

पेटेंट कार्यालय
शासकीय जर्नल

**OFFICIAL JOURNAL
OF
THE PATENT OFFICE**

निर्गमन सं. 17/2025
ISSUE NO. 17/2025

शुक्रवार
FRIDAY

दिनांक: 25/04/2025
DATE: 25/04/2025

पेटेंट कार्यालय का एक प्रकाशन
PUBLICATION OF THE PATENT OFFICE

(12) PATENT APPLICATION PUBLICATION

(21) Application No.202511032688 A

(19) INDIA

(22) Date of filing of Application :02/04/2025

(43) Publication Date : 25/04/2025

(54) Title of the invention : NOVEL SUSPENSION SYSTEM WITH HINGED ARMS AND OPTIMIZED DAMPING RATIO FOR RURAL ROADS RIDE COMFORT

(51) International classification		:B60G0017018000, B60G0017016500, B60G0017015000, B60G0017019000, B60W0030180000	(71)Name of Applicant : 1)BHARAT RAJ SINGH Address of Applicant :School of Management Sciences, 5/323, Viram Khand, Gomti Nagar, Lucknow-226010 Lucknow -----
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Filing Date	:NA		3)GARIMA SINGH
(87) International Publication No	: NA		Name of Applicant : NA
(61) Patent of Addition to Application Number	:NA		Address of Applicant : NA
Filing Date	:NA		(72)Name of Inventor :
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(57) Abstract :

The present invention relates to an advanced modular suspension system (100) for vehicles operating on rural roads with uneven surfaces such as 4–5 inch deep potholes. The system comprises a vehicle chassis (10), a hinged arm mechanism (12), a spring element (14), a damper element (16), and optionally an active control element (18) such as a hydraulic actuator. The system further includes an Hydraulic control unit (20) for real-time adjustment of suspension dynamics based on road input and vehicle behavior. The system is designed to limit sprung-mass displacement to within 100–120 mm and maintain ride stability at speeds ranging from 25 km/h to 75 km/h. It features a modular configuration, allowing hybrid passive-active functionality for cost-effective performance tuning. Validation through bond graph modeling and simulation results demonstrate superior shock absorption, reduced body acceleration, and improved handling over conventional suspension systems.

No. of Pages : 26 No. of Claims : 8