

论文

基于PCC的任意巷道断面自动截割成形控制系统

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摘要:

为进一步提高自动截割成形控制精度, 提出任意巷道断面自动截割成形控制方法。基于PCC(可编程计算机控制器), 提出断面轮廓概念, 设计了系统控制功能、截割工艺路径及人机交互功能。研究表明: 截割头空间位置检测装置精度高, 对于巷道两帮的截割精度来说, 其测量误差可忽略不计, 控制方法的合理设计是巷道两帮截割精度的决定性因素; 在自动截割过程中, 慢停功能的设计可很大程度上减小截割臂惯性误差; 垂直截割时回转与升降液压缸的联动可保证截割头沿断面边界运动; 自动刷帮功能可取代人工修整断面边界, 消除截割步距过大引起的表面粗糙度误差, 提高断面成形质量。以EBZ200型掘进机为试验机型进行了地面性能试验与井下工业性试验, 结果证明系统运行稳定可靠, 控制精度较高, 可保证所截割巷道两帮误差小于5 cm。

关键词: 悬臂式掘进机; 任意巷道断面; 自动截割成形; 自动刷帮; PCC

Control system of automatic arbitrary roadway section cutting and forming based on PCC

Abstract:

To further improve control precision of automatic section cutting and forming, method of automatic arbitrary roadway section cutting and forming control was proposed. Based on PCC(Programmable Computer Controller), the concept of section profile was put forward and system control functions, cutting processing route and human computer interactive function were designed. The research results indicate that detection sensors of cutting head space position are in high precision, and their measurement errors are negligible for cutting precision of roadway sides, therefore the decisive factor of roadway sides precision is reasonable design of control methods; in the process of automatic cutting, slow stop function could reduce the inertial error of cutting arm to a large extent; in vertical cutting, linkage of slew and lift cylinders could make cutting head moving along section boundary; function of automatic brushing sides could replace trimming roadway sides by workers and eliminate surface roughness error caused by larger cutting step to improve the quality of section forming. Using EBZ200 type roadheader, ground performance tests and underground industrial tests have been carried out and the results show that the system is operated stable and reliable and its control precision is high which could guarantee error of cutting roadway sides within 5 cm.

Keywords: boom type roadheader; arbitrary roadway section; automatic cutting and forming; automatic brushing sides; PCC

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