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Design and Development of Wheel Tire Lifter for Heavy Motor Vehicle

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ABSTRACT:-

This paper presents the design and development of a Wheel Tire Lifter (WTL) specifically tailored for heavy motor vehicles. The aim of this paper was to develop a lifting mechanism that enhances the efficiency and safety of tire replacement processes, particularly in the context of large-scale vehicles such as trucks and buses. Through a systematic approach encompassing conceptualization, design iteration, prototyping, and testing, the WTL was engineered to address the challenges associated with lifting heavy tires, minimizing manual labor, and reducing the risk of workplace injuries. The final design incorporates robust materials, intuitive controls, and ergonomic features to ensure ease of operation and reliability in demanding operational environments. Performance evaluations and comparative analyses validate the efficacy and practicality of the developed WTL, showcasing its potential to significantly improve productivity and safety standards in heavy vehicle maintenance operations.

INTRODUCTION:-

PROBLEM STATEMENT

Design a safe and efficient automobile wheel lifter machine (WTL) capable of lifting and lowering vehicle wheels, facilitating streamlined and convenient tire replacement or servicing by mechanics. Engineer a device that ensures the secure handling of automobile wheels, minimizing the risk of accidents or damage during the lifting and lowering process. Create a user-friendly and ergonomic wheel lifter that enhances the overall efficiency of automotive maintenance tasks, providing mechanics with a reliable tool for improved productivity and ease of use.

REASON FOR DEVELOPMENT:

Improving efficiency in the automotive industry. Enhance safety during maintenance and repair tasks provide a tool for easy lifting and lowering of heavy car wheels. Contribute to overall advancements in automotive technology.

SOLUTION:-

The selection of an automobile wheel lifter machine is crucial to improve the efficiency and safety of wheel maintenance in automotive repair shops. It reduces the risk of workplace injuries, increases productivity, and ensures precise wheel positioning during installation. The chosen machine should be compatible with various vehicle types and wheel sizes, have a user-friendly interface, robust construction, and adhere to safety standards. Proper selection ensures cost- effective and reliable wheel servicing in the automotive industry.

WHEEL TYRE LIFTER:-

A Wheel Tire Lifter for Heavy Motor Vehicle Machine is a specialized piece of equipment designed to lift and manipulate the tires of heavy motor vehicles, such as trucks, buses, and other large commercial vehicles. It is engineered to safely and efficiently handle the weight and size of these vehicle tires, which can be substantial compared to those of passenger cars. The machine typically includes features such as hydraulic systems, motorized components, and sturdy construction to ensure it can lift, position, and secure tires effectively. Additionally, modern wheel tire lifters may offer multi-directional capabilities, ergonomic designs, and safety features to enhance usability and minimize the risk of accidents or injuries during operation.

Fig 2: Drawing of WTL

WORKING:-

A Wheel Tire Lifter for heavy motor vehicles employs hydraulic or mechanical systems to lift large vehicle tires. Positioned near the tire, it securely grips and raises it off the ground. The lifting mechanism, often hydraulic arms or platforms, is activated to provide the lifting force. Once lifted, the tire can be rotated or moved for maintenance tasks like tire replacement. Safety features like overload protection ensure safe operation. After maintenance, the lifter slowly lowers the tire back to the ground. Its design simplifies tire handling and enhances efficiency in heavy vehicle maintenance

CASE STUDY:-

1. The conventional Wheel Tyre Lifter takes approximate 5 minite's for loading and unloading. Also more power and skill required for worker to do loading and unloading operation. But if we use the wheel tyre lifter then the loading unloading time is reduced to approximate 1 minite's which results in **minimizing time and effort for tasks**.
2. WTL Provide a cost-effective solution for automotive service businesses by **reducing labor costs and improving overall workflow efficiency**.
3. WTL **Increase the productivity** of automotive workshops and service centers.

ADVANTAGES:-

1. Minimizing time and effort for tasks.
2. Reducing labor costs and improving overall workflow efficiency.
3. Increase the productivity of automotive workshops and service centers.
4. Compact in size, low weight and stable
5. Minimizing time and effort for tasks such as tire changes and brake maintenance.

APPLICATIONS:-

1. Tire Changing:
Hydraulic bottle jacks are commonly used to lift vehicles, allowing for tire changes and maintenance.

2. Suspension Work:
They are utilized for lifting specific areas of the vehicle to perform suspension and brake system repairs.

3. Undercarriage Access:
Hydraulic bottle jacks provide access to the undercarriage of vehicles for maintenance tasks such as oil changes and exhaust system repairs.

4. Emergency Situations:
They serve as crucial tools in emergency situations such as roadside repairs and recovery operations.

5. Load Support:
Hydraulic bottle jacks are employed to stabilize or support vehicle loads during repairs or maintenance work.

6. Body Repair:
They help in lifting vehicles to access the underside for body repairs and restoration work.

FUTURE SCOPE:-

1. Lifting Capacity:
Ability to lift a range of vehicle sizes, including cars, SUVs, and light trucks.
Ensuring the lifter can handle various wheel weights and sizes.

2. Adjustable Height and Width:
Capability to adjust the height and width to accommodate different vehicle types and wheel configurations.
Providing flexibility for lifting vehicles with varying ground clearances.

4. Safety Mechanisms:
Incorporation of safety features such as locking mechanisms to secure the lifted vehicle in place.
Consideration for safety standards and regulations to ensure user and vehicle safety.

5. Mobility and Maneuverability:
Incorporation of wheels for easy movement and positioning in the garage or workshop.
Ensuring the lifter is easy to transport and store when not in use.

6. Durability and Stability:
Use of durable materials and construction to support the weight of the vehicle.
Providing stability and balance during lifting and maintenance operations.

7. Efficient Operation:
Implementing a user-friendly design for smooth and efficient lifting and lowering of the vehicle.
Incorporating quick setup and operational procedures to save time for technicians.

8. Compatibility with Automotive Systems:
Integration with other automotive tools and equipment for seamless operation during maintenance and repair tasks.
Connectivity with vehicle diagnostic systems for advanced servicing capabilities.

CONCLUSION:-

1. WTL Increase the productivity of automotive workshops and service centers by expediting wheel-related tasks, such as tire replacement and brake servicing.
2. WTL Speed up tasks like tire replacement, Brake servicing, Suspension work.
3. WTL Provide a cost-effective solution for automotive service businesses by reducing labor costs and improving overall workflow efficiency 4. In case of the production of the other batch or other job the same machine can be operated by removing the multispindle drilling attachment.
4. WTL Minimizing time and effort for tasks such as tire changes and brake maintenance

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