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Development of an Electropneumatic Vehicle Brake Drive

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Abstract

The article is in the course of the study, it was determined that with a three-phase adjustment of the braking torque, it is possible to stabilize the wheel rolling process due to the stretching of the process of filling the brake chamber with a working fluid. It has also been found that adjusting the braking torque is necessary to perform at high speeds of the wheeled vehicle (WV) according to the angular acceleration of the automobile wheel, since it grows faster than the slip tires relative to the road surface, and vice versa, with a small initial braking speed of the vehicle (no more than 8 m s-1), the slip reaches critical values faster than the acceleration of the car wheel, so the braking torque must be adjusted according to the slip.Based on the analysis of the obtained results, for further improvement, the nature of the change in pressure in the electropneumatic brake drive (EPBD) electro-pneumatic apparatus is proposed when implementing the axial control principle, which makes it possible to reduce the consumption of the working fluid when performing the anti-lock braking system (ABS) function in the electro-pneumatic brake drive. The main difference between the proposed principle of controlling the pressure modulators of the electro-pneumatic brake drive from the existing ones is the stretching of the processes of filling the working fluid with the DE-links of the brake system drive within the pressure change from 0.2 to 0.5 MPa for a time of no more than 0.6 s.A mathematical description of the working process of an electro-pneumatic drive with an ABS function under various operating conditions of the movement of a wheeled vehicle is made.Modeling the working process of changing the pressure in the brake drive of the WV, taking into account the peculiarities of the interaction of automobile wheels with the road surface, showed that forced stretching of the process of filling the brake chambers with EPBD gives an overall positive dynamics of the braking process of the WV, while the number of cycles of operation of the automated brake control system is reduced by 20-30% without significant change in the braking performance of the wheeled vehicle. It should also be noted that the load of the brake mechanisms when the process of filling the brake chambers is stretched decreases, which means that their durability increases. © 2023 IEEE.

Author keywords

automated system; brake force adjustment; brake system; control principle; electric brake drive; electro pneumatic brake system; proportional pressure modulator

Indexed keywords

Engineering controlled terms
Anti-lock braking systems; Braking performance; Filling; Pneumatics; Roads and streets; Tires

Engineering uncontrolled terms
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