

## STAIR CLIMBING TROLLEY

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### Abstract

The projects aims to develop a mechanism for easy transportation of heavy load over stairs. The need of such system have raised from day to day requirement in our society. Local goods transportation generally depends on manual Trolleys which are used in warehouses, construction sites, malls, residential relocations etc. Mostly hand trolleys are manufactured with the main aim of transporting goods on flat surface or at ground level. However, when it comes to shifting the goods above the ground level there are limitations where a hand trolley cannot be brought to, such as rough surfaces or any up level from ground is not an easy job, especially where there are no lifting facilities (elevator, conveyer, etc). Therefore, limiting the aspect of transportations from lower ground to higher levels or vice versa. The hand trolley could be tried to handle through the staircase but there are higher chance of failure occurring during the lifting on staircase, such as falling of hand trolley when it gets out of control and causing accidents as well as injuries. Apart from that, smaller and circular objects have the highest tendency of falling as it doesn't fit the trolley area. In shifting and moving heavy load above ground, Human labors are considered to be the solitary This mechanism of stair climbing trolley allows for efficient stair climbing functionality. This functionality allows for easy movement of goods across stair cases. The project aims to develop a mechanism for easy transportation of heavy load over stairs. The need of such system have raised from day to day requirement in our society. Using of this vehicle the labor cost can be reduce as well as large amount of load can be transfer uniformly with less power consumption thus our project introduces the new alternative for transportation of load over the stairs. It has designed in such a way that it can be climb a stepped path with its modified wheel structure.

### 1. INTRODUCTION

Nowadays, mechanical artifacts are commonly found in our daily life. They are currently used in many fields of

applications such as office, hospital operation, industrial automation, military tasks and security systems. It is not difficult to observe that mechanical

designs play an important role in assisting human tasks. Stairs are one of the most commonly faced mobility challenges for daily life applications. Whenever it comes to shifting the goods above the ground level there are limitations where a hand trolley cannot be brought to, such as rough surface or any up level from ground is an easy job. So, our group has been involved in a project to design and develop a mechanical STAIR-CLIMBER that can climb up and down the stairs in a stepwise and safe manner. After studying various options it was decided to build a trolley that could be carry load across stair and also it can work on even surfaces whenever it is needed. Thus we have decided to make a stair climbing trolley which is affordable to everyone with low cost. This will enable efficient handling of goods across stairs with less human energy

## 2. RELATED WORK

Many researchers performed various experimental investigations on stair climbing vehicles such as trolley, trucks, chair for handicapped person, forks etc. it requires an in depth study of maximum load acceptable for a cabin and how stress transferred to wheels alignment. Pratik H. Rathod designed and fabricated a hand truck which climb stair with less effort which is useful for library, hospital, regular goods carrier etc. the main modification in this truck where made at

wheels using plat surface roller plat attached instead of traditional wheel frame. The mechanism based on retched arrangement mechanism. The inclination of 44 degrees plays a major role which covers more than 90% of all stairways within this limit. There is an optional maximum inclination warning alarm that alerts the operator of an inclination of more than 44 degrees. When truck operated with exceeding the limit there should be taken the necessary safety precautions. Md. A. Hussain designed and manufactured a stair climbing vehicle using modified form of frame arrangement i.e a curved wheel frame which move on rough surface. To address several technical issues in designing this vehicle is stability and maintain high speed at vehicle wheel arrangement while climbing stairs. The frame arrangement consists of sun, planetary, idler wheel which are assembled to the shaft which reduces application of load. However, the steepness of the stairs is also the important concern of this study. The vehicle has four set of wheels arrangement to support its weight when it moves over the flat terrain. Each wheel frame consists of three sub-wheels attached with the sun wheel through three idler gears.

Ashish Singh worked on four-wheeled robot will have the capability of climbing the stairs of height equal to its diameter. It

will possess maximum gripping capacity and stability during motion in rough terrain owing to the 4 differential driven wheel configurations. The main of this investigation involved within this project such as the robot should be upgradeable with a variety of application sensors, e.g. cameras, thermal vision, or chemical sensors. To be usable in any search and rescue or security application, the robot has to be operational without changing batteries for at least two hours.

### 3. IMPLEMENTATION

Mostly hand trolleys are manufactured with the main aim of transporting goods on flat surface or at ground level. However, when it comes to shifting the goods above the ground level there are limitations where a hand trolley cannot be brought to, such as rough surfaces or any up level from ground is not an easy job, especially where there are no lifting facilities (elevator, conveyer, etc). Therefore, limiting the aspect of transportations from lower ground to higher levels or vice versa. The hand trolley could be tried to handle through the staircase but there are higher chance of failure occurring during the lifting on staircase, such as falling of hand trolley when it gets out of control and causing accidents as well as injuries.

Apart from that, smaller and circular objects have the highest tendency of falling as it doesn't fit the trolley area. In

shifting and moving heavy load above ground, Human labors are considered to be the solitary solution.

- The Project aims at making headway for developing a mechanism for transportation of considerable loads over stairs.
- Lifting material with heavy weight to upper level from the ground with painless work. Especially where there are no lifting facilities for (elevator) moving objects from lower to upper level or vice versa.
- Weight reduction and minimum effort require carrying the load.
- Keep safety, weight, and size in perspective.

A typical hand trolley consists of two small wheels located beneath a load-bearing platform, the hand trolley usually has two handles on its support frame. These handles are used to push, pull and maneuver the device. The handles may extend from the top rear of the frame, or one handle may curve from the back. An empty hand trolley usually stands upright in an L-shape, and products are usually stacked on top of the platform. When the goods are in place, it is tilted backward so that the load is balanced between the platform and the support frame. Especially if heavy or fragile materials are moved, the person operating the trolley should return it to an upright position carefully, to insure nothing falls off the platform. The front of the frame may be squared off for boxes or

curved for drums and barrels. Sometimes, a hand truck also has straps for securing loose freight during transport. Professional material handlers prefer to use a hand truck when moving stackable items such as boxes, crates or packages. Heavier items are usually stacked on the bottom of the hand truck, with lighter objects saved for the top. Hand truck users must be careful not to stack it so high that their vision is blocked or the load becomes unstable. Generally, it is safe to load a hand truck to the level of its handles or the top of the frame. The load is then shifted onto the wheels with a backwards lifting motion. The user can maneuver the cargo by steering it left, right or forward.

#### 4. EXPERIMENTAL RESULTS

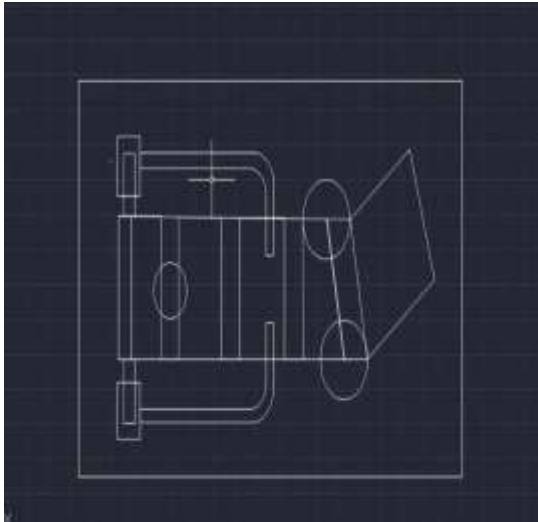
Most of the people living in developing or less developed countries have a limited earning to provide somehow their basic needs and usual staffs. Carrying goods is a regular task in life and several products have been invented to minimize efforts in this purpose. However, the price and features of most available products are out of the reach for the people of limited earnings. Stair climbing trolley is very useful for those houses where a lift is not available. In this research, we modified mechanical design with 3 wheels providing the easy movement while carrying the goods on the stairs these represents the equations of pulling force,

constraints of stair dimensions and climbing mechanism. The factor of safety and different types of stress have been determined for different types of loads and conditions. The design represented and simulated for sustainability and longevity including better carrying convenience provided by the suspension feature have ensured the uniqueness of this research.

It consists of three wheels at three corners of the equilateral triangle while moving on flat surfaces two wheels on the either side will slide on ground. Because of two wheels on either slide can carry more loads compared to conventional trolleys. While, climbing stairs each wheel with respect to centre of the triangle gets rolled. Control of this trolley is made easier by using a flexible handle. Load is carried on a plywood supported by a iron frame



Working of stair climbing trolley



Top view of stair climbing trolley



Stair climbing trolley

## 5. CONCLUSION

The main aim of the project is stair climbing mechanism for load carrier with decreasing effort. The stair climbing trolley has been designed in such way that it can carry the heavy loads as well as bulky loads over stairs and also used for carrying loads on flat surfaces from one place to another place without many efforts from the user. Accordingly to the tests conducted, the stair climbing trolley has a capacity of carrying a load of 70-80

kgs on the flat surfaces. It has the ability to ascend a flight of stairs of 30 degree elevation carrying a load capacity of 40 kg.

- Thus our better work with lessor effort has been the main objectives of human beings in any field.

- The main project as platform we try to present mechanized stair climbing load carrier with reducing effort.

- Stair climbing mechanism in stair case load carrier which helps to carry the loads with help to carry the loads with stair case.

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