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Design and Fabrication of Hydraulically Operated Forklift

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ABSTRACT: This paper presents the significance of hydraulic forklift. In modern life, there are many types of forklifts, from a large heavy loading truck to one operating between narrow corridors. Forklifts have become one of the basic transportation tools we use in our lives. With all the existing forklifts, we can make a fork lift with less cost and with same capacity and effectiveness without the use of electricity or battery.

KEYWORDS: Hydraulic forklift, transportation tool, Capacity, Cost.

I. INTRODUCTION

The focus of this project is a study on the An industrial truck with power used for short-distance lifting and material movement is called a forklift truck. A number of businesses, including the hoist manufacturer Yale & Towne Manufacturing and the transmission manufacturer Clark, collaborated to develop the forklift in the early 20th century. Afterwards After World War II, forklift truck development and use have significantly increased globally. These days, forklifts are a necessary piece of machinery for manufacturing and warehousing businesses. The main function of forklifts is to lift and move big objects to designated areas in stores, warehouses, and construction sites

Forklifts are either powered by gasoline, or electricity. Electric forklifts relay on batteries to operate. Gasoline or propane forklifts are sometimes stronger or faster than electric forklifts, but they are more difficult to maintain, and fuel can be costly.

Electric forklifts are great for warehouse use because they do not give off noxious fumes like gas powered machines do. Forklifts are most often used in warehouses, but some are meant to be used outdoors. The vast majority of rough terrain forklifts operate on gasoline, but some use diesel or natural gas. Forklifts have revolutionized warehouse work. They made it possible for one person to move thousands of pounds at once. Well-maintained and safely operated forklifts make lifting and transporting cargo infinitely easier. This is the general description of a normal forklift

II. RELATED WORK

The design and fabrication of forklift for long and heavy loads by Lokesh et al. [1]. 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. The significance of forklift by Chintada anusha et al. [2] we find that there are improvements that can be made to bring the forklift to better performance. The design of the existing forklift is limited in rotation and the structure has a potential safety hazard. Our new design has 180 rotating forks attached to the body of the truck at both ends. Also, it has a screed height under the user's cabinet that enhances stability. 3 wheel forklift for industrial purposes by Jugal Jagtap et al.[3], The operator using these forks

can lift any heavy weight material on a click of button without any effort . The forklift operator just pushes the fork below the weights and upto certain distance the weights are lifted above in air so that they can be moved accordingly as per the requirement . In [4], The study focused on exploring improvements to the self-propelled nature of forklifts, aiming to optimize their overall functionality. By analyzing factors such as power sources, lifting mechanisms, maneuverability, and control systems, researchers identified areas for enhancement.

III. METHODOLOGY

In the design and fabrication of the fork lift we have used our own fabrication equipments for the making of the parts of the forklift

Materials used are Mild steel plate, Mild steel hallow round bars, arc welding electrodes, spraying color, coolants and oil, fastners and safety wears.

Tools used are cutting tools,hacksaw, hammers, measure tape, spanner plate screw driver.

Fork lift is designed on the principle of pascal’s law

Pascal’s law is very popular in every equipment where heavy loads needs to be lifted by applying negligible amount of forces.

“Pascal’s law simply states that when there is an increase in pressure at any point in confined fluid, there is an equal increase in pressure at every other point in the container.”

Pressure is equal to the force divided by the area on which it acts. According to the Pascal’s law, in a hydraulic system a pressure exerted on a piston produces an equal increase in another piston in the system. If the second piston has an area 10 times that of the first piston, the force produced on second piston will be 10 times more than the force applied on the first piston.

IV. EXPERIMENTAL RESULTS

SR.NO	NAME OF THE COMPONENT	THE QUANTITY	MAKE /BUY
1	Base Frame	1	Make
2	Hydraulic cylinder	1	Buy
3	Double Steering wheels	1	Buy
4	Forklift handle	1	Make
5	Load wheels	2	Buy
6	Push lever	1	Make
7	Nut-bolts	As required	Buy

Above parts are purchased as well as fabricated so that the system is economical with the same performance as the forklift which is readily available

1. **MAIN FRAME OR CHASSIS:** THE MAIN FRAME OF THE FORK LIFT IS MADE UP OF MS SQUARE SECTION (50X50 MM) AND 2 MM THICK. LENGTH OF THE FRAME IS 875 MM, WIDTH IS 610 MM.
2. **Lever:** A bar or handle that moves around a fixed point, so that one end of it can be pushed or pulled in order to control the operation of a machine or move a heavy or stiff object. Length of the lever is 1000 mm.
3. **Fork:** Fork is the part that comes in contact with the load and lifts it. It is connected to the lever with the help of a pin joint. It is made up of pipe sections,
 - a) 50 mm X 50 mm square cross section pipe

- b) 75 mm X 25 mm rectangular cross section pipe, and
- c) 20 mm X 36 mm rectangular cross section pipe.
- 4. **Hydraulic cylinder:** Long Ram Hydraulic Jacks (3, 5, and 8 Ton Capacity)
Used on engine hoists, cranes, lifts, farm equipment, and/or in conjunction with original equipment manufacturers of various products, the Long Ram Hydraulic Jack will lift efficiently and hold for the long-haul.
Ram cylinder: The ram cylinder transfers the pressure of the hydraulic fluid to the ram piston.
Ram piston: The ram piston lifts the load.
Release valve: The hydraulic jack release valve returns pressurized fluid to the reservoir.
- 5. **Spring operated Pedal:** Pedal is a very important part of the fork lift. It is used for mainly three purposes.
 - 1. For creating pressure in the cylinder by tilting or pushing it frequently.
 - 2. For the proper direction alignment of the forklift by hand.
 - 3. For the travelling of forklift by pushing it in forward direction.
 The forklifts pedal works as a lever for lifting the load. And is generally made from a round bar of mild steel. Proper gripping is to be given to the pedal for efficient travelling. The pedal is loaded with a spring so that it returns back after pumping the oil.
- 6. **Handle/ Steering:** Handle is used steer the fork lift in different directions. Handle is made up of 25 mm round cross section pipe.
- 7. **Tension rods:** The tension rod system is intended for the use in structures with predominantly static loads. Furthermore the tension rod system shall only be used in accessible structures in order to facilitate replacement of individual components at any time. Positioned between the fork and the main chassis, the tension rods balance the fork in a horizontal position. Tension rods are made up of 10 mm round cross section, connected to chassis and fork with the help of M 10 bolts.

Load lifting capacity	1500-2000 kg
Fork length	82 cm
Distance between two forks	43 cm
Fork width	10.5 cm
Max. Lift height	10 cm
Handle length	90 cm
Gripping handle width	25 cm

Specification of the fork lift After the assemble of the components.Finally we come to know that the project is cost effective with good performance



a.



b.



c

Fig.1 a, b & c are the parts of the main frame



a.

Fig. 2 (a) is the main frame



a.

Fig. 3 a is the fork



a.

Fig4 a is the complete model of the fork lift

V. CONCLUSION

We conclude that, this project will helpful for small scale industries as it is easy to operate with less cost and indirectly it will save the labor cost. Savings resulting from the use of this machine will make it pay for itself with in short period of time and it can be a great companion in any field dealing with rusted and unused metals. It is mechanical device, does not required electricity as well as any external source of battery. 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 efficiency of productivity and it provide safety of operator while handling of the material. It lifts maximum load up

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