

Design & Development of Stair Case Ramp for Disable People using Lead Screw

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Abstract – The aim of this article is to illustrate the evolutionary forms of the stair ramp. I know that people with disabilities face difficulties when they want to travel or move from one floor to another. They accepted the other person's support for the move. Sometimes it is more difficult when the person is in a wheelchair. Our focus is on developing the stair ramp for disabled people to move from one floor to another without assistance from the other person. The economy of the ramp must be there. So, I went through several posts to find the stair ramp evolution. I developed the approach that can help people move from one floor to another without additional support.

Keywords- D.C, Motor, Stair Climbing Mechanism, Climber

I- INTRODUCTION

There are many old and physically disable peoples in the world and it is difficult for them to climb stairs as compared to normal persons. So to help them and to help the persons who cannot afford lift as their houses are small, the project is made. The most concern of this project is to fabricate a mechanism which will lift them up and put them down whenever they want and at very low budget. A stair with escalator is a mechanical device for lifting people up & down. Rail is mounted on the stairs on which a platform is attached. The platform is

lifted by a simple mechanism of rope & pulley by it is lifted. Person gets on the platform is lifted when he/she switch on the plug the motor starts, after that the shaft of motor is connected to gearbox (speed reducer) by the Oldham's coupling.

The outlet shaft of gearbox is connected to another Oldham's coupling which transmits the power to the spindle to wind or unwind the rope. Winding the rope will lift the platform up & unwinding will make the platform go down. Advancements in technology made disabled people to lead an independent life and play a more productive role in society. Stairways into buildings present a significant environmental barrier for those with mobility impairments, including older adults. A number of home access solutions that allow users to safely enter and exit the home exist, however these all have some limitations. The purpose of this work was to develop a novel, an inclusive home access solution that integrates a staircase and a lift into one device. The Excel stairway lift system will be installed in order to give people the independence needed to move around their home. The use of two individual stairway lift systems ensures that she can easily move from level to level. A handle placed in between the two stairway lift systems, which will allow them to move from one chair to the other. A novel remote centre mechanism was proposed where in a

wheelchair can glide along the stairs. In this system, the angle of the seat on the attitude of the chair changes along the angle of inclination of the user irrelevant of the angle of the wheelchair. An attitude sensor along with a relatively small actuator used, this minimal degree of active control made possible. Usually we find that people neither can drive wheelchairs properly at cross muddy patches nor uneven terrain. Similar is in the case of stair where one approach is use of legs. Advances in robotics have made it possible to build and control machines in every way possible. It is not difficult to build a wheelchair with legs that can climb slopes, step over obstacles, which run along stairs. In 1987 a four legged chair developed by the University of Illinois at Chicago and the Veterans Administration Hines Rehabilitation Research and Development Centre based on research in quadruped walking was developed. This invention could sustain a weight of around 110 kg. In addition, has a capacity of carrying a payload of 113.6 kg.

II- LITERATURE REVIEW

Vanish V. Gaikwad, Previn S. Ghawde, Sandip J. Kadam this topic deals with the design fabrication and analysis of a stair case lift, which can be use as Material Handling System. In this system they use DC motor for changing the polarity of the power supply which will make the motor run in reverse direction connected with the earlier, while the later will form the entire assembly run to in downward direction, with the help of Toggle switches and push buttons. In this model they used MDF (Medium density fire core hard plywood) for making stair, and saddle. From ANSYS analysis it was found that for maximum load of 5 kg deformation is 0.0089403mm with maximum stress 3.263 N/mm.

Prof B.B. Biswal this project involves the design of an ergonomically designed electric wheelchair for domestic use by Indian old aged people. The product mainly consists of 3 modules viz. seat, links and frame. The design is validated by developing Digital Mockups of individual parts are generated in CATIA and are assembled to form the final product. Necessary simulations of the product are generated in virtual environment of CATIA.

Weijun Tao, Junyi Xu and Tao Liu In this article, a review of electric-powered wheelchair with stair climbing current technology is given and its future tendency is discussed to inform electric-powered wheelchair with stair climbing researchers in the development of more applicable and popular products. According to the author respective advantages and

disadvantages of different types of electric-powered wheelchairs with stair-climbing are outlined for an overall comparison of the control method, cost of mechanical manufacture, energy consumption, and adaptation to different stairs. Insights into the future direction of stability during stair-climbing are discussed as it is an important aspect common to all electric powered wheelchairs with stair climbing. Finally, a summary of electric-powered wheelchairs with stair climbing discussed in this article is provided.

A S Shriwaskar and S K Choudhary this paper presents stair climbing mechanism by which chair will climb on stair without any assistance. Project reveals about synthesis, modelling and simulation of mechanism for guiding wheels for climbing mechanism. Mechanisms like four bar mechanism, single slider crank mechanism, double slider crank mechanism, etc., are used for transmitting motion, force, torque, etc... Generally, a mechanism is designed for the desired performance output of the machine and these mechanisms are being used in case of climbing wheels. This project focuses on presenting the development of a stair climbing wheelchair. This wheel chair is adaptable to climbing and descending stair and slopes. Operation on level ground is similar to the operation of a conventional wheel chair.

Murray J Lawn, Toshihide Sakai, Megumu Kuroiwa and Takakazu Ishimatsu this paper focuses on presenting continued development of the "Nagasaki Stair climber", A dual section tracked stair climbing wheelchair "the Nagasaki Stair climber" has been developed in Nagasaki, a dual section tracked wheelchair capable of negotiating the large number of twisting and irregular stairs typically uncounted by the residents living on the slopes that surround the Nagasaki harbor. A control system has been added to the proven dual track mechanism wheelchair. The control system provides for automation. Recent developments include an auto guidance system, auto leveling of the chair angle and active control of the front rear track angle. Future work includes the continued development of the control system with regard to improved automation, safety and general robustness. Further refinement is also required on reducing the weight of system.

Harout Markarian Wheelchair users face difficulties while crossing rugged terrains and sidewalks, as well as climbing up and down stairs. With the safety of the user as a main concern, the following concept will allow the occupant of the wheelchair to ascend and descend stairs while remaining safely on the seat. This conceptual

design consists of two differential drive wheels and a two legged mechanism, in addition, it uses light weight material. Using Solid works simulations, the dynamic analysis of the wheelchair is presented while it climbs the stairs. Finite element analysis is also performed on the wheelchair's frame, along with DC motor power analysis and control system design.

Mulik shriniwas, Salunkhe Rohit, Shaikh Shahrukh, Waghmode Dada, Swipnil Gaikwad. this article aims is developing a mechanism for easy transportation of heavy loads over uneven terrain. 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 triwheel or tri-star mechanism eases the movement of trolley in irregular surfaces like holes, bumps, etc.

III-PROBLEMS IDENTIFIED

There exist few models such as escalators and elevators, used to go up and down the stairs but these, are not explicitly for the physically handicapped. For an instance, a physically handicapped people cannot use the escalator. There also exist scenarios where both elevators and escalators cannot be used due to limitations in architecture. Elevators occupy more space. Therefore, implementation in places, where sufficient space is not available, becomes tough. Healthy people develop the habit of depending upon elevators; therefore, physical activity reduces. In elevators, people get stuck for hours between floors when the power goes out and there is no back up for the power supply

IV-PROTOTYPING

- **Base** : The project arrangement is in "L" shape to provide support to the link. Links are used to convert stairs into ramp. Base has horizontal and vertical arrangement. Vertical arrangement is used to support two links with the help of two support. Horizontal arrangement is also supporting the two links with of help of stopper.
- **Links** : Links consists of several parts that holds the run of stairs and the ramp was also supported by the link. The link was provided with three supports that can be adjustable by the adjuster

which was connected by the linkage provided. And also, another three adjustable supports for the run were also provided by attaching to the link, the same support was also provided on each link. Each link length was approximately around 110cm and each support length for run is of around 6.4cm and the three support was provided according to the support needs of run of stairs. The link was supported by a base support.

- **Run** : While designing width of run of stairs we came to know that higher width has to be provided in order for smooth movement over stairs and also in ramps and in order to have strong foundation greater width has to be provided. The run was connected to the links and with the help of links the run can be moved upwards or downwards in order for the conversion of stairs into ramp.
- **Design** : The stairs and ramps are built side by side for providing path to people and physically disabled people respectively and for providing separate path are not possible in every street corner or on every stair and also cost for constructing separate path were also increased. Next rise and run length are more than the hypotenuse, so if we convert the rise and run of stair into ramp, length will be increased and it should not so it's a problem. In order to create portable product many linkages have to be provided and each has to work on what they are given.
- **Model** : The same mechanism applied to the prototype was applied on model but material used here was metal has to take into account.

V-ANSYS ANALYSIS OF DESIGN & DEVELOPMENT OF STAIR CASE RAMP FOR DISABLE PEOPLE USING LEAD SCREW

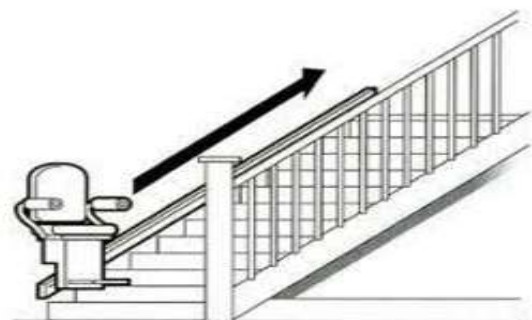


Figure 1: On Straight Stairs

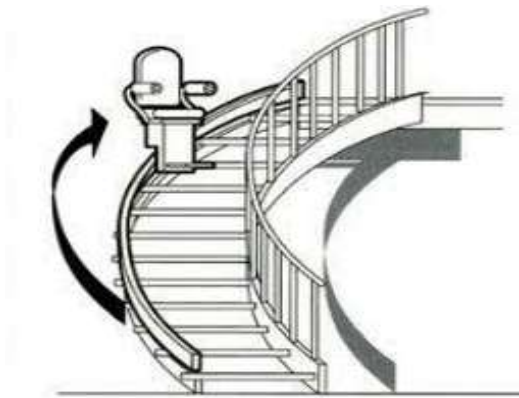


Figure 2 : on Curve and Spiral Stairs



Fig 3- On straight stairs with flat slop



Figure 5_ Fabrication of Stairs



Figure 6. fabrication of Ramp

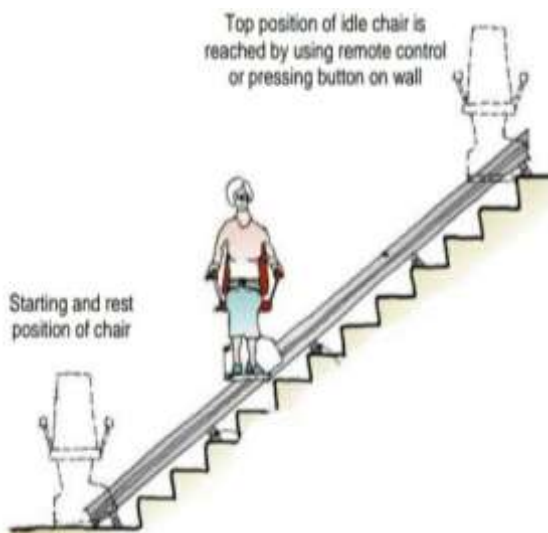


Fig 4- Stair Slope

VI-CONCLUSION

The design of the wheelchair is compact, so it can be moved on almost all the stairs that we find in institutions, offices, industry and also in some apartments. The design is very safe and there is no possibility of frame failure and wheels under normal conditions according to the tests carried out, the stair wheelchair has a load capacity of 100 kg on a flat surface. It has the ability to climb a 40-degree staircase weighing 55 kg. The design of the wheelchair is compact, so it can be moved on almost all the stairs that we find in institutions, offices, industry and also in some apartments. The design is very safe and there is no possibility of frame and wheel failure under normal conditions.

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