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"Smart Dash Trolley (SDT): Intelligent Dashboard Dismantling Solution."

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Abstract - The dashboard dismantling process plays a crucial role across various automotive industries, including repair and maintenance, manufacturing and assembly, collision repair and refinishing, recycling and salvage, and research and development. A modular trolley fixture is designed to hold the vehicle's cockpit or dashboard assembly, optimizing the dismantling process. The primary objectives of dashboard dismantling, depending on the industry, include efficient component access, improved repair and maintenance, enhanced quality control, reduced waste and environmental impact, and increased productivity and cost savings. Modular trolley systems, like the one described, significantly improve dashboard dismantling, making it safer, more efficient, and cost-effective. This trolley addresses challenges such as the complexity of modern dashboards, the variety of vehicle models, limited workspace, risk of component damage or loss, and worker fatigue or injury. Applications of this modular trolley are found in automotive repair shops, manufacturing and assembly lines, collision repair, and R&D, accommodating various dashboard sizes with adjustable features.

Key Words: Initial Concept, Material Selection, Finite Element Analysis (FEA), Prototyping, Testing and Validation, Final Product.

1. INTRODUCTION

In the Indian market, you will be the first to see the cars of many companies on the road. It will have cars from companies like Mahindra, Tata, Maruti Suzuki, Hyundai, Toyota, Honda, Mercedes-Benz, BMW, Audi, Volkswagen and Ford. These companies have many different types of cars. The car dashboard or cockpit is crucial for customers, as it serves as the primary interface between the driver and the vehicle's various systems. The design and functionality of a car's dashboard impact the safety, convenience, and overall driving experience. When customers are seating inside the car, The Dashboard / Cockpit contribute significantly to the overall luxury experience. Features like ergonomic seat adjustments, temperature controls, and high-quality infotainment systems all come together on the dashboard, providing drivers and passengers with an elevated level of comfort. In summary, customers are drawn to car dashboards because they represent a convergence of style, technology, safety, convenience, and personalization. As cars continue to evolve into highly connected and intelligent machines, the dashboard will remain at the center of this transformation, offering more ways for drivers and passengers to interact with and enjoy their vehicles. The dashboard of a vehicle is not just a functional space but a crucial aspect of a car's user experience. OEMs (Original Equipment Manufacturers) across the globe invest heavily in dashboard design to offer drivers ease of use, safety, and a visually appealing interface. Over the years, dashboard designs have evolved to incorporate digital technology, ergonomic layouts, and personalized features. In this overview, we will explore how different OEMs approach dashboard design, highlighting key features and innovations.

2. METHODOLOGY:

1. Initial Concept: Define the overall dimensions and mounting points based on vehicle packaging and customer requirements.
2. Material Selection: Choose materials based on weight, strength, cost, and crash performance (e.g., high-strength steel or aluminium).
3. Finite Element Analysis (FEA): Conduct FEA simulations to optimize the geometry for strength, crashworthiness, and weight. This step ensures that the design meets safety standards.
4. Prototyping: Manufacture a prototype using the selected materials and manufacturing processes.
5. Performance Test: To validate the design an ensure the proper working of the concept model.
6. Production: Finalize the design and tooling for mass production.

3. PROBLEM STATEMENT:

The absence of a modular trolley for the assembly and dismantling of different dashboard designs has resulted in several inefficiencies, ergonomic concerns, and quality control issues within the production environment. The current process is marked by a disorganized and cluttered workspace, where components are scattered and difficult to access. This leads to increased labor costs, reduced productivity, and

a higher risk of component damage. The lack of a modular trolley has led to the following specific issues.

1. Inefficient Workflow: The current process requires multiple trips to retrieve and store components, wasting time and labor. Additionally, workers must constantly search for and gather components, which significantly reduces productivity.
2. Component Damage: The disorganized workspace heightens the risk of component damage, resulting in costly repairs and replacements. These damages also cause delays in the production process, further diminishing overall efficiency.
3. Ergonomic Concerns: The current process is physically demanding and poses ergonomic risks. Workers must bend, stretch, and lift heavy components, which increases the likelihood of musculoskeletal disorders and other work-related injuries.
4. Quality Control Issues: The lack of a standardized workspace complicates the maintenance of quality control standards. Components are often misplaced or lost, leading to delays, rework, and a potential decline in the overall quality of the final product.
5. Design Variability: The current process is not flexible enough to accommodate different dashboard designs, leading to increased complexity and reduced efficiency when switching between different models.
6. Training and Onboarding Challenges: The current system makes it difficult for new workers to learn and understand the assembly and dismantling processes. The absence of a standardized workspace and clear workflow creates confusion, leading to longer training periods and reduced productivity.

4. CONCLUSIONS

The Modular Trolley for Dashboard Dismantling has demonstrated significant effectiveness in enhancing efficiency, safety, and organization within the automotive disassembly process. Its flexible and ergonomic design delivers substantial benefits to operators, ensuring a streamlined and organized workflow. The successful deployment of this system provides a scalable solution that can be adapted to various tasks within the automotive maintenance and repair sectors. Future developments could focus on enhancing material durability and incorporating additional features tailored to specific tasks, further optimizing its functionality and versatility.

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REFERENCES

1) http://en.wikipedia.org/wiki/Friction_drilling.

2) http://www.flowdrill.com/

3) Amaral, N., Rencis, J.J. and Rong, Y. (2005) ‘Development of a finite element analysis tool for fixture design integrity verification and optimization’, International Journal of Advanced Manufacturing Technology, Vol. 25, Nos. 5/6, pp.409-419.

4) An, Z., Huang, S., Rong, Y. and Jayaram, S. (1999) ‘Development of automated dedicated fixture configuration design systems with predefined fixture component types: Part 1, Basic design’, International Journal of Advanced Manufacturing Technology, Vol. 15, pp.99– 105.

5) Asada, H. and Andre. B.B. (1985) ‘Kinematic analysis of workpart fixturing for flexible assembly with automatically reconfigurable fixtures', IEEE Journal of Robotics and Automation, Vol. 1, No. 2, pp.86-93.

6) Bakker, O.J., Papastathis, T.N., Ratchev, S.M. and Popov, A.A. (2013) ‘Recent research on flexible fixtures manufacturing processes', Recent Patents on Mechanical Engineering, Vol. 6, No. 2, pp. 107–121.

7) Benhabib, B., Chan, K.C. and Dai, M.Q. (1991) ‘A modular programmable fixturing system', transaction of the ASME. Journal of Engineering for Industry, Vol. 113, No. 1, pp. 93–100.

8) Bi. Z.M. and Zhang, W.J. (2001) ‘Flexible fixture design and automation: review, issues and future direction', International Journal of Production Research, Vol. 39, No. 13, pp.2867–2894.

9) Boyle, L.M., Rong, K. and Brown, D.C. (2006) 'CAFixD - a case-based reasoning fixture design method, framework and indexing mechanisms', Journal of Computing and Information science in Engineering, Vol. 6, No. 1, pp.40–48