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Integrated Brake Safety System Ensures Maximum Vehicle Safety through Combination of ABS and EBA Systems of Braking

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Abstract: *Anti-lock braking system (ABS) is an automobile safety system that allows the wheels on a motor vehicle to maintain tractive contact with the road surface according to driver inputs while braking, preventing the wheels from locking up (ceasing rotation) and avoiding uncontrolled skidding. It is an automated system that uses the principles of threshold braking and cadence braking which were practiced by skillful drivers with previous generation braking systems. It does this at a much faster rate and with better control than a driver could manage. ABS generally offers improved vehicle control and decreases stopping distances on dry and slippery surfaces for many drivers; however, on loose surfaces like gravel or snow-covered pavement, ABS can significantly increase braking distance, although still improving vehicle control. Many accidents caused by ignoring right-of-way, driving on the wrong side of the road, inappropriate speed, insufficient distance from other vehicles and so on might have been prevented had the vehicles been able to brake faster, Studies have shown that many drivers do not apply the brakes sufficiently in emergency situations due to lack of experience. That means that the greatest possible braking effect is not attained because the drivers did not press the brake pedal hard enough. Therefore, the brake assist system was developed to support the driver in critical braking situations. Emergency brake assist (EBA) based on the speed and force with which the brake pedal is pressed, the brake assist system detects an emergency. The brake assist system increases the brake pressure until the ABS regulation intervenes to prevent the wheels from locking. This way the greatest possible braking effect can be achieved and the brake path can be shortened significantly. The system comprises of the brake lever which when operated at first operate the conventional solenoid braking of ABS type i.e. The brake will cycle between 'ON' & 'OFF' condition to prevent the skidding of the vehicle, preventing accidental locking of braking owing to excessive heating as a result of continuous contact of disk brake and caliper shoes. But In case of emergency when the driver forces the pedal beyond predetermined limit the EBA-sensor (proximity sensor) will detect the condition and actuate the electro-hydraulic thruster which will operate at high speed to develop brake force in multiples of the human effort and apply the brake to bring the vehicle to stop. Objective of the project is determination of braking force required for emergency braking at three operating speed conditions and selection of the braking system arrangement i.e., disk brake and caliper arrangement suitable for derived conditions. Design Development & analysis of electro - hydraulic thruster mechanism with three step operation modes. 3-D cad modelling using Unigraphics and analysis for strength of critical components of the thrusters using ANSYS. Development of Emergency brake assist system test rig to test the electro-hydraulic thruster to determine braking distance determination for individual stages i.e., three individual vehicle speeds and carry out comparative study of the theoretical braking force and braking distance to experimental braking force and braking distance and there by validation of result. Iterative methods will be used to predict safe braking distance at various vehicle speeds for different settings of EBA thruster mechanism.*

Keywords: Anti-Lock Braking System, Emergency Braking System, etc.

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