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(57) Abstract :
The present invention relates to an autonomous AI-integrated mechanical crack-sealing machine designed for efficient pavement maintenance. This innovative machine leverages cutting-edge artificial intelligence and mechanical automation to detect, analyze, and seal cracks in road surfaces, providing a cost-effective and sustainable solution for maintaining pavement infrastructure. The system consists of a mobile platform equipped with sensors, cameras, and machine learning algorithms, which work in conjunction to autonomously identify cracks, assess their size and severity, and determine the most effective sealing method. The AI algorithms are trained to accurately identify various types of cracks, from minor fissures to large structural damage, and automatically adjust the machine's sealing technique. The crack-sealing process is fully automated, requiring minimal human intervention, thus reducing the risk of errors and labor costs. The machine utilizes a high-precision mechanical system to apply sealant to the cracks, ensuring consistent coverage and optimal adhesion. It operates on multiple pavement types, including asphalt and concrete, and can be deployed in a variety of environments, such as highways, city roads, and rural pathways. The integration of AI ensures real-time monitoring and decision-making, enabling the machine to adapt to changing conditions on the pavement and optimize its performance. The machine’s autonomous nature allows for continuous operation, even in remote or hard-to-reach areas, contributing to increased productivity and reduced maintenance downtime. The invention offers significant advantages in terms of speed, accuracy, and efficiency over traditional manual methods of crack sealing, making it an ideal solution for large-scale pavement maintenance projects. This autonomous crack-sealing machine is a sustainable, innovative approach to enhancing the longevity of pavement infrastructure while reducing maintenance costs and improving road safety. It represents a breakthrough in the field of road maintenance technology with the potential for widespread application in India’s growing infrastructure development sector.

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