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Multipurpose Wheelchair {Wheelchair cum Stretcher}

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Abstract - The objective of the project was to develop a low-cost multipurpose wheelchair aimed at enhancing mobility and improving the quality of life for individuals experiencing difficulty in walking. The tool enables the patient to be lifted directly from the bed, thereby assisting in the reduction of pressure injuries. In addition to lowering costs, the intention was to diminish pressure injuries and falls through the use of our device. The wheelchair can be utilized both indoors and outdoors, adding to its multipurpose functionality. Upon completion of the project, the goals were successfully achieved. In the wheelchair, what was aimed for has been accomplished. A superior multipurpose wheelchair with all necessary safety features has been created. Secure data transfer is enabled through low-cost, high quality measures

Key Words: Multi-Purpose Wheel-Chair

1.INTRODUCTION

Thousands of families around the world have experienced the impact of disability. Presently, approximately 650 million individuals worldwide live with disabilities, with nearly 21.9 million people in underdeveloped countries like India facing some form of disability. Despite their challenges, these individuals must rise every day, morning, and live life to the fullest. For most, achieving this is only possible with the assistance of a wheelchair, a gadget that can empower and enable a disabled person to lead a normal, independent life. Wheelchairs have undergone significant progress over time, evolving from manual to motorized forms. However, these wheelchairs have not fully met the demands of people with disabilities. Hence, it is vital to recognize the problems faced by disabled individuals and design wheelchairs to address their needs. The working principle of a multipurpose wheelchair centers around its adaptability, versatility, and user-friendliness. It encompasses several key components and features. The wheelchair's frame can be adjusted and customized to accommodate various seating positions, heights, and configurations, ensuring maximum comfort and support for the user.

1.1. Research Problems

- Expensive Wheelchair designs are present in the market.

- Injuries may occur to the patient while handling (transferring) the patient from wheelchair to the stretcher.

1.2. Research Objectives and Importance

- Low cost of the mechanism that we have built due to less electronics and basic design.

- The wheelchair can be converted anytime, anywhere into the stretcher and transferring of the patient can be avoided.

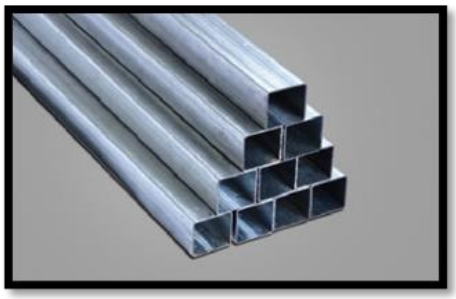
Fig -1: **Simple Structural diagram multipurpose wheelchair.**

2 Design of the wheelchair.

The design of this special wheelchair is mainly based on the framework that we have made after the analysis of the object that 1st wheelchair 2nd stretcher.

COMPONENTS	QUANTITY
Galvanized Pipe of 38.1mm	3pcs
Plywood of 12mm	3pcs
Spoked Wheels	2pcs big diameter. 2pcs small diameter.
Steel Hinges	6pcs
Sponge Bed	3pcs

2.1} Galvanized pipe:



Galvanized steel pipes are manufactured using a process known as galvanization, whereby molten zinc is added to the pipe steel, thereby adding an additional layer to the steel pipe and imparting qualities and advantages over conventional steel pipes.

With that in mind, the advantages of using galvanized steel pipes include:

- Strong corrosion resistance:

One of the primary issues with any type of metal is corrosion, as it damages and weakens the surface, causing parts and sections to break over time. Galvanized steel pipes provide a steel surface protected against corrosive elements and increased strength and resistance.

- Long lifespan:

With an extra protective layer of molten zinc on the surface, galvanized steel pipes boast a longer lifespan than conventional piping, lasting several years before needing replacement. This longevity saves money in the long run.

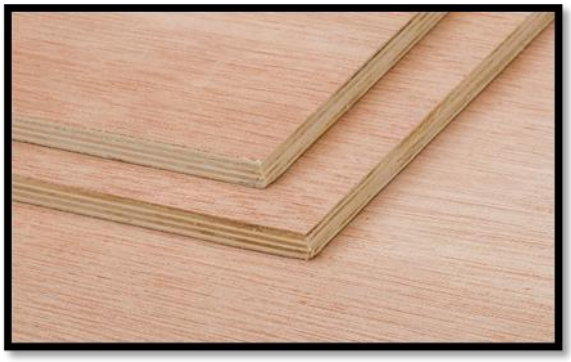
- Cost-effectiveness:

Steel maintenance can be very expensive, as convention steel pipes tend to wear out more quickly, necessitatir frequent repairs and replacements. Galvanized steel pipe have a 50-year lifespan compared to the 20 to 25 years of conventional steel pipes, reducing maintenance and repair costs.

- Quick installation:

In addition to having a strong protective surface that increases resistance to wear and tear, galvanized steel pipes are easy to install. These pipes are ready-made, eliminating the need to prepare or paint the surface before installation. If a tight project deadline exists for a construction project, galvanized steel pipes represent the most efficient option.

2.2} Plywood:



Manufacturers produce plywood by gluing together thin layers, or "plies," of wood veneer with adjacent layers, rotating their wood grain up to 90° to one another. Plywood belongs to the family of manufactured boards, which comprises medium-density fiberboard (MDF), oriented strand board (OSB), and particle board (or chipboard).

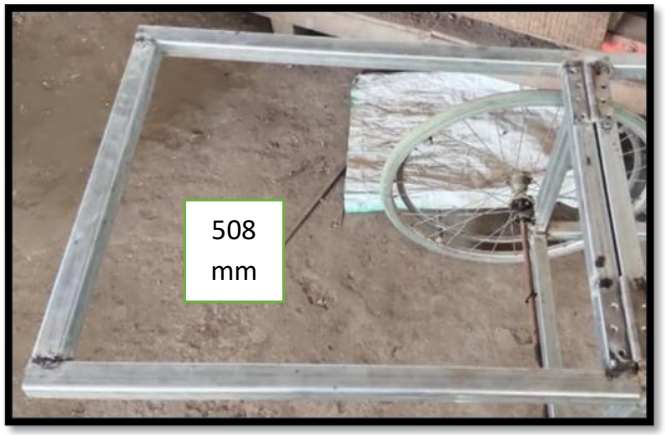
2.3} Wheels:

Wheels are basically used to give a smooth drive to any of mechanism wheels are of mainly to two type 1st Alloy wheel 2nd spokes wheel but as we solving the problem of budget the spokes wheels are cost effective and for bigger diameter normally in wheelchair spokes wheels are used as theses wheels have a fixed path but as in case of wheelchair the smally wheels are used of alloy steels or fiber as these wheels gives direction to the wheelchair.

3 Result and Discussion:

While making the project we faced many challenges like ratio of the sitting position, resting position should be somewhat near too accurate. So, 1st we decided to design this project in computer added design. After designing we must consider that the weight of the project should be somewhat equally distributed because the project has three different frames for the conversion. As this project have mainly three sides that is 1st Head, 2nd Middle ,3rd last.

1st Head: Basically, the head frame is made up of 635mm length and a width of 508mm and a folding mechanism with the help of hinges the head side is made.



2nd Middle:

Middle frame works a major role in this project as the word middle says (in this context) that the height, position, length of other two sides and the width of this wheelchair is decided on this part. At this middle area both the wheels are installed for better mobility and better center of attraction and the weight of the wheelchair remains in the center. The dimension of this side is 495.3mm height, 508mm of breath 609.6mm of length.

3rd Last: This is the position where the wheelchair ends, and this space is utilized for resting the leg of the patient. The dimensions of this side are length 431.8mm and breath 508mm.

These all three parts are made with such mechanism that they can be folded and can be utilized in both way Wheelchair and Stretcher. We have installed two different diameters of the wheel's small diameter of wheel is of 203mm this wheel is used for better mobility and better direction and another wheel which has bigger diameter that wheel is used for better sustainability and the bigger wheel is used because if we convert the stretcher into wheelchair wheels size of 558mm can be easily used by the patient.

❖ After finishing the framework the basic look of the project can be seen in the image.

❖ **Final look of the Project**

4 Literature Review:

- In recent years, it has been indicated by a census that around 700 million persons suffer from some kind of disability or handicap. There is an increase in the elderly population around the globe. This results in an increased need for support structures to enable comfort and independent life for them. The phenomenon raises attention in the scientific community[1].

- In this era of changing technology there are many new technologies evolved in medical field. The development in inter disciplinary science give new hopes to physically disabled people. In this project we try to develop a wheelchair cum stretcher economically[2].

- In the recent years a census indicates that around 700 million persons suffer from some kind of disability or handicap. There is an increase in the elderly population around the globe[3].

- At present in world, the number of handicapped individuals is increasing each year. Their mobility has become a serious problem, and it poses a great challenge before the engineering and scientific community. It demands conceptualizing and developing effective solutions in the form of mobility aids[4].

- The number of patients in India is increasing day by day. So in hospitals patients need to be shifted from wheelchair to stretcher, stretcher to beds, bed to wheelchair, or vice versa; which creates unsafe conditions for patients[5].

- The main aim of our project is to build an automatic wheelchair cum bed which acts as both wheel chair and when as stretched it can be used as a bed. The wheelchair cum bed model is a mechanism which is used for moving the bed up and down. This is used for handicapped person for in order to lead a normal life as other persons do. For making the handicapped person's job easy (i.e., they can move bed up and down)[6].

- From olden times it was the problem of transferring the patients exists. After certain period of times, they will be carried on wheels, which further reduced the effort of the people carrying the patients. This problem is not properly addressed by the medical field or healthcare technology efficiently[7].

- Wheelchair is a chair with wheels used to move patients from one location to another location due to their inability to move or physically disabled. In this project rack and pinion mechanism is used to convert a wheelchair into stretcher and vice versa[8].

- Nowadays, in India the number of disabled individuals is increasing every year. For patients' mobility aids are useful for transportation and a replacement for walking especially in indoor and outdoor environment as well. Wheelchairs and stretchers are commonly used medical equipment's for the transportation[9].

- Wheelchair and stretcher are very commonly used in the hospitals, airports, railway station, shopping malls, etc. This design here is a modified wheelchair cum stretcher depending on the needs. This machine can be used to convert the wheelchair into a stretcher according the requirements. This can be accessed manually. The chair gets converted into a stretcher when the levers are engaged[10].

6 Conclusion:

The scope of improvement in mobility and patient transport solutions in healthcare settings is encompassed by a wheelchair-cum-stretcher. It is characterized by functioning as both a wheelchair and stretcher, thereby enhancing accessibility and efficiency in hospitals, clinics, and emergency services. Furthermore, it is designed to cater to users with diverse needs, rendering it a valuable tool for healthcare professionals and caregivers.

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