

DESIGN AND FABRICATION OF MODERN THREE WAY DUMPING TROLLEY MECHANISM

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ABSTRACT

Trolley has lots of applications in today's world. In industrial and domestic considerations, tippers can pull a variety of products including gravel, grain, sand, fertilizer, heavy rocks, etc. The older dropping trolley/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. 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.

Keywords: Trolley, Tippers, Automobile Garages, Tipper Mechanism

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.

II. HYDRAULIC SYSTEM

- ❖ In the development of the submarine from pre-war classes, many changes and improvements have occurred. One of the outstanding differences is the large variety of submarine devices which are now operated by hydraulic power. In early classes, there was no hydraulic system, and power requirements were met by means of air or electricity. Along with constantly improving submarine design has gone a constant extension and diversification of the use of hydraulic power.
- ❖ Comparative advantages of hydraulic power
- ❖ 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. Hydraulic systems are self-lubricated; consequently there is little wear or corrosion. Their operation is not apt to be interrupted by salt spray or water. Finally, hydraulic units are relatively quiet in operation, an important consideration when detection by the enemy must be prevented.

- ❖ Therefore, in spite of the presence of the two power sources just described, hydraulic power makes its appearance on the submarine because of the fact that its operational advantages, when weighed against the disadvantages enumerated for electricity and air in the preceding paragraphs, fully justify the addition of this third source of power to those available in the modern submarine.

III. COMPONENTS AND DESCRIPTION

3.1 Major Parts

The major parts “HYDRAULIC THREE AXIS MODERN TRAILER” are described below:

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

3.1.1 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.

SINGLE ACTING HYDRAULIC CYLINDER: The Single Acting hydraulic cylinder (see Figure 6), which is the simplest type of hydraulic motor, contains a spring-loaded piston, with a piston Rod that extends through one end of the cylinder. In our project, this single acting hydraulic cylinder is used.



Fig: Single Acting Hydraulic Cylinder

3.1.2 Hydraulic Pump



FIG: HYDRAULIC PUMP

3.1.3 Trolley

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. 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 tonne, 5 tonne, 6 tonne, 8 tonne etc.



Trolley

3.1.4 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. An important consideration in chassis design is to have adequate bending stiffness along with strength for better handling characteristics. The Chassis is used to support the container on which the load is to be carried out .The trolley chassis main frame is supported at two points over the axle.

Functions of Chassis

- To carry load of the goods carried in the body.
- To withstand the forces caused due to the sudden braking or acceleration.
- To withstand the stresses caused due to the bad road condition.



Chassis

3.1.5 Worm Drive

A worm drive is a gear arrangement in which a worm (which is a gear in the form of a screw) meshes with a worm gear (which is similar in appearance to a spur gear). The two elements are also called the worm screw and worm wheel. The terminology is often confused by imprecise use of the term worm gear to refer to the worm, the worm gear, or the worm drive as a unit.

Like other gear arrangements, a worm drive can reduce rotational speed or transmit higher torque. The image shows a section of a gear box with a worm gear driven by a worm. A worm is an example of a screw, one of the six simple machines.



Worm Drive

3.1.6 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 fibers or steel cord. Commonly used reinforcement methods are braiding, spiraling, 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.

Hydraulic tubes are seamless steel precision pipes, specially manufactured for hydraulics. The tubes have standard sizes for different pressure ranges, with standard diameters up to 100 mm. The tubes are supplied by manufacturers in lengths of 6 m, cleaned, oiled and plugged. The tubes are interconnected by different types of flanges (especially for the larger sizes and pressures), welding cones/nipples (with o-ring seal), and several types of flare connection and by cut-rings. In larger sizes, hydraulic pipes are used. Direct joining of tubes by welding is not acceptable since the interior cannot be inspected.

Hydraulic pipe is used in case standard hydraulic tubes are not available. Generally these are used for low pressure. They can be connected by threaded connections, but usually by welds. Because of the larger diameters the pipe can usually be inspected internally after welding. Black pipe is non-galvanized and suitable for welding.

Hydraulic hose is graded by pressure, temperature, and fluid compatibility. Hoses are used when pipes or tubes cannot be used, usually to provide flexibility for machine operation or maintenance. The hose is built up with rubber and steel layers. A rubber interior is surrounded by multiple layers of woven wire and rubber. The exterior is designed for abrasion resistance. The bend radius of hydraulic hose is carefully designed into the machine, since hose failures can be deadly, and violating the hose's minimum bend radius will cause failure. Hydraulic hoses generally have steel fittings swaged on the ends. The weakest part of the high pressure hose is the connection of the hose to the fitting. Another disadvantage of hoses is the shorter life of rubber which requires periodic replacement, usually at five to seven year intervals.



Fig. Connecting Hoses

3.1.7 Wheel Arrangement

A three-wheeler is a vehicle with three wheels. Some are motorized tricycles, which may be legally classed as either automobiles or motorcycles, while others are tricycles without a motor, some of which are human powered vehicles and animal powered vehicles.

Many three-wheelers which exist in the form of motorcycle-based machines are often called trikes and often have the front single wheel and mechanics similar to that of a motorcycle and the rear axle similar to that of a car. Often such vehicles are owner-constructed using a portion of a rear-engine, rear-drive Volkswagen Beetle in combination with a motorcycle front end.

3.1.8 Vehicle Model Frame



Vehicle Model Frame

IV. 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 filled. The Valve was ON at the time of emergency, the Control Valve was activated.

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. The hydraulic cylinder moves towards the Lifting arrangement.



Fig: Modern Three Way Dumping Trolley Layout

4.1 Advantages

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

4.2 DISADVANTAGES

1. Need separate oil tank
2. Efficiency is Low.

Addition cost is required to install this system to four wheeler.

V. CONCLUSION

Trolley has lots of applications in today’s world. In industrial and domestic considerations, tippers can pull a variety of products including gravel, grain, sand, fertilizer, heavy rocks, etc. The older dropping trolley/dumper has been conceived by observing the difficulty in unloading the materials.

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