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QUALITATIVE ANALYSIS OF THE TRACTION OF A VEHICLE UNDER ASYMMETRIC VIBRATIONS OF THE DRIVING WHEELS

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A system of equations describing the rectilinear motion of a vehicle is supplemented with equations for the processes occurring in the internal combustion engine. As a result, a control proportional to the indicator pressure in the cylinders is explicitly introduced. The problem of optimal acceleration in the presence of constraints on the control is formulated. The mechanical losses due to viscous friction inside the engine are taken into account. It is shown that the moments passed from the inter-wheel differential to the wheel pair mainly contribute to the creation of traction. This leads to a significant and sharp loss of the maximum possible average traction during the acceleration of the vehicle when asymmetric or asynchronous vibrations of the driving wheels occur accidentally in the vertical plane. It turned out that when the wheels vibrate in opposite phases and periodically detach from the road surface, an almost complete loss of traction is possible in ideal road conditions. An analogy is drawn with other known similar phenomena related mainly to the properties of the inter-wheel differential. The serious danger of this rarely occurring effect is noted. Additional necessary conditions for its occurrence are specified.

Keywords: cars, driving wheels, asymmetric vibrations, optimal acceleration, inter-wheel differential, traction, friction, slippage, internal combustion engine.

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