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Finite Element Analysis of Radial Tire Based on Elastic Theory of Different Modulus in Tension and Compression

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Abstract: When the vehicle is running, the stress state of each part of the tire changes with the load conversion of the whole vehicle. The belt layer, which is the key stress component of radial tires, exhibits different deformation states and mechanical properties when under tension and compression. Based on the elastic theory of different modulus in tension and compression, the material subprogram of UPFs (User Programmable Features) was compiled, and the secondary development of ANSYS software was carried out. The belt material was set to different tensile modulus and compressive modulus to simulate the inflation and obstacle crossing rolling conditions of radial tire. The results showed that it was more consistent with the actual structural characteristics of the tire by considering the different mechanical properties of tire skeleton material in tension and compression. This method had certain reference value for accurately simulating the tire stress state and tire structure design optimization.

Key words: radial tire; belt; skeleton material; different modulus in tension and compression; finite element analysis; ANSYS UPFs

一种橡胶发泡轮胎

由天津九宇飞驰科技有限公司申请的专利(公布号 CN 111775632A,公布日期 2020-10-16)“一种橡胶发泡轮胎”,公开了一种橡胶发泡轮胎,包括外胎和橡胶发泡内胎。其中,橡胶发泡内胎包括一体结构的主胎体和辅助胎体,主胎体与外胎内壁紧密结合为一体结构,辅助胎体从外胎的开口处溢出,轮胎与轮辋固定安装后,辅助胎体的外端面与轮辋的内表面完全接触压紧安装,使得轮辋内表面通过辅助胎体对轮胎形成径向支撑。本发明橡胶发泡轮胎填充饱满,受力更为均匀,不容易出现偏摆所致受力不均的开裂、塌陷等现象,有效地提高了车圈与轮胎之间的密合程度,从而保证了骑行的安全与轮胎的使用寿命。

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