

# Design & Development of Hand Pallet Lifter

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## **Abstract:**

Hand pallet truck is widely used to carry baggage and cargoes in daily life and work. However, rotary-lift based luggage hand pallet truck is inconvenient to handle and difficult to carry heavy goods. Hydraulic based hand pallet truck is also used commonly, but its lifting speed is not fast enough. In addition, most of them can't save energy. To this end, a novel rotary-lift based hand pallet truck is proposed. Auxiliary and cushioning forces are provided by gas springs. Its lifting height is adjustable. Critically, its lifting mechanism can be locked automatically after ascending or descending into the target positions. Thus, it's easy for just one person to operate.

Keywords: Pallet, cargo, pull, lift, jack, Ton.

## INTRODUCTION:

Hand pallet trucks are one of the most popular handling and movement tools used by businesses in almost any given industry. Nowadays, you can't even find transportation or a logistics hub without at least one hand pallet truck. Thanks to their compact size, as well as the fact that it can move different loads of cargo packed on pallets in all directions, they are irreplaceable for small businesses. Then there is their affordable price which is also a big factor for small businesses.



Hand Pallet

## Features:

- Effective and cost-efficient at work
- Low noise levels and Low Rolling Resistance
- Air and dust-tight enclosure of the hydraulic circuit ensures trouble-free operation over long periods of time
- 210 degree steering for excellent maneuverability in trailers and other confined working areas
- Fork lowering speed is controllable, operated by hand control and foot pedal
- Construction of the strong chassis (5mm Thick) permits safe handling of loads up to 3000 kg
- Long life is a built-in feature of the sturdy hydraulic lift unit housing, made as single-piece casting.
- Entry/Exit Roller, more freely travel.
- Equipped with over-load valve, with long service time.
- Ergonomic Large handle with three control lever.

## LITERATURE REVIEW:

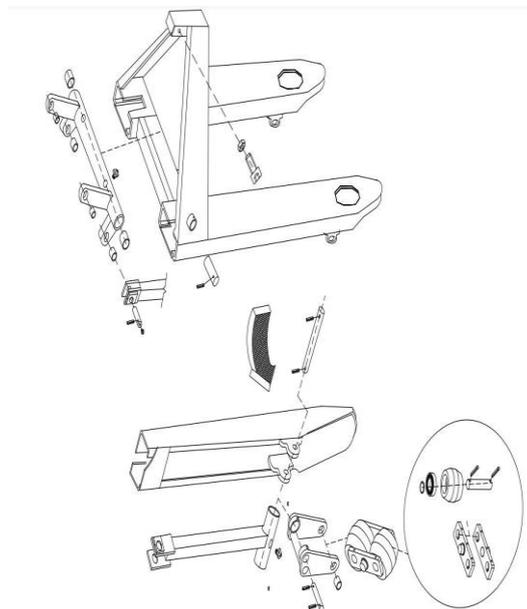
It is used for material handling i.e. movement of heavy material from one point to another point. It helps to reduce human efforts required to move or ship the material from one dept. or one place to another place. It is a mechanical assembly of links, chain, jack mounting, pivots and compression spring. This machine is purely based on compression spring's principle which will give up and down movement of the machine (leg) which carries material and further movement done by the wheels and directions is controlled by the handle.

## PROBLEM DEFINITION:

From the past era of industry, the material handling was done by the humans with bare hands and that was the challenging job and sometime it was impossible to move the material.

So, to move the material efficiently and with less effort we have overcome the challenges so by using mechanical components like compression spring, pivots, links and chain we made a material mover instrument which will take less human efforts towards this and also, we can use the electrical components to do same job but have to keep cost of machine low which should be affordable to the small-scale industries too so we went for the handoperated pallet truck.

## METHODOLOGY:



Solid Works Drawing

Part Lists:

1. Hydraulic Jack
2. Handle

3. Castor wheel
4. Tandem wheel
5. Elevating Links
6. Forks
7. Legs
8. Yoke
9. wheels

### Fabrication processes:

Some manufacturing processes were carried out during the fabrication of the machine, they include;

- (i) **Marking out:** The actual dimensions of the parts required were obtained by taking measurements with steel tape, measuring tape and necessary marking was made with a 25 divider. Major marking out was done on the materials used for the casing, the cover and joining.
- (ii) **Cutting:** Cutting is mainly required in the reduction of length and diameter of the material to get the desired parts.
- (iii) **Assembly:** This involves bringing the various parts together to form a single unit. The most essential process in assembling is the welding process. An electric arc welding machine was used in joining the various cover. Other coupling processes employed are use of nuts and bolts.
- (iv) **Finishing:** This is the final operation involved in the production of any machine usually to increase the efficiency and improve aesthetics. Painting was done to promote visual inspection.

### WORKING:

**Find the release lever.** Stand behind the manual pallet jack as this is the position you will be in when you move it.

- The pallet truck drop lever is often a small lever in the middle of the rounded handle, on the vertical stem of the manual machine. It may be distinguished by a different colour of plastic, or otherwise marked, or it may not be.



**Push inward on the drop lever to lower the legs.** If the legs are already completely lowered, you will not see them move. The legs should only be an inch or two from the floor.



**Put the legs underneath the skid or pallet.** You will see when approaching the skid whether or not the product will fit underneath. If they will not fit, the machine has not been lowered sufficiently, so try to push again on the drop lever.

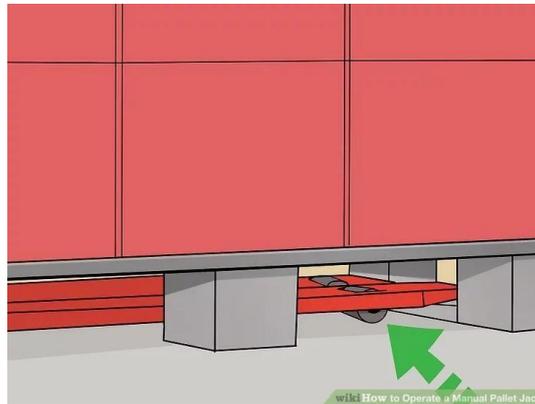


**Use the handle to jack up the pallet jack.** When the legs are under the skid, pull the vertical stem toward you, away from the pallet and toward the floor in a diagonal motion. You should feel the pallet truck (and the pallet) slowly rising against the pressure of gravity.



**Check to make sure that the pallet truck is not on the cross wood of the skid, front wheels must be on the floor.** If the wheels are on the cross wood this will stop the pallet from going up and also stop it from rolling.

- Make sure that the pallet is jacked up from the floor before moving the manual pallet truck.



**Move the pallet truck.** When it looks and feels like the pallet is sufficiently raised so that it will not drag, pull on the pallet truck handle to move the raised pallet in any one direction. Alternately, users can push against the pallet when it's time to move the pallet up over a lift gate or onto a truck.



## IMPLEMENTATION

### Materials Selection:

The following were considered in the selection of materials:

- Availability of materials so that the parts can be manufactured locally,
- Costs of materials to enable us fabricate a machine that is affordable and economical,
- Durability of the machine, because the operating environment may be harsh which can lead to deterioration of machine parts.

The machine will be fabricated with mild steel because it meets the above considerations and also due to its machinability, forming, and weld ability since the fabrication process involves cutting, folding, bending, welding, and other machine operations.

**Design Methodology:**

Design and fabrication of the machine involved the steps mentioned below: -

1. The market review was identified.
2. Made the design of the prototype model.
3. The design was evaluated.
4. Specifications of the components were noted down.
5. Observations and calculations were made.
6. The major components of the machine were assembled.
7. Fabrication of the inbuilt hydraulic car jack was carried out.
8. Later on, testing and trial runs were carried out.

**MAINTENANCE:**

Simple maintenance work, such as checking the hydraulic oil level, may be carried out.

Function group	Maintenance work	Chapter
Chassisframe	Checking the condition, mounting and wear of the rollers	"Roller maintenance"
Load liftsystem	the function of the initial lift	"Servicing the lifting system"
	ing the lowering device	ng the lowering device"
Identification points	ing the labelling for completeness	"Overview"

**RESULT:**

The numerical stress analysis of the CAD model was performed using Solid Works 2019 Software. To avoid deformation on the base support, and the mechanisms, the maximum load applied was 3 Tons. The CAD model of the prototype was generated using ZD Cam then imported to Solid Works 2019 for the analysis. The analysis was done on the mode to know the weight at which the design can withstand deformation, the material selected the mode was mild steel because of its availability, cost, machinability, etc. the base support model was fixed the support a force of 3 Tons was applied and the prototype was able to withstand the force. Therefore, the design was considered safe.

## CONCLUSION & FUTURE WORK:

Pallet Jacks are the ideal product to push, pull, lift, lower and position loads of anything from a couple of kilograms to hundreds of tons. The need has long existed for an improved portablejack for load. It is highly desirable that a jack become available that can be operated alternatively from inside the workshop or from a location of safety off the workshop on which the load is located. Such a jack should desirably be light enough and be compact enough so that it can be stored in a workshop store, can be lifted up and carried by most adults to its position of use, and yet be capable of lifting a wheel of a 2,000-3,000-pound vehicle off the ground. Further, it should be stable and easily controllable by a switch so that jacking can be done from a position of safety. It should be easily movable either to a position underneath the axle of the vehicle or some other reinforced support surface designed to be engaged by a jack. Thus, the product has been developed considering all the above requirements.

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