履带式机械换刀系统的设计

摘　　要

数控技术随着时代的发展，已经成为制造行业中非常重要的一部分，是制造行业生产自动化、工业智能化、环保类型的基础。数控机械设备的整体发展代表着一个国家的工业新型水准和经济进步的程度。加工中心配备了刀库及其他具有换刀作用的组件，并用其进行数控机床加工，用来细化加工的多程序处理。此次毕业设计设计的是加工中心中刀库的部分，本次设计的履带式刀库利用包括一个调节轮，导向轮，驱动轮形成的履带式框架，刀库总库容是 32 件。履带式刀库的运动特征有：定位精密，启停安稳无冲撞，间断运动时间短，刀具选取方法为顺序选刀，刀具的主要作用为储存刀具和并进行自动更换刀具，刀库的运动效率和失误率将直接影响数控机床加工的效率和是否精准的进行更换刀具，因此设计简单，效率高的刀库至关紧要。

为确保可以增强履带式刀库换刀的灵敏度以及可靠性，策划了换刀系统的移动能力，设计了换刀的运作程序，而且对运动次序进行了研究。经过设计履带式刀库来达到更便捷更廉价的制造方式和运行结构，本文通过对换刀履带式刀库机械系统的计算，检测了运动机构设计的合理度，为改进实际生产程序当中换刀过程的精确度，可靠性和速度提供了含有参考价值的指引。

关键词：加工中心；自动换刀装置刀具库；履带

ABSTRACT

The overall level of numerical control equipment marks the level of industrial modernization and the strength of comprehensive national strength of a country. The machining center is a kind of numerical control machine tool which has a tool magazine and can automatically change the tool to process the workpiece in multiple processes. The tool magazine adopts the crawler structure, which is composed of a guide wheel, a regulating wheel and a driving wheel. The capacity of the tool magazine is 32, The movement characteristics of the magazine are short intermittent movement, stable start and stop without impact, accurate positioning, arbitrary knife selection and low movement speed. The main function of tool magazine and automatic tool change device (ATC) is to store and exchange tools. Its performance, especially the movement accuracy of the tool magazine, affects whether the large-scale CNC machine or machining center can complete the tool change quickly and accurately, which is the key factor affecting the reliability of the machine tool.

In order to increase the speed and reliability of the tool change of the track-type tool magazine, the movement mechanism of the tool change system is designed, the process of tool change is designed, and the movement sequence is analyzed.By designing the crawler-type tool magazine to achieve a more convenient and cheaper manufacturing method and operating structure, this paper verifies the rationality of the planning of the motion mechanism by calculating the mechanical system of the tool-changing crawler-type tool magazine, and changes the tool during the practice production process. The accuracy, speed and reliability of the process provide reference and meaningful guidance.

Key words: machining center ;automatic tool changer;caterpillar

目　　录

第 1 章 课题研究背景以及价值.....2

1.1 选题的意义与价值.....2

1.1.1 理论意义与价值.....2

1.1.2 实践意义与价值.....2

1.2 研究综述.....2

1.2.1 国际数控机床的发展现状.....2

1.2.2 国内控机床的发展状况.....3

1.3 加工中心.....4

1.3.1 加工中心介绍.....4

1.3.2 加工中心用途和特点.....4

1.3.3 加工中心的组成及其工作原理.....6

1.4 研究范围与内容.....7

1.4.1 研究范围.....7

1.4.2 研究内容.....7

1.5 研究视角与方法.....7

1.5.1 研究视角.....7

1.5.2 研究方法.....7

第 2 章 加工中心履带式刀库方案设计.....8

2.1 加工中心刀库换刀系统概述.....8

2.2 履带式刀库方案设计.....9

2.2.1 刀库方案的确定.....9

2.3 总体方案设计.....10

2.3.1 刀库的总体设计.....10

2.3.2 确定刀具的选择方式.....13

2.3.3 刀库的驱动系统.....14

2.3.4 刀库运动的定位装置.....14

2.3.5 刀库运动中力的传输.....15

第 3 章 刀库的选型与计算.....16

3.1 电机的选用.....16

3.2 履带驱动轮选用.....16