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(57) Abstract :

This invention presents an Omni Wheeled Wall Climbing Robot (WCR) designed to revolutionize vertical surface operations in industrial settings, such as shipbuilding, by enabling omnidirectional movement on metal walls. Traditional wall-climbing robots are constrained to linear or bidirectional motion, requiring frequent repositioning and increasing operational time. Addressing this limitation, the proposed robot integrates omni wheels with superstrong permanent magnets (FWZ63 type) to achieve diagonal traversal without repositioning, significantly reducing path complexity and inspection time. The robot's chassis features two strategically positioned FWZ63 magnets, generating robust adhesion to vertical metal surfaces while maintaining lightweight portability. Coupled with high-torque motors, the omni wheels allow holonomic navigation (forward, lateral, diagonal), enabling the robot to follow the shortest path to target locations. This innovation enhances efficiency in critical industrial tasks such as non-destructive testing (NDT), water jetting, and sandblasting, particularly in hard-to-reach areas of ship hulls or storage tanks. Developed collaboratively by Periyar Maniammai Institute of Science and Technology (PMIST) with Bosch Rexroth, IIT Bombay, and Prag Robotics, the robot incorporates an Arduino-based control system for precise movement and task execution. Its modular design allows seamless integration of inspection tools, while the magnetic adhesion mechanism ensures stability without external power dependency. Key advantages include a 40% reduction in operational time through diagonal traversal, enhanced safety by minimizing human intervention in hazardous environments, and scalability for diverse industrial applications. This invention bridges a critical gap in automation technology, offering a cost-effective, agile, and reliable solution for vertical surface maintenance and inspection. Accompanied Drawing [FIG. 1] [FIG. 2] [FIG. 3] [FIG. 4] [FIG. 5] [FIG. 6] [FIG. 7]

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