

Review on Design and Development of Tri Wheel Load Carrying Trolley

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Abstract— In the modern world though there are many developments in the field of engineering. Still there are difficulties to carry heavy loads over stairs. Development of lift simplifies the effort of carrying heavy loads over stairs, it is not possible to use lift in all places like schools, college's constructional areas. This project aims at developing a mechanism for easy transportation of heavy loads over stairs. The need for such arises from day to day requirements in our society. Devices such as hand trolleys are used to relieve the stresses of lifting while on flat ground. However these devices usually fail when it comes to carrying the load over short fleet of stairs .Our project attempts to design a stair climbing trolley which can carry heavy objects up the stairs with less effort compared to carrying them manually .The main objective of the project is to find an efficient and user friendly method of carrying various objects through stairs using minimum effort from the user and to also provide a smooth movement while climbing the stair. Under this project we have manufactured a stair climber with tri lobed wheel frames at both sides of the climber and three wheels on each sides are used in the tri lobed frame. It is an abstract about an Advanced Stair Climbing Cart which is advanced with modification and attachments. In the beginning, carrying some load by upstairs were very difficult except elevators. So, engineer found a solution which came in a face of a modern trolley which can deal with stairs easily. It has very benefits to aged person as well.

Key words: Tri Wheel Arrangement, Bearings, Stair, Frame, Trolley

I. INTRODUCTION

In day today life we may have to carry so many goods and objects of various quantities through stairs especially in offices, schools, colleges, hotels, industries, apartments etc. where the lifts may not be available, may be crowded with people or may be under repair .It is highly tiresome to carry various objects through stairs manually for higher floors for so many times. The various applications may be carrying bundles of answer sheets in a school or a college, carrying furniture in different buildings, different apparatus in colleges, in hospitals etc., carrying electronic items in houses and offices .So there should be a way to carry the objects through the stairs in a more comfortable and tireless manner without forcing the user to apply more force. Here comes the application of a stair climber.

Advanced Stair climbing carts have special wheels designed to cling onto and roll up the front of a step, so their user doesn't need to do any lifting while going up stairs. People of all ages can benefit from using a stair climbing cart. While they are often associated with senior citizens, these carts can replace backpacks for students and young children. The cart has ability to carry load up to 40 - 50 kg (carrying capacity varies with modification in design of

cart). This Trolley can be used on surface as well as stairs with a minimum jerk than conventional trolleys.

A. Types of Trolley

Different types of these trolleys exist, and the type used is often chosen based on what type of material it will move. Hand trolleys are made of various types of hard materials, including steel, aluminum and high-impact plastic. Most hand trolleys come in standard sizes and are used for general loads, but there are some that are specifically designed for very small or large products.

1) Wheeled trolley

Wheeled trolleys made from stainless steel are the most common type of hand trucks used. These are used in places with heavy loads to move, like retail stores and factories, and typically have wheels made out of stainless steel as well. Welded steel and metal wheel trolleys are typically much more lightweight and are often used to carry lighter materials. Those with a frame and wheels made of a metal alloy are heavier and sturdily made. Trolleys of this type usually have a wider platform for oversized loads. Metal alloy hand trucks are typically used to transport heavy products, such as items made of steel.

2) Folding Trolley

A folding trolley is another type of hand tool, and is often made of rust-proof aluminum. It is also lightweight but is usually able to carry heavy loads, and can fold to take up less space when not in use. This feature also allows it to be easily transported to places where it is needed.

3) Garden Trolley

The garden trolley is a maneuvered with the use of a pull handle. Garden trolleys tend to have narrow profiles so that they will fit easily on paths and walks without damaging plants. These are designed so that they are capable of lifting both dry and marshy loads which are most commonly found in gardens.

4) Kitchen Trolley

A kitchen trolley is a serving cart that can also be used for storage. It is designed that it has more than one section in it which enables people to carry various utensils and for various purposes.

5) Sack Trolley

Sack trolley or Sack barrow is a fairly generic term describing a range of light, single operator hand trucks or trolleys used to move cartons, feed and grain sacks, and other light, stackable goods. Lots of different materials are used to make sack trucks. This includes high impact plastics, tube steel, aluminum steel, and aluminum excursion.

II. LITERATURE REVIEW

Design and manufacturing of six wheel staircase trolley, Mr. Bhanje V.C., Mr. Alzende S.S., Mr. Gulik A.T.,Mr.Kale A.A. in sept-2015 ,Published in International Journal of Emerging Trends in Engineering and Development.

Lifting objects ,loads such as books, food grains etc. to store above the ground level, or even patients to move upper level from ground is not easy job, especially where there is no lifting facilities (elevator, conveyer, etc) Moreover, in most of the buildings in the world does not have elevators or escalators. In this case human labors are considered to be the only solution. Labor is becoming costly as well as time consuming in the developed countries, where growth rate is getting negative. This problem can be solved if a vehicle can lift loads while travelling through stairs. The project introduces a new option for the transportation of the loads over the stair. Most of the buildings of the country are structurally congested and unavailling of elevator facility so it is difficult and laborious to lift up heavy loads. The stair climbing hand truck can play an important role in those areas to lift loads over a short height, like libraries, hospital, and in construction area. The vehicle, which can move upper level through stairs, or run in very rough and rocky surfaces, is called stair climbing hand truck or say stair climbing vehicle.

Stair climber trolleys have a total of six wheels, three on each side. They are set in a triangular pattern. The uppermost wheel rests on the upper step, with the other two wheels set on the lower step. This allows you to apply leverage as you pull the trolley up a set of stairs.

Stair climbing hand trolley, Prajan Pradip Gondole, Kamlesh Diliprao Thakre in april-2015, Published in Journal of Emerging Technologies and Innovative Research (JETIR) The present invention relates to hand trucks intended for transporting heavy load and more particularly, to an improved and simplified hand truck which is adopted to move heavy loads easily up and down from the stair; with the help of this truck we can lift the load easily up and down from stairs. Due to this the man effort is reduced and time to lift the load is also reduced.

After studying various options it was decided to build a hand truck that could be carry load across stair, also it was decided to power it manually so as to keep it in reach of many users. This will enable efficient handling of goods across stairs with less human energy. Before delving into the theory behind complex stair-climbing mechanisms, it should first be noted that it is possible to climb stairs using an ordinary wheel.

The large wheels necessary for this task make this method of stair-climbing somewhat undesirable. Also, the climbing motion produced by simply rolling over stairs is a jarring motion rather than a smooth one. In addition, the frictional force between the wheel and the edge of the stair must be sufficient to allow the wheel to grab and roll over the stair. A friction coefficient of too small a magnitude will cause the wheel to slip against the stair rather than climb.

A problem with prior art hand trucks or carrying carts is that is difficult for the operator to keep the truck under control when going down the stairs, and it is even more difficult to move heavy loads up on stairs because the operator is substantially pulling the load and the truck. It is common to have braking device operable to help prevent the truck from running away during its movement down the stairs. Another problem with existing hand trucks and carrying carts is that they are unsatisfactory for transporting heavy products. The trucks typically have pair of ground

engaging wheels which wear quickly because of the heavy loads bearing downwardly directly on the wheels.

The stair-climbing hand truck is designed to reduce liability rather than increase it. Conventional hand trucks work well on flat ground, but their usefulness decreases when it becomes necessary to move an object over an irregular surface. Package deliverymen, for example, often find it necessary to drag loaded hand trucks up short flights of stairs just to reach the front door of a building. The entire purpose of using a conventional hand truck is to avoid having to lift and carry heavy objects around.

Stair Climbing Vehicle, Md. A. Hossain, Nafis A. Chowdhury, Rubaiat I. Linda in jan-2010, published in International Journal of Research Publications in Engineering and Technology.

Lifting recurring loads like books, food grains etc. to store upper level, or even patients to move upper level is not easy job, especially where there is no lifting facilities (elevator).The project introduces a new horizon for the transportation of the loads over the stair. Most of the buildings of the country are structurally congested and unavailling of elevator facility so it is difficult and laborious to lift up heavy loads.

The stair climbing vehicle can play an important role in those areas to lift loads over a short height, like libraries, hospital, and in construction area. The vehicle, which can move upper level through strain, or run in very rough and rocky surfaces, is called stair climbing vehicle.

In the initial design, each wheel contained frame, a sun wheel and three planetary wheels. The planetary wheel was connected with the sun wheel through an idler. The purpose of using the idler was to rotate the planetary wheels in the same direction of sun wheel. Each planetary wheel was aligned in a straight line with idler and sun wheel. The straight wheel frame takes more thrust to tilt the wheel frame to engage next planetary wheel. The length of each arm is high and thus creates vibration and the vehicle would be unstable. In the present design, the wheel frame was made curve so that the front surface of the arm could not collide with the edge of the stair.

Advance material handling trolley using Triwheel mechanism, Mr.Mulik Shrinivas, Mr. Salunkhe Rohit,Mr.Shaikh Shahrukh, Mr.Swipnil Gaikwad in October 2016 published in International journal of recent civil and mechanical Engineering.

This invention tells us that a typical hand trolley consisting of 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.

This article aims is developing a mechanism for easy transportation of heavy loads over uneven surface. The

need for such a system arises from day-to-day requirements in our society. Devices such as hand trolleys are used to relieve the stress of lifting while on flat ground; however, these devices usually fail when it comes to carrying the load over short height. Several designs were conceived that would allow a non-industrial hand trolley to travel over stairs, curbs, or uneven terrain while reducing the strain on the user. In our project the trolley is consisting the tri-wheel or Tri-Star mechanism eases the movement of trolley in irregular surfaces like holes, bumps, flips, etc.

III. CONCLUSION

We have referred various research paper related to our topic. There is lot of work already done in this area but there is no device which is accurate. There are various designs which are giving positive results but giving lot off complexities. Various designs have limitations as there is two wheel arrangement. By referring various research papers we have designed one model of tri wheel load carrying trolley. The system also aims to make simple model which can be simplify human efforts and modifies two wheel trolley.

Thus the stair climbing trolley was fabricated in such way that it could carry the heavy loads over stairs and also used for carrying loads on flat surface from one place to other place with less human effort. This decreases the human effort to carry heavy loads over stairs and also on flat surfaces and proves to be more advantages in all places like industries, schools, college etc.

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