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Design and Development of Three Wheel Drive Forklift

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ABSTRACT: A fork-lift carrier for transporting long heavy loads, having adjust width for accommodating various size loads and for compacting the carrier for storage. The adjustable width allows the carrier to negotiate relatively narrow passages. A high degree of maneuverability is achieved by utilization of independently driven and steered traction wheels. Raising and lowering of loads is accomplished by motorized operated forklift mechanisms disposed on either side of the carrier. Operation of the carrier is controlled by a handheld control unit. A load carrying arrangement for a lift truck includes two spaced apart hollow upright elongated members which are mounted on a mounting element that is displaceable mounted on the frame of the truck, and at least one load-engaging attachment which has at least one load-engaging portion and two mounting portions introducible into the interiors of the corresponding upright members through the open ends thereof to mount the load-engaging attachment on the upright members and thus on the mounting element. Fixing elements, such as pins or bolts extending through aligned bores in the upright members and in the mounting portions, position ally fix the mounting portions within the corresponding upright members. The attachment may be constituted by a pair of fork prongs each of which has a load-engaging portion and a mounting portion which is introducible either into the open upper end or into the lower end of the respective upright member, or a container spreader whose load-engaging portion is adapted to engage a container and whose mounting portions are introducible into the upper open ends of the upright members& turn on 180 degree motion.

KEYWORDS: Forklift , machine, lift , weights , forks .

I. INTRODUCTION

A forklift, also called as lift truck or counter-balanced truck is a powered industrial truck, which is used to lift, shift and move the material from one place to another place in an industry. Forklifts are primarily used for lifting and transferring heavy loads to stations or locations in warehouses, shops or construction sites. The earliest forklift truck was invented between 1914 and 1915 and put on the market since 1930s. After that, the increasing need of transporting military material during the World War II spurred the development of the Forklifts. Following the war, more efficient methods for storing products in warehouses were being implemented. Warehouses needed more maneuverable forklift trucks that could reach greater heights. More new forklift models were made that filled this need. Since then, forklift trucks have become indispensable equipment in manufacturing and warehousing operations. Forklifts can be electric powered or diesel powered. Electric forklifts are powered by stored batteries and require frequent charging to operate. These forklifts are best suited for indoor use in areas where ventilation is not great because they are quiet and do not exhaust. Electric forklifts have lower operating costs than diesel operated ones. However, their lifting capacity is limited to 3000 kg. Their batteries can take as long as 16 hours to charge and cool off, and have a slower acceleration than the trucks those run on diesel. Diesel powered forklifts are typically used outdoors due to exhaust gases.



They cost less than electric forklifts to buy, but they have higher ongoing costs, as they need frequent refueling. Diesel-powered forklifts are typically capable of lifting weights ranging from 1000 kg to 25000 kg, which makes them ideal for heavy-industry situations and under in all types of weather. Usually a fully functional forklift would consist of the following major systems: the driving system, steering system, hydraulic system, lifting system, operator work area.

II. FORKLIFT

2.1 Methodology:

A forklift (also called lift truck, fork truck, fork hoist, and forklift truck) is a powered industrial [truck](#) used to lift and move materials over short distances. The forklift was developed in the early 20th century by various companies, including [Clark](#), which made [transmissions](#), and [Yale & Towne Manufacturing](#), which made hoists. Since World War II, the use and development of the forklift truck have greatly expanded worldwide. Forklifts have become an indispensable piece of equipment in manufacturing and warehousing. In 2013, the top 20 manufacturers worldwide posted sales of \$30.4 billion, with 944,405 machines sold.



Figure 1: Forklift

Forklift Components: Forklifts are very important in safe and industrial operations and in performing some functions. The forklift are the undercarriage which supports the goods. In mechanical terms, a forklift consists of is a chassis or framework with wheels, thus serving as a modular subassembly of wheels and axles.

Forklift Frame: The forklift frame is known as the main supporting system. The bogie frame is either casted or fabricated. The forklift frames are manufactured based on its working conditions. It is the main component which takes the stresses. The forklift frame is designed in such a way that it can take the load of the goods, operator as well as the components attached to it with proper body weights balance.

Forks: The forks are the main element which are made to take up the load of the goods being lifted. These are the most stressed elements as it involves variable loading condition during lifting and loading. These components are generally low in cost and made up of cast iron. Hence such elements need to be analysed properly and a proper maintenance should be done by removing the rust scales, polishing or others.

2.2 Working:

Fork lift truck is mini size load carrying vehicles this type of load carrying equipment fix on front of vehicle. It consists of frame, motor, battery, lifting equipment, screw rod, bearing, and tyre. The back drive mechanism to operate this function run on to wiper motor (An electric motor is an [electrical machine](#) that converts [electrical energy](#) into [mechanical energy](#)). And the screw rod use to load carrying equipment worked. This type screw rod rotary motion convert into vertical motion is using up & down movements And other one screw rod is operate the load



carrying equipment vertical rotating motion& servo motor to run the screw rod. Those motor are dc operated, so power supply from battery. And truck is fully operated by toggle switches

2.3. Forklift Design:

A forklift is a machine which helps in moving a heavy load from place to place as per the requirement. It provides an industry to work efficiently and its much time saving in optimization of a working cycle.

Its function is to transport the goods over short distance as when the requirement occurs . It must control the load and goods in the correct alignment to meet the conflicting requirements of stable running on straight track and good curving performance with low track wear. At same time, it must also provide acceptable ride levels in the vehicle to which it is fitted, under a wide range of track conditions. Support the goods being lifted.Run stably on both straight and curved track.Ensure good ride comfort by absorbing vibration generated by track irregularities and minimizing impact . Minimize energy or manpower required to lift a weight . have forks to lift the weight easily and manually, brake arrangement, axle box guide and many other parts which are welded to the frame. The main purpose of the forklift is to transfer the load from a manufacturing area to the inventory area of the industry efficiently and it would be time saving approach. wheels support the load tranfering the force of the load to the rear part hence tranfering the overall CG point of the forklift .



Figure 2: Development of forklift.

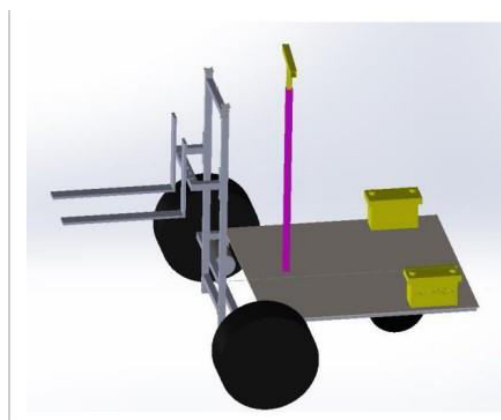


Figure 3: Forklift 3D Model.

2.4. Handle:

The handle has been added and many holes are provided such that the driver can adjust the handle accordingly to his comfort . The selected handle is of hollow type as it would be in low in cost , less in weight and the throttle wires can be incorporated through it .

2.4.1. Inner handle:



Figure 4: Inner Handle.

2.4.2. Outer handle:



Figure 5: Outer Handle.

III. RESULTS

Three-wheel-drive forklifts offer enhanced maneuverability, making them ideal for navigating tight spaces in warehouses or industrial settings. These compact vehicles typically feature a single wheel in the rear, allowing for greater agility and ease of movement. With their smaller turning radius and improved handling, they excel in confined areas where traditional forklifts may struggle. Additionally, three-wheel-drive forklifts often have electric power options, providing environmentally friendly and cost-effective operation.

IV. FUTURE-TIME SCOPE

Project work “3 WHEEL DRIVE FORKLIFT FOR INDUSTRIAL WAREHOUSE” is aimed to elevate the load with the assistance of hydraulic jack. the most blessings of exploitation this can be to simply handle significant load by solely pressing the jack. It will increase the productivity because of no external supply like battery or wire is hooked up. The system is meant & developed with success, for the demonstration purpose paradigm model (mini model) is built & the result's satisfactory. After collection the go back numerous journal we tend still as analysis paper there's great deal of electricity is wasted by elevating a load or significant material thus we came to conclusion that manual hydraulic lift is that the solely thanks to stop such industrial issue like ability operator solely will operate don't seem to be needed, significant load handling and therefore the main advantage of this self-propelled vehicle is most effective, low cost & increase productivity. Most of all the electricity saving could be a major concern by exploitation hydraulic jack self-propelled vehicle. we will use human brain similarly as hands & legs & operate a self-propelled vehicle and thereby nullifying the possibilities of accident.



V. COST ESTIMATION

Sl. No.	PARTS	Qty.	Amount
1	Motor	3	1500
2	Screw rod	1	869
3	Frame	1	3750
4	Bearing	2	250
5	Wheel	2	2168
6	Battery	1	1600
7	gear	4	3600
8	Switch	2	178

TOTAL = 13,915

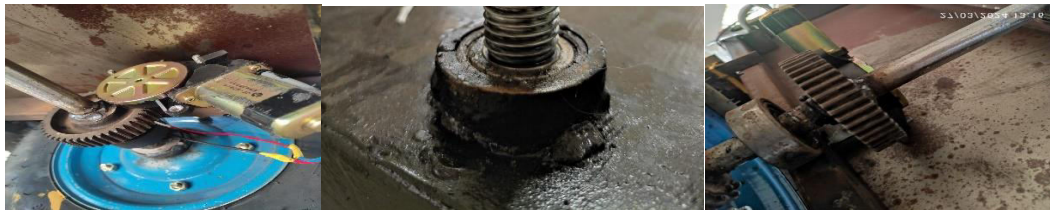


Figure 6: a) DC motors

b) Bearing with Cap

c) Spur Gear



Figure 7: a) Screw Rod

b)Wheel

C)Wheel (for rotation)

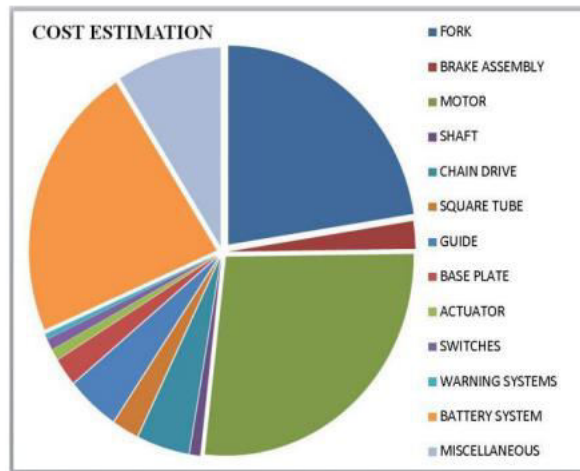


Figure 8: PIE Chart

VI. CONCLUSION

The development of Mechanical forklift assures the ergonomically comfort to the operator or worker and to reduces time required for manual lifting and handling. This increases the productivity & it provide safety of operator while handling of the material. We are proud that we have completed the work with the limited time successfully. The **“DESIGN AND DEVELOPMENT OF THREE WHEEL DRIVE FORKLIFT”** is working with satisfactory conditions. We can able to understand the difficulties in maintaining the tolerances and also the quality. We have done to our ability and skill making maximum use of available facilities. This project work has provided us an excellent opportunity and experience, to use our limited knowledge. We gained a lot of practical knowledge regarding, planning, purchasing, assembling and machining while doing this project work. We feel that the project work is a good solution to bridge the gates between the institution and the industries.

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