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Modeling and experimental tests on motion resistance of double-flange rollers of rubber track systems due to sliding friction between the rollers and guide lugs of rubber tracks

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Abstract: Modern off-road vehicles are often equipped with rubber tracked undercarriages. While designing a rubber tracked crawler, an issue of high importance is to distinguish a power unit whose performance corresponds well with the actual power demand of the vehicle. In order to do so, algorithms for determination of external and internal motion resistance of rubber tracked vehicles are required. The Department of Off-Road Machine and Vehicle Engineering (DORMVE, Wrocław University of Science and Technology) conducts theoretical and experimental research aimed at development of advanced computational models of this type. Motion resistance of rollers (road wheels) is one of the factors affecting the energy consumption of rubber tracked undercarriages. Firstly, since the rollers are loaded with vertical force, they indent into rubbery envelope of the track. Consequently, some amount of energy is lost due to mechanical hysteresis of rubber. Secondly, motion resistance of rollers is attributed to sliding friction between the rollers and guide lugs of the track. Energy losses caused by this phenomenon are noticeable if rollers are loaded with high lateral force, i.e. while turning or operating a vehicle on a slope inclined along the lateral axis of the vehicle. The article presents a model for estimation of motion resistance of double-flange rollers of rubber tracked undercarriages allowing for both abovementioned phenomena. The results of exemplary model computations will be compared with experimental data.

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