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滚珠旋摆作动器的优化设计

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OPTIMIZED DESIGN OF THE BALL ROTARY OSCILLATING ACTUATOR

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摘要 提出了一种新型液压执行机构——滚珠螺旋液压旋摆作动器，建立了一套伺服动态优化设计理论及分析方法。在结构上，采用了多头大升角的滚珠螺旋副、滚珠花键副、滚珠卸荷副、活塞式液压缸等结构，以保证作动器受力特性好、传动平稳、效率高、且输出扭矩大，适应于低、中、高压任何压力的液压系统；在理论上，导出了滚珠螺旋液压旋摆作动器优化参数的设计计算公式，分析了优化参数与系统效率、频宽之间的关系。按照该理论设计的滚珠螺旋液压旋摆作动器，系统耗能最小、效率最高、频带最宽。

关键词： 滚珠旋摆作动器　液压伺服系统　优化设计

Abstract：In this paper, a new type of hydraulic executor, ball spire hydraulic rotary oscilating actuator is presented, and the dynamic optimal design theory and analysis method for the servo system of this new actuator are also built.In order to ensure good load performance, high efficiency, stationary transmission, and large torque output, a special structure consisting of the ball spire pair of multiple thread of large ascension angle, the ball spline pair, the ball discharge pair, the piston hydraulic cylinder, etc.is used.This actuator can be used in hydraulic systems of low, intermediate or heavy pressure.The calculating formula of the optimal design parameter for actuators is introduced, and the relationship between the optimal parameter, system efficiency and frequency band is analyzed.The system will consume least energy, and own highest efficiency and widest frequency, if its actuators is designed according to the above design theory.

Keywords：ball ro tary-o scillat ing actuato r　hydraulic servo system　op t imal design

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