MULTIPURPOSE 360 DEGREE WHEEL MATERIAL HANDLING TROLLEY

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ABSTRACT

Material handling plays a vital role in industrial, commercial, agricultural, and healthcare sectors where goods must be transported efficiently and safely. Conventional trolleys often suffer from limited maneuverability and require significant human effort, particularly in congested environments. This paper presents the design and development of a Multipurpose 360 Degree Wheel Material Handling Trolley. The proposed system utilizes swivel castor wheels capable of rotating through 360 degrees, allowing smooth movement in all directions without changing the trolley orientation. The trolley is fabricated using a mild steel frame, load-supporting platform, handle mechanism, and heavy-duty swivel wheels. The developed system improves mobility, reduces operator fatigue, enhances workplace safety, and increases productivity. The proposed trolley provides a simple, economical, and user-friendly solution suitable for industries, warehouses, hospitals, construction sites, and commercial applications.

INTRODUCTION

Material handling is one of the most important operations in manufacturing industries, warehouses, hospitals, and commercial establishments. Efficient transportation of materials reduces labor costs, minimizes physical effort, and improves productivity. Traditional trolleys generally use fixed wheels that restrict movement and make navigation difficult in narrow spaces.

Recent industrial developments have increased the demand for flexible and efficient transportation systems. The Multipurpose 360 Degree Wheel Material Handling Trolley is designed to overcome the limitations of conventional trolleys by incorporating swivel wheel technology. The trolley can move forward, backward, sideways, and diagonally with minimum effort.

The system offers improved maneuverability, ease of operation, and safe transportation of materials. It can be used for multiple applications including industrial goods transportation, hospital equipment movement, warehouse operations, and commercial logistics.

LITERATURE SURVEY

Material handling systems have evolved significantly over the years. Early transportation methods relied on wooden carts and fixed-wheel mechanisms that provided movement only in one direction. Industrial development led to the introduction of wheelbarrows and heavy-duty carts with improved load carrying capacity.

The invention of caster wheels during the late nineteenth century represented a major advancement in mobility systems. Swivel caster wheels enabled directional flexibility and reduced human effort during transportation activities.

Modern material handling systems utilize 360-degree swivel wheel technology to improve maneuverability and operational efficiency. Researchers have demonstrated that omnidirectional wheel arrangements reduce operator fatigue, improve safety, and increase productivity in confined environments. Recent developments

also focus on stair-climbing mechanisms and smart transportation systems for advanced material handling applications.

IMPLEMENTATION AND WORKING

The developed trolley consists of a mild steel frame, load platform, swivel castor wheels, handle assembly, mounting plates, and fastening elements. The trolley is fabricated using conventional welding and machining processes.

Block Diagram

Methodology

The trolley is fabricated using mild steel square pipes and plates to provide structural strength and durability. Four heavy-duty swivel castor wheels are mounted at the bottom corners of the frame.

The construction process includes frame fabrication, platform installation, handle assembly, wheel mounting, welding, surface finishing, and final testing. The completed trolley is evaluated for mobility, load carrying capability, stability, and operational efficiency.

Working Procedure

Step 1: Materials are placed on the trolley platform.

Step 2: The operator applies force through the handle.

Step 3: Swivel castor wheels rotate and facilitate smooth movement.

Step 4: The trolley moves in any required direction including forward, backward, sideways, and diagonal movement.

Step 5: The load is transported efficiently with reduced friction and human effort.

Step 6: The trolley is stopped manually or by applying wheel locks if available.

Components Used

The developed system consists of:

- Mild Steel Frame
- Base Platform (MS Sheet)
- Vertical Support Structure
- Upper Frame
- Handle Assembly
- 360 Degree Swivel Castor Wheels
- Wheel Mounting Plates
- Fasteners (Nut and Bolt)

- Welded Joints

The swivel castor wheels are the key component responsible for omnidirectional movement and improved maneuverability.

RESULTS AND DISCUSSION

The fabricated trolley demonstrated smooth multidirectional movement under different loading conditions. The swivel wheel arrangement enabled easy operation in confined spaces and reduced the physical effort required for material transportation.

The system provided stable movement and effective load distribution. The estimated fabrication cost was approximately ₹8600, making the trolley a cost-effective solution for small and medium-scale applications. The developed system successfully met the objectives of improving mobility, reducing operator fatigue, and increasing material handling efficiency.

CONCLUSION

The Multipurpose 360 Degree Wheel Material Handling Trolley provides an efficient and economical solution for modern material transportation requirements. The integration of swivel castor wheels significantly improves maneuverability compared to conventional trolley systems.

The developed trolley reduces human effort, increases productivity, enhances workplace safety, and can be used across various sectors including industries, warehouses, hospitals, and commercial establishments. The simplicity of design, low maintenance requirements, and cost-effectiveness make it suitable for widespread implementation.

FUTURE SCOPE

The system can be further improved by integrating a star-wheel stair-climbing mechanism. This enhancement would enable transportation of materials across multiple floor levels without manual lifting. Future developments may also include motorized drive systems, braking mechanisms, IoT-based monitoring, and automated navigation systems.

References

1. Raymond A. Kulwiec, Material Handling Handbook, Wiley Publications.
2. O.P. Khanna, *Industrial Engineering and Production Management*, Dhanpat Rai Publications.
3. V.B. Bhandari, Design of Machine Elements, McGraw Hill Education.
4. S.S. Bhavikatti, Engineering Mechanics, New Age International Publications.
5. Research Papers on Material Handling Systems and Castor Wheel Technologies.
6. Standard Manufacturer Catalogs for Swivel Castor Wheels and Material Handling Equipment.