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Fabrication of compact fork lifter for small industries

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Abstract **- The mechanical forklifts are the revolution in the warehouse industries and that productivity and time efficiency. There are different types of fork lifters are used depends upon its need. Fork lifters are semi automotive machine which is controlled manual operators. These are heavy lifting machine used to lift heavy objects and also for transporting the materials. But these fork lifters are expensive for small scale industries and its fuel consumption also high, while compare to electrically power system. To overcome this disadvantage, the compact fork lifters are used for small industries. The fork lifters are semi automotive and the wheels are powered by battery source to reduce the fuel consumption. The lifting mechanism used to lift the objects is hydraulic system. The triangular effect is also considered to maintain the stability of automobile.**

Key words-Fork lifter, Hydraulic system, Triangular effect, DC motor, Shaft, Chassis .

I.INTRODUCTION

The early forklifts are machines that use levers and pulleys to lift different weights. A fork lift is a technique which is in the usage for several centuries ago. The monuments which were built use fork lifter type models, so it is not a modern invention. The modern forklifts are in different type depends upon its need, and its operation where is simple. They are various changes are made in the forklifts like pulleys to hydraulic system and also a fully automotive forklifts. The forklift can be defined as a tool which can be capable of lifting heavyweight materials. A forklift is a automotive vehicle like a small truck that has two metal forks on the front used to lift cargo. The maximum forklifts are semi automatic vehicle where the forklift operator drives the forklift forward until the forks touch under the cargo. Then only it can lift the cargo to a particular height from the ground level by operating the forks. The forks, are in a form of blades or tines, are usually made out of steel and can lift up to a few tons.

II.LITERATURE SURVEY

[1]Eric Johnson et al, LPG and electricity are provide performance and cost efficient and also less obvious of energy efficient and carbon footprint.

[2]Thomas H. Bradley et al, energy component forklifts are more costly to buy and the kinds of offices considered in the investigation. Quick charge forklifts are be monetarily advantaged at high workloads in respect to ordinary battery-swapping forklifts.

[3]Juan M. Masson et al, the sudden drop of lift nd impact in the floor cause fatigue cracks inside the fork, these are avoided by changes in the loading and transportation practices.

[4]Jian-Yi Wang et al, forklift is the important tool in the logistic and also for transportation, but due its overweight and decrease fuel economy. To overcome this, a kind of lifting mechanism is suggested based on a spatial multi-link mechanism.

III. FORKLIFTER COMPONENTS

The components which are used for the construction of fork lifter are chassis, DC motor, battery, shaft and bush, wheel axle, hydraulic system, fork blades.

CHASSIS:

The chassis is fabricated from mild steel. This metal used to reduce the overall weight,and it increase the speed of the fork lifter. The chassis was designed to take a static load of 80kg. The flange which holds the motor and is bolted to the chassis which is designed to prevent bending of shaft during rotation .So that the driving motors can easily rotate below the chassis without any vibration. The chassis which also holds the lifting mechanism to it fork blades are attached. The chassis also consist of handle to drive the vehicle.

DC MOTOR:

An direct current motor is a device which to used converts electric energy into mechanical energy. The DC motor is used to reduce the fuel consumption. The DC motor connected to the wheel axle shaft and it also consist of bush to prevent friction. 30MPH DC motor is used to move 90kg load at particular speed.

SHAFTS:

A shaft is a transmission machine element which is used to transmit power from one element to another by rotation. The power which transmitted to the shaft by tangential force and then resultant torque accommodate with the shaft which permits the power to be transmitted to various parts linked up to the shaft. The power of shaft is also transmitted through gears, pulleys to various machine parts. The shaft rotates on rolling contact bearings or bush bearings .The torsion stress on the shaft cause bending of shaft. The shaft is used for the transmission of torque and bending moment.

BATTERY:

Batteries are used as the power source for motor drive. Normally a 12V battery is used and it is placed upon the chassis.

FORK BLADES:

Fork blades are attach to the hydraulic system which perform the to and fro motion. Fork blades are made to touch materials to be carried and it is lifted by hydraulic system. Two narrow blades of 700mm length, 300mm width, 6mm thickness of mild material is used. Fork blades are in different modules depend upon its different need.

HYDRAULIC SYSTEM:

This hydraulic system lifts the fork blades using a hydraulic ram, a fluid-driven piston mounted inside a cylinder. The main advantage of hydraulic systems is they can easily multiply the relatively weak force of the pump to generate the strong force needed to lift the cabin and the cargo. The hydraulic system does not need any fuel consumption so it is a cost efficient. The hydraulic system which lift maximum weight depend upon its capacity. Fork blades are attached to hydraulic system to lift the cargo up and down. To lift the cargo high the piston of cylinder made to be long than the cylinder. The hydraulic cylinder is fixed to the front of the chassis where it is bolted with the frame for stable lifting.

WHEEL AXEL:

Wheels are attach to the drive motor shaft along with the bush. Wheels are used to increase the ground clearance for ease fixing of motor drives. Wheels are used to move and carry the load and also to make the vehicle stable. The forklifts run with the concept of triangular effect. This effect is employed to make the vehicle stable while turning the vehicle with load.

TRIANGULAR EFFECT:

When imaginary lines are drawn to connect them, this is known as the stability triangle. The lift truck also has a center of gravity, which shifts once the truck picks up a load. When the load is lifted, then the center of gravity moves forward. Care must be taken to maintain the center of gravity within the stability triangle of the forklift, by not lifting more than the maximum allowable, given the load center. The operator must ensure that the center of gravity of his combined forklift and load remains within the stability triangle.

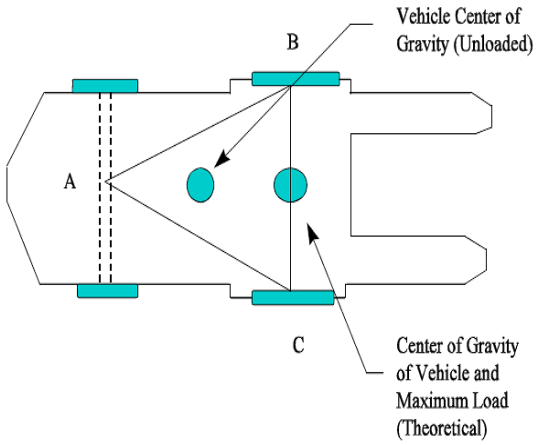

Fig .1 Triangular effect

IV.TYPES OF FORKLIFTS DESIGN

SLIDE LOADER:

When using a side-loader, the operator doesn't have to drive the forklift forward in order to move the fork and do the loading. The lifting and moving cargo process can be done by controlling of the forks to move forward and backward. When system make the forks rotatable, it could put those side-loading forks in front of the truck. Instead of facing the whole truck to the shelf every time before the lifting motion, the forks will do the side-loading motion, and rotate back to its own position.

CHAIN TRANSMISSION:

The forklift with a cable lifting system attached in the back of its forks to lift the cargo. With this chain transmission, those forks are able to do the up-and-down lifting motion. The drawback in the chain transmission lift is that it cannot able to lift heavy cargo and also chance for breakage of chain.

V. VARIOUS IDEAS PROPOSED

FORKS WITH CHAIN LIFTING TRANSMISSION:

The forks are loaded with cargo, they will rest on the top of the operator cabin, which saves time from coming all way this chain transmission is very similar to the rope transmission we use in our elevators. In rope elevators, the blade is raised and lowered by traction. The ropes are attached to the blades and looped around a sheave and it is connected to an electric motor. When the motor turns one way, the sheave raises the blades; when the motor runs the other way, the sheave lowers the blades. Typically, the sheave, the motor and the control system are all housed in a machine room above the cabin. The ropes that lift the cabin are also connected to a counter weight, which hangs on the other side of the sheave. But this design has a problem, which is that, the during heavy loading can be dangerous during the transportation. After picking up the load, the cargo would stay above the operator's head the entire time. Although the blades would be tested to make sure it is strong enough to support the loading, considering the roof failure accident might danger driver's life, the safety.

FORK WITH HYDRAULIC LIFTING MECHANISM:

The hydraulic pump installed in order to lift the cabin along with those forks. The hydraulic pump under the operator cabin will lift the cargo need to be lifted by blades, so the forklift can pick up higher loads. This hydraulic system lifts the blades using a hydraulic ram, a fluid-driven piston mounted inside a cylinder. The advantage of hydraulic systems which is used to lift heavy objects, because as they can easily multiply the relatively weak force of the pump to generate the stronger force needed to lift the blades along with the cargo. In order for the blade along with the cargo to reach certain height, we have to make the piston long. The cylinder should be longer than the piston. Higher loading range means longer cylinder. Since the entire cylinder structure must be placed below the bottom of operator area which means to build the operator cabin higher from particular ground level. The important aspect while lifting cargo is the shifting weight center of a forklift. High operator cabin also means higher center of gravity which leads to the risk of loss in stability. The hydraulic forklifts concept is implied in this project.

FORKS WITH SCISSOR LIFTING MECHANISM:

The scissor lift rather than the hydraulic pump to achieve the vertical movement of the operation of the fork lift. After the scissor lift finish its job, it can be compressed to a very compact shape which would save space and there is no need to build operator cabin higher. Normal blade height means centre of gravity is low, so the whole vehicle would be more stable. There is two position which is performed by scissor lifter they are Extended

Position, Resting Position and the power behind the scissor lift is also hydraulic. The difference between scissor lift and elevator system is working of hydraulic pump which is used to lift. The hydraulic pump is elevate the blade along with cargo vertical ,while the scissor lift is working with an angle is changing constantly along with the height . There is the hydraulic pump inside of the scissor lift in order to structure to change the height.

VI. WORKING

COUNTER WEIGHT:

It is a mass attached to the rear of the forklift truck frame. The purpose of the counterweight is to counterbalance the load being lifted. In an electric forklift the operator weight itself serve as the counter weight and also the large lead-acid battery as part of the counterweight.

POWER SOURCE:

Electric forklifts are powered by either a battery or fuel cell that is the power source to the electric motors. The electric motors used on a forklift to reduce fuel consumption.

HYDRAULIC SYSTEM:

Hydraulic system is used to lift the blade along with cargo. The system can lift heavy objects with its capacity.

SWITCH: 2 WAY SWITCH

This switch is used for selecting direction of fork lift.

DC MOTOR:

D.C. Motor is used in our project for moving fork lift from one location to another. Our project has used two number of motors in which two motors are used to run the rear wheels

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VII. PROPERTIES OF MILD STEEL

STRENGTH:

Mild steel a greater degree of flex which can be advantageous – particularly in applications where flexibility is required and where stronger steels would be too brittle. Due to its strength this material is used for the construction of cages, frames, fencing and in other applications where it will not be subjected to high stress.

MALLEABILITY:

The reduced carbon content of mild steel makes it easier to shape, drill, weld and cut than other, more brittle varieties of steel.

JOINING:

Compared to other types of steel, this type is better for welding purposes, as it conducts electric current effectively without damaging the metal surface in any way.

CORROSION RESISTANCE:

Mild steel has a high proportion of iron to carbon, which means that it is very susceptible to corrosion. Corrosion is brought on by exposure to oxygen, moisture or salt and manifests in brownish red deposits on the surface of the material which is commonly referred to as ‘rust’. This rust comes away from the surface of the metal, more of the material to that which is causing it to corrode. Therefore, if left untreated, corrosion in mild steel will eventually lead to the total decay of the material.

VIII. SYSTEM SPECIFICATION

Forklift trucks are vehicles designed to move and stack heavy or bulky goods. They are mainly used in warehouses, stockyards and other storage areas. Forklift trucks are highly useful with a very small turning circle which allows them to move easily in confined spaces. On the front of the truck are two forks operated by hydraulics, the forks into the pallets on which goods are stored. The operator then uses the hydraulic forks to lift the pallet, takes it to where it is needed and sets it down. Some trucks are fitted with small computer display panels that direct the operator where to place goods in the warehouse. There are also some of the basic maintenance of the truck. This includes greasing or oiling parts and changing or recharging the battery. .Industrial lift trucks are used for handling materials, parts, products, tools, equipment, supplies and maintenance items. Forklifts are efficient for material handling because they are self-propelled, maneuverable and require only one operator to lift, transport, and stack or un-stack the material.

Forklifts may be used for indoor or outdoor use depending on their size, tires and load capacities.

XI. CONCLUSION

The fundamental concept of this project is to make use of forklifts in the small industries with reduced fuel consumption. The electric forklifts are used to reduce the fuel cost and reduce man power in small industries. These increase the time efficiency in small scale industries and also intend to reduce the vehicle cost.

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