Design and Fabrication of Stairs Climbing Trolley

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Abstract— This paper gives project aim at developing a mechanism for easy transportation of heavy loads over stairs. The need of such system arises from day-to-day requirement in our society. Hand trolley used to minimize effort of human on flat surface but this conventional hand trolley cannot lift load on stairs.

Keywords: Stair, Hand-Trolley, Wheel-Frame, Shaft, Tri Star Wheel

I. INTRODUCTION

A hand trolley is consisting of two wheels at the bottom of trolley. The handles are provided to support the frame and applied the human effort to lift load. This hand trolleys have limitation to climb over stairs. For minimize the effort of human we smartly designed staircase climbing trolley. The trolley is smartly designed to carry loads on staircases as well as on flat surfaces and rough surfaces. The trolley uses of a three interlinked wheels arrangement that allows it to climb on stairs.

The stairs climbing trolley is use to lift heavy loads on stairs by tri star wheel mechanism. This mechanism consists of three wheels connect to the shaft by means of triangular plate. In some areas like constriction sites, industrial areas, buildings where lift is not available so we can lift load by less effort on stairs.

II. OBJECTIVES OF PROJECT

- To design all parts of trolley like frame, wheel arrangement, bearing and assembled them by use of AUTO CAD software according to their dimensions.
- Structural analysis of trolley by analyzing workbench software.
- Fabrication is based on analysis with accurate measurements to withstand on load.
- Combine various parts to make multifunctional trolley to climb over stairs and flat and rough surfaces

III. DESIGN AND MODIFICATION

Simple hand trolley	Stairs climbing trolley
1.In this trolley one or two wheels are use on either side	1.In this trolley we attached set of three wheel on either side of vehicle rather than single or double wheel.
It required more human effort.	It required minimum human effort.
It can lift load on flat surfaces	It can lift load on stairs as well as on flat surfaces

Simple hand Trolley

Stair climbing Trolley

IV. TRI STAR WHEEL

In this project, we have used tri star wheel and is equipped the trolley. It helps to carry and transport the load with ease. It has the ability to work on the flat surface normally and has the potential to climb uneven surfaces such as the stairs robotically with help of its rolling action. These triangular shaped wheels also help the vehicle to climb small obstacles like rocks and holes.

V. TROLLEY FRAME

The trolley frame is made up of mild steel material. It has handled to operate which is perpendicular to the structure of the trolley so that it becomes convenient to operate the trolley at an inclined angle. The base of the trolley is welded and the material used for the is mild steel.

VI. WHEEL AND SHAFT ASSEMBLY

The Tri star clamps get wheel fixed on it which is then assemble on hollow shaft. The Tri star wheel is fixed at the ends of the hollow shaft. The sprocket is fixed on the hollow shaft before welding which connects the small sprocket.

VII. WORKING PRINCIPLE

The tri-wheels of the trolley consist of three wheel which are placed at three corners of an equilateral triangle while rolling this tri-wheels on the flat surface, only two wheels out of three wheels will slide on the flat surface and the other one will be in rest. Due to this mechanism, the trolley will carry more loads as compare to conventional trolley. While climbing trolley on the stair, with the help of the center part of the tri star wheel each wheels get rolled. To get control on this trolley easily handle are make flexible. The load is carried on supported by an iron frame.

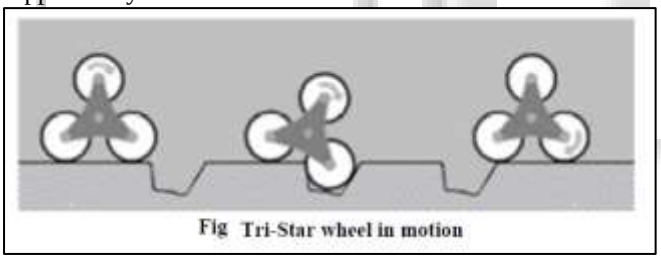

Fig Tri-Star wheel in motion

VIII. LITERATURE REVIEW

It requires study of maximum load acceptable and stress transferred to the vehicle alignment. The aim of making this stair case climbing trolley is to develop a mechanism for easy transportation of heavy loads. The need of such system arises from day to day requirements in our society

IX. CONCLUSIONS

The mechanism of this trolley is made in such a way that it can carry heavy loads without much efforts, with the help of the stair plates the trolley can be climb to any height of stair without much tolerance. Due to nut bolts and adjustments more luggage can be shifted from one location to another location within less time.

X. APPLICATIONS

- warehouses,
- construction sites,
- malls
- residential relocations,
- Workshops.

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