case. Study and analysis of existing Tipper system, its design constraints, limitations. Mechanism to be used and its workability. Actual designing and balancing of system.

IX.REFERENCE

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