



# Mechanically Operated Stair Climbing Wheelchair

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**Abstract:** “STAIR CLIMBING WHEEL CHAIR”, the project aims at designing a wheelchair capable of climbing staircases with manual effort. This project is inspired by many projects done earlier on the concept of climbing stairs by wheelchair, but the modifications we are planning to do are;

- (i) Simpler operation mechanism, the motion of the wheelchair is operated mechanically.
- (ii) Reduction in the overall cost.
- (iii) Use of worm gear for the rotation of the shaft.

The main conceptual elements that have been proposed to improve this idea are mainly to simplify the mechanism and make it work using human effort. The conceptual design, preliminary design, are being done and explained in the report. The report also contains about materials to be used and design aspects and constraints that we have to keep in mind while designing. Some of the drawings relating to our project are drawn. The model of wheelchair which helped us in getting an idea of this project are shown in the project.

**Keywords:** worm gear, shaft, nubs, chain, handle.

## I. INTRODUCTION

Since the beginning of mankind, he has been improving himself in science and technology. This is to overcome his difficulties and reach & improve his comfort levels. It is not that every man is born perfect, some have their own difficulties, problems and disabilities. Some are since their birth and some by the game of time. They struggle a lot to lead life in the society. wheelchair is one of the most commonly used assistive devices for enhancing personal mobility, which is a precondition for enjoying human rights and living in dignity and assists people with disabilities to become more productive members of their communities. The invention of wheelchair is one of the contributions for such physically challenged people. It is a boon for them. Since from the day wheelchair was invented, it has been continuously improving to raise its comfort level and with as many features as possible. We have come across many types of wheelchairs with different shapes, sizes, mechanisms, sources, materials etc. For many people, an appropriate, well-designed and well-fitted wheelchair can be the first step towards inclusion and participation in society.

Though the wheelchair is helping the physically challenged & disabled people for their mobility, it is not equivalent to the motion by normal people. They can't run, jump and reach all places where ever they wish to go. These suppress the mental level of those people and they start feeling themselves as 'burden' to others. To overcome this psychological depression, the comfort level should be raised up to the 'peak', where they can do all those things that a normal man can do. This is the responsibility of the engineers. We have the responsibility of satisfying the needs of people. When the need is not met, people with disabilities are isolated and do not have

access to the same opportunities as others within their own communities. Providing wheelchairs that are fit for the purpose not only enhances mobility but begins a process of opening up a world of education, work and social life. So this is our small step or attempt to reach that 'peak'. We wish that this work will become a contribution for the society helping large number of disabled. Keeping all the above things in mind, focusing the possible improvements in wheelchairs, we got an idea of a stair climbing wheelchair.

## II. WHAT IS NEW IN THE WHEEL CHAIR??

The wheel chair is capable of climbing the stairs. However, this concept is already worked out, but it works either with the need of a helper or using electrical power and batteries. Our project aims at climbing stairs mechanically and self-operated, not depending on someone. Simplification is done in both operation and construction. Our project aims at reduction in the overall cost of the stair climbing wheelchair.

## III. MECHANISM

The wheel chair consists of a frame made by welding the links/rods, which supports the wheel chair. There are two long chains in the base and two short chains behind the chain inclined. There are three shafts, which are used in the wheel chair. First two connected by two long chains and the third is connected to the second by the shorter chains.

The shafts are mounted using ball bearings. Eight ball bearings are used in the wheel chair. There are eight sprockets used, on which the chain rotates. The sprockets are of special feature that they rotate unidirectional, which stops downward motion of wheel chair during ascent.



The chain has nubs that aid traction to keep the wheelchair from sliding downward during climbing. The power is transmitted by the rotation of the handle connected by the rod. The rotation of the rod is transmitted to the middle shaft with the use of worm and worm wheel gear. Hence the chain rotates. Wheel chair is designed such that, it climbs the stairs backwards so that person sitting on the wheel chair feels comfortable even at the middle of the steps.



Fig.1. working model of stair climbing wheel-chair

#### TOTAL PROJECT COST:

=Cost of material + Cost of machining + Cost of std. part  
+ other Cost  
= 1440 + 1710 + 5260 + 1790  
= Rs.9900/-

#### IV. CONCLUSION

While concluding this part, we feel quite contented in having completed the project assignment well on time. We had enormous practical experience on the manufacturing schedules of the working project model. We are therefore, happy to state that the inculcation of mechanical aptitude proved to be a very useful purpose. We are as such overwhelmingly elated in the arriving at the targeted mission. Undoubtedly the joint venture has had all the merits of interest and zeal shown by all of us the credit goes to the healthy co-ordination of our batch colleague in bringing out a resourceful fulfilment of our assignment described by the university. This climbing mechanism can serve as a generalized design that can improve upon to meet the basic requirements and restrictions. There are many unique qualities associated with this mechanism. Some of these qualities include (1) a retractable “stair – climber,” (2) the actual stair climbing device, (3) its lightweight design, (5) its size, (6) what looks to be a ratchet device, and (7) its collapsibility which makes this mechanism portable.

Some future steps have been proposed and some practical steps have been taken towards making the reality for step

taking disabled persons. Such steps could be considered “even greater steps for man and mankind,” steps towards a vision of providing mobility or equality for all.

Although the design criterion imposed challenging problems which however were welcome by us due to availability of good reference books. The selection of choice of raw materials helped us in machining of the various components to very close tolerances and thereby minimizing the level of wear and tear.

The design of control architecture was an important aspect of study because a strong interaction between the many different parts was needed. We know that the robot developed by us cannot be directly used on the factory floor because of some limitations. So we are satisfied with our project.

#### V. SCOPE FOR FUTURE WORK:

- 1) One more gear can be used near the handle for easy rotation of handle.
- 2) To increase the speed of the wheel chair gears and sprockets sizes can be varied.

#### REFERENCES

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