A REVIEW OF DESIGN AND FABRICATION OF AUTOMOTIVE CREEPER

Akhil Kujur
Akhilkujur83@gmail.com
Department of Machanical Engineering,
Tulsiramji Gaikwad-Patil College of Engineering & Technology (Polytechnic), Nagpur, India

Radheyashyam Gurav
Department of Machanical Engineering,
Tulsiramji Gaikwad-Patil College of Engineering & Technology (Polytechnic), Nagpur, India

Jatin Hatagare
jatin272007@gmail.com
Department of Machanical Engineering,
Tulsiramji Gaikwad-Patil College of Engineering & Technology (Polytechnic), Nagpur, India

Aniket Khode
Department of Machanical Engineering,
Tulsiramji Gaikwad-Patil College of Engineering & Technology (Polytechnic), Nagpur, India

Ritik Chandele
Department of Machanical Engineering,
Tulsiramji Gaikwad-Patil College of Engineering & Technology (Polytechnic), Nagpur, India

Kanhaiya Yadav
Department of Machanical Engineering,
Tulsiramji Gaikwad-Patil College of Engineering & Technology (Polytechnic), Nagpur, India

Yogesh Ramteke
Department of Machanical Engineering,
Tulsiramji Gaikwad-Patil College of Engineering & Technology (Polytechnic), Nagpur, India

Abstract
This project presents the design and development of an innovative automotive creeper integrated with a screw jack mechanism powered by a portable drilling machine. The system is developed to enhance ergonomic efficiency and reduce the physical strain experienced by mechanics during under-vehicle inspection and maintenance tasks. The screw jack mechanism converts rotary motion from the drilling machine into controlled linear motion, enabling smooth and precise vertical adjustment of the creeper platform. The proposed design emphasizes simplicity, cost-effectiveness, and ease of operation while maintaining adequate stability and safety. Compared to conventional fixed creepers, the developed system significantly improves accessibility and working posture. This makes it a practical solution for small-scale workshops and service stations. The project demonstrates the effective application of basic mechanical principles to achieve improved functionality and user convenience.
Keywords- *Structure & Mobility, Ergonomics & Comfort, Work More Efficiently and Comfortably*

Introduction -

The Automotive Creeper is a mechanical device designed to assist mechanics in performing under-vehicle inspection and repair tasks with greater comfort, efficiency, and safety. Traditional creepers are static and do not provide adjustable support, which can lead to discomfort and reduced productivity during prolonged usage.

This project introduces an innovative automotive creeper equipped with a screw jack mechanism that enables vertical movement of a portion of the frame. The screw jack is operated using a portable drilling machine, which reduces manual effort and provides smooth and controlled lifting and lowering. The system is mounted on wheels for easy mobility and is designed to offer better ergonomic support to the user. By integrating simple mechanical components with practical functionality, the project aims to improve working conditions in automobile maintenance and repair environments.

An **automotive creeper** is a low-profile tool designed to help mechanics and car enthusiasts work comfortably underneath vehicles. It's essentially a flat platform, often padded, mounted on small swivel casters that allow smooth movement in tight spaces.

The creeper eliminates the need to crawl or lie directly on the ground, reducing strain on the back and shoulders. It's especially useful for tasks like oil changes, exhaust work, or inspecting undercarriage components.

The creeper eliminates the need to crawl or lie directly on the ground, reducing strain on the back and shoulders. It's especially useful for tasks like oil changes, exhaust work, or inspecting undercarriage components.

The concept dates back decades, evolving from

simple wooden boards with wheels into ergonomic, durable designs made from steel, plastic, or composite materials. Modern creepers often feature foldable frames or convertible designs that double as seats.It has the following key factors:

1)L**ow clearance design**: Lets you slide under cars with minimal ground clearance.

2)**Swivel casters**: Provide easy mobility in all directions.

3) **Padded surface**: Offers comfort during extended work sessions.

4) **Headrest support**: Many creepers include adjustable or cushioned headrests.

Methodology

The methodology adopted for the development of the Automotive Creeper involves systematic design, fabrication, and evaluation processes. Initially, the limitations of conventional creepers were analyzed to identify the need for an adjustable and efficient system. A conceptual design was developed by integrating a screw jack mechanism with a creeper frame, using a portable drilling machine as the power source. The system was then designed by selecting appropriate materials and components such as a mild steel frame, lead screw, nut, bearings, and wheels. Fabrication was carried out using standard machining and welding processes, followed by proper assembly of all components. The working mechanism was established by coupling the drilling machine to the screw jack for rotational motion.

The system was further analyzed through calculations of load, torque, and mechanical advantage to ensure feasibility. Finally, testing was conducted to evaluate the performance, stability, and efficiency of the developed automotive creeper.

Block Diagram And Working Principle

The Automotive Creeper operates on the fundamental principle of conversion of rotary motion into linear motion using a screw jack mechanism. The system is designed to provide vertical adjustment to a portion of the creeper frame, allowing the user to raise or lower their body position while working underneath a vehicle.In this setup, a threaded screw (lead screw) is engaged with a corresponding nut fixed to the movable section of the creeper frame. When the screw is rotated, the nut translates along the axis of the screw, resulting in linear upward or downward motion. This motion is used to lift or lower the upper portion of the creeper.

The rotation of the screw is achieved using a portable drilling machine, which is mechanically coupled to the screw shaft. When the drilling machine is operated, it provides the torque required to rotate the screw. Due to the helical threads, even a small rotational input produces a controlled and precise linear displacement.

The system also utilizes the principle of mechanical advantage, where a relatively small input effort (torque from the drilling machine) is capable of lifting a larger load (user weight). The friction between the screw and nut helps in maintaining the position of the creeper, thereby providing a self-locking feature that prevents accidental downward movement when the input is stopped.

Additionally, the creeper is mounted on wheels, enabling smooth horizontal movement beneath the vehicle. The combination of mobility and adjustable height enhances the usability, comfort, and efficiency of the device.

Thus, the working of the automotive creeper is based on a simple yet effective mechanical system that integrates screw jack mechanism, power transmission through drilling machine, and ergonomic design to achieve efficient under-vehicle operation.

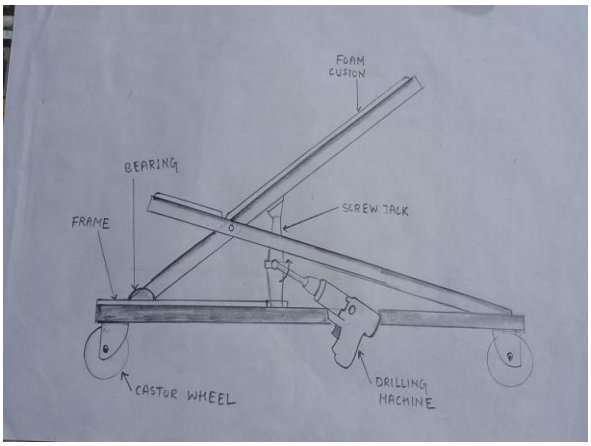

Fig 1.. Outline sketch of Automotive creeper

Fig. 2 Automotive Creeper

Advantages

1.Reduced Manual Effort

The use of a screw jack mechanism powered by a drilling machine significantly reduces the physical effort required by the user. The system utilizes mechanical advantage to lift the load with minimal input force.

2. Improved Ergonomics

Unlike traditional flat creepers, this design allows vertical adjustment, enabling the user to maintain a comfortable working posture. This reduces body strain and fatigue during prolonged operations.

3. Cost-Effective Solution

The system is designed using simple and easily available components such as mild steel, screw jack, and drilling machine. This makes it more affordable compared to hydraulic lifting systems.

4. Simple Construction

The design is mechanically simple and easy to understand, manufacture, and assemble. It does not require complex components or advanced technology.

5. Low Maintenance

Compared to hydraulic systems, the screw jack mechanism requires less maintenance, as it does not involve fluid leakage or complex sealing arrangements.

Disadvantages -

Limited Lifting Speed

The screw jack mechanism operates relatively slowly compared to hydraulic systems. The lifting and lowering process takes more time, especially for larger heights.

2. Dependency on External Power Tool

The system relies on a portable drilling machine for operation. If the drill is not available or fails, the lifting mechanism cannot function efficiently.

3. Friction Losses

The presence of threads in the screw jack leads to friction losses, which reduce overall efficiency and require more input torque.

4. Wear and Tear of Threads

Continuous operation may cause wear in the screw and nut threads, affecting performance and accuracy over time. Regular lubrication and maintenance are required.

5. Limited Load Capacity

Compared to hydraulic lifts, the screw jack system has a moderate load capacity and may not be suitable for very heavy-duty applications.

Result

The Automotive Creeper was successfully developed and tested. It was able to lift approximately 100 kg load smoothly using the screw jack mechanism. The system required less effort due to high mechanical advantage and provided stable and controlled operation. The adjustable design also improved user comfort during under-vehicle work.

Conclusions

The Automotive Creeper was successfully designed and developed to improve the efficiency and comfort of under-vehicle operations. By integrating a screw jack mechanism with a portable drilling machine, the system effectively converts rotary motion into linear motion for controlled lifting. The project demonstrated that the creeper can lift moderate loads with reduced effort, providing stable and smooth operation. The design is simple, cost effective, and suitable for small workshops and educational applications. Although certain limitations such as slower operation and friction losses exist, the overall performance of the system is satisfactory. The results indicate that the proposed Automotive Creeper is a practical and efficient solution with potential for further improvement and real-world implementation. In this paper, a dual side shaper is designed and fabricated.

References

1. Rohana Ahmad, S. A. (2022). Analysis of an Adjustable Topside Mechanic's Creeper for Automotive Repair and Maintenance Using Simulation Methods. Springer, 65. U.Nations. (2023, 12). Department of Economic and Social Affairs. Retrieved from https://sdgs.un.org/
2. M. Anisha, J. V. (2021). Design of Mechanical Creeper for Disabled Persons. Proceedings of the Third International Conference on Intelligent Communication Technologies and Virtual Mobile Networks (ICICV 2021), 503. Nations, U. (n.d.). Department of Economic and Social Affairs. Retrieved Dec Tuesday, 2023, from https://sdgs.un.org/
3. Chen, J. Y. (2004). A remote controller system for home appliances using the internet and radio connection. International Conference on Robotics and Automation, 249-254.
4. Afrifa, J. Y.1, Amoanab, N. J.2, Dery, F.3, Naawe, N.4, Awongo, S. D.5, Akokre, E. A.6 And
5. Dorbal,(2024)Engineering A Locally-Sourced Adjustable Height Mechanical Creeper For Enhanced Automotive Service Ergonomics,jafrifa@bolgatu.edu.gh,https://doi.org/10.26437/ajar.v11i3.1149
6. G.Rush (1995). Mechanic's Creeper. P & B Manufacturing Co.
7. M. Anisha; J. Sivasangari; V. Aarthi Rani; Ponmozhi Chezhiyan, (2021). Design of Mechanical Creeper for Disabled Persons