

PEDAL AND ROPE OPERATED FORKLIFT

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Abstract - Many industries use forklifts for lifting heavy goods, etc. these are applicable for large scale industries and highly automated industries. Since the small industries requires repeated movement of load from one station to another station the use of these forklift will not be economically. Hence, we decided to design a forklift for transporting the load in easy and cost efficiency way for small scale industries.

The idea is to lift the load and transport the material, heavy load which cannot be lifted by humans

Key Words: Fork, Human Powered, Material Handling, Small scale industry

1. INTRODUCTION

Forklift is a device which is used to transfer goods from one place to other, there are fuel based and battery based forklift. These are short distance transport vehicle and pedal and rope operated forklift are used in small scale industries. Large forklift (fuel based or battery based) are used in industries. Running on fuel, they can generate torque but this pedal and rope operated forklift works mechanically. It can lift minimum 50 KG.

A population of India is large so that the main of industrial company to fulfill customer's requirement due to heavy workload. Due to this the stress on the worker is increased by this there is an effect on human health. So, to minimize this problem forklifts are used in the industry.

2. OBJECTIVES

- Less energy consumption as it is operated by pedal for the movement.
- As the overall cost is less it can be effectively used in small scale industries.
- The operation performed by using forklift provides safety for an operator.
- Time consumption is less for performing loading and unloading operations.
- Safety to workers at workplace.

3. LITERATURE SURVEY

- I. Design development and modelling forklift by Ugale Sachin, Salvi Tushar, Lanjekar Sachin, Kshirasagar Prashanth: fabricated a forklift by using ratio frequency technology. This makes it wireless and increase visibility as well as safety.
- II. Chunshan when forklift is loading and unloading it is directly under all cargo weight and finished the goods fork, handling, lifting. It is mainly composed of door frame, outrigger and cargo, guide wheel, chain and lifting oil cylinder.
- III. Aashish Kumar L Sharnagati, M.S. Tufail developed a robotic forklift to handle palletized material using local sensing so that it needs electricity.

4. CONSTRUCTION AND WORKING MECHANISM

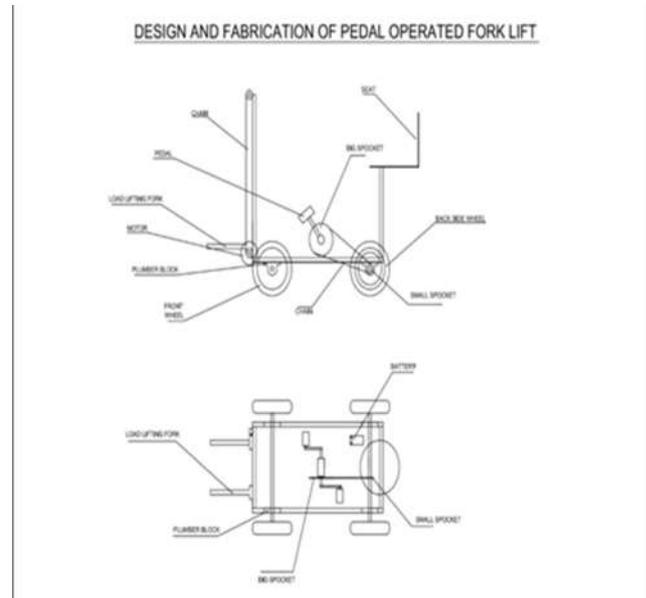


FIG-1. Design of Forklift

Pedal and rope operated forklift consists of a frame made up of steel bars which are welded together to form a structure. The wheels are provided at the front and back for the movement of the forklift. The wheels are connected to the front axle. Chain and sprocket mechanism are provided for the forward and backward movement of the forklift which is placed at the back side.

The forklift consists of three mechanism:

- Lifting mechanism
- Steering mechanism
- Pedaling mechanism

4.1 LIFTING MECHANISM:

Lifting below is a chain block diagram of mechanism gear assembly chain block system lifts the desired load. It consists of gear, chain and a pulley. The worm starts rotating by the rotation of pulley which in turn rotates the worm wheel. The chain which is fixed to the output of gear helps in lifting the load placed in the fork of the forklift. The below figure shows lifting mechanism.

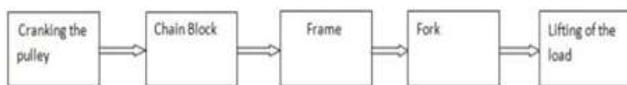


FIG-2 Block diagram of lifting mechanism

4.2 STEERING MECHANISM:

Steering is controlling the movement of forklift which is used to control the movements. It consists of bell crank lever, tie rods, steering rod with pivot pin. Tie rods one end are connected to the pivot pin and the other end of the tie rod is connected to the longer arm of the bell crank lever on each side. The front wheels are held by short arm. The pivot pin are connected to the steering rod. The wheels are steered by rotating steering wheel.

4.3 PEDALLING MECHANISM:

This consists of gear box. The gear box has two shafts. Input shafts rotate due to the pedalling, hence gear fixed to the shaft rotates which mates with the gear on output shaft. An idler gear is placed to move the vehicle in forward direction. The gear assembly is disengaged when the lever direction is changed and the other two gears are engaged which enables the vehicle to move in reverse direction.

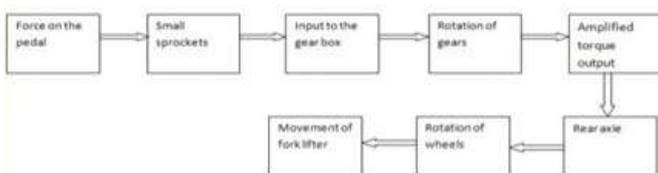


FIG-3 Block diagram of Pedalling Mechanism

5. COMPONENTS DESCRIPTION:

Different components used in this project are as given below:-

5.1 BASE(CHASSIS):-

- The chassis is fabricated from mild steel.
- This is done for ease of fabrication, and to reduce the overall weight.
- The chassis was designed to take a static load of 3kg.
- The flange which holds the motor was designed using Aluminium and is bolted to the chassis.
- So that the driving motors can easily accommodate below the chassis.

5.2 SLIDER:-

It is a rectangular shaped which is in between two channels of Aluminium which slides up and down easily to lift and it lowers the load up to a desired limit by using rope which is connected to the DC Motor.

5.3 SHAFT:-

- A shaft is an element which transmits power.
- The power is obtained to the shaft by tangential force and various machines are linked to the shaft due to this resultant force is setup.
- Pulleys, gears, etc., are mounted on shaft, so that power is transferred from one place to other
- Bending of shaft occurs due to the force exerted and other member present on it.

5.4 NYLON ROPE:-

A nylon rope is used because it withstands certain load. The rope transmits power by means of pulleys which rotate at a speed. The power transmitted depends upon the following factors:

- The velocity of rope.
- The tension under which the rope is placed on the pulleys.
- The condition under which the rope is used.

5.5 PULLEYS:-

- Transmission of power takes place from one point to other by means of pulley with belt or rope.
- The velocity ratio is the inverse ratio of the diameter of the driving and driven pulleys. So, selection of pulley diameter is done precisely to have a desired velocity.
- To allow the belt or rope to travel in a normal to pulley then the pulley must be in perfect alignment.

5.6 DC MOTOR:-

- Electric energy is converted into mechanical energy by an motor.
- It works on the principle of Fleming's left hand rule that mechanical force is experienced when a current carrying conductor is placed in a magnetic field.

5.7 PEDAL:-

Pedal is used for the movement of the forklift, when the operator pedals, the pedal connected to the chain and gear box starts rotating due to which interconnected flywheel in the wheel starts to rotate by this forklift moves forward or backward.

5.8 WORM WHEEL:-

This material is made up of cast steel, crank pulley rotates the worm. Gear with chain is connected to the fork frame to lift the load. It is also called as worm gear.

6. FUTURE SCOPE

As this is used for small scale industries it is just a basic, for the future an advancement can be done by

- Lifting can be done by hydraulics using Pascal's law
- Engines can be replaced instead of pedalling mechanism.
- Increase of worm dimensions can increase the mechanism.
- Steering also can be replaced by rack and pinion.

7. CONCLUSION

This machine will be useful for small scale industries, it is easy to operate and labour cost is also less. It can lift limited load if some modification will be done then the limit can be raised. It can also deal in a field of unused metals.

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