



普通高等教育“十一五”国家级规划教材

数控技术专业系列

数控技术应用专业英语

刘 瑛 罗学科 编

ABC



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内容提要

本书是普通高等教育“十一五”国家级规划教材。

编者将该领域最常见的内容提炼为 14 篇短小精悍的课文,并就高频词汇和句法做了详细分析和讲解,精心设计的课后练习可帮助读者进一步巩固各个知识点。通过本书以及配套光盘的学习,读者可以在字典的帮助下,读懂一般的数控类英文文献。

本书可作为高等职业学校、高等专科学校及本科院校举办的二级职业技术学院的数控技术专业教材,也可供相关专业的本科生以及工程技术人员参考。

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前 言

目前市场上数控技术应用专业英语教材很多。编者使用过一些教材,发现现有教材主要存在以下几方面问题:

1. 课文的难度和篇幅偏大,对教师讲授和高职学生的学习都有一定困难。
2. 课文重点不突出,教材设计上体现不出学生的参与性,导致学生学习热情不高。
3. 缺乏培养听说能力的环节。

在过去的几年里,编者和高职高专类院校的师生进行了大量交流。大家重新探讨了学习英语的目的和要求,并一致认为具备一定的英语阅读能力以及基本的英语听说能力,是时代对新一代专业技术人员提出的新要求。

本着这个目标,我们着手编写了这本《数控技术应用专业英语》。本书具有如下特点:

1. 首先,本书提供了所有课文的朗读、翻译以及课后习题答案,并将三者通过软件集成在一起,刻录在一张光盘上,使用本教材的教师可免费赠送,希望它成为广大师生的立体资料库。

2. 相对传统教材,课文结构有了较大的改革。本书特点之一就是在保留重要语法和关键词汇的同时,篇幅大大缩减。课后练习是本书的另一大特色。每个单元都以几个问题开始(Tuning-in),其目的是促进学生思考,并将思想逐渐转入要学习的内容。回答 Tuning-in 中的问题时,可以用汉语进行,但要提醒学生发现其中哪些语句和词汇自己还不能英语表达,为有目的地学习课文做好准备。课后练习分为三类。第一类是 Words study,其目的是帮助学生掌握简单的构词法或用法、含义较灵活的词。第二类是 Language study,其目的是帮助学生理解常见句法,如被动语态、定语从句等。虽然这些内容大多在中学阶段学过,但编者在教学实践中发现,多数高职学生对此掌握欠佳,从而直接导致对相关篇章的理解困难。这两部分内容均从相应课文中引出,再加以讲解,最后让学生通过练习进行巩固。第三类练习形式为 Speaking practice,其目的是帮助学生掌握数控英语常用词汇,并锻炼最基本的交流能力。这类练习要求学生成对和分组进行,一般会设置一个交流话题,学生首先要从课文或课后阅读资料中找到讨论该问题所需的词汇和句式,然后尝试向同伴描述自己的意图。这个练习看起来有些难度,但由于有现成的课文和课后阅读内容作为参考,实际上是让学生把这些内容重新加工整理,内化为自己的表达能力。在这里特别提醒教师不必在对话的流利性和准确性方面提出过高要求,而应将重点放在说话的可理解度上。这样就可以调动学生积极性,将被动的词汇语法的灌输转变为主动的查找和询问。

3. 各单元后均附有课外阅读内容 Technical reading,这是为了弥补课文篇幅缩短而导致阅读量下降的缺憾。教师可选取 Technical reading 中的内容布置为课后阅读作业。

最后,编者真诚地希望该书的改进和出版能更好地为广大师生服务。不论您有什么意见或建议,欢迎给 nengdouma@263.net 来信探讨,您的思想将为我们下次改进提供新的思路。

编者

2007年8月

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Unit 1 Introduction of CNC machine tool

Tuning-in (引入)

Task I. Before you read the text, discuss the following questions in your group.

- (1) There are two basic types of machining centers(加工中心), what are they?
 - (2) Why vertical machining centers(立式加工中心) are called 'vertical'?
 - (3) Try to label the diagram of a vertical machining center(Figure 1 - 1) with the following terms
- (试用下列词汇标出立式加工中心各部分名称).

column headstock spindle splash guard table saddle bed automatic tool changer

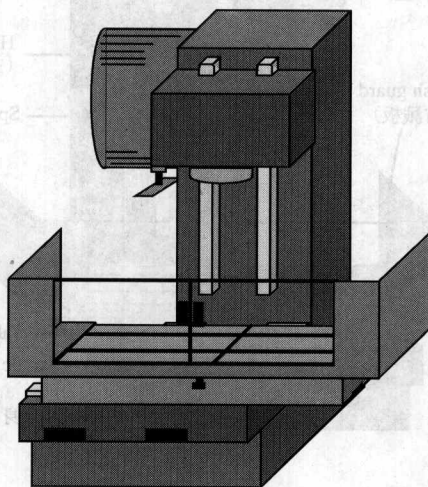


Figure 1 - 1 label the diagram

Text

There are two basic types of machining centers that we will be addressing in this unit. They are vertical machining centers and horizontal machining centers.

A vertical machining center has the spindle oriented in the vertical position. ① An automatic tool changer is mounted to the machine (usually on the left side) to allow tools to be loaded into the spin-

dle automatically. Basic vertical machining centers will allow three directions of motion, or axes. The table can move from left to right (the X axis). The table can move in and out, toward and away from the operator (the Y axis). And the headstock or spindle can move up and down (the Z axis). Figure 1 - 2 shows a vertical machining center.

Let's introduce the most important components of the vertical machining center. A typical C-frame is mainly composed of the machine bed, column, headstock, spindle, saddle, table, splash guard and automatic tool changer. The bed commonly rests on the floor and contains Y axis ways. The column is attached to the bed and contains the Z axis ways. The headstock of the machine slides along the Z axis ways and contains the machine's spindle. Note the headstock, column and bed form a letter C. That's why this kind of machining center is called C-frame style. The saddle is mounted to the bed and slides along the Y axis ways and contains the X axis ways. The machine table, to which the work holding devices will be mounted, is mounted to the saddle and moves along the X axis ways. Most vertical machining centers have a chip guarding system, which protects the operators from being hurt by chips. A vertical machining center has a tool changing device to exchange the tools stored in magazine with the tools in spindle. This eliminates the need for operators to change the tools manually during the machining cycle.

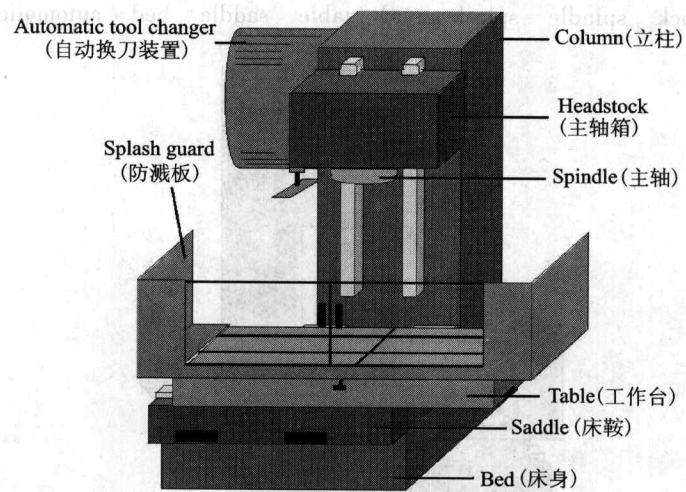


Figure 1 - 2 The components of a vertical machining center

A horizontal machining center has the spindle oriented in the horizontal position. At first glance, it may appear that the configuration of a horizontal machining center is dramatically different from that of a vertical machining center. ② However, notice that if you look at the machine from the perspective of a workpiece being machined, the basic layout for X , Y and Z is essentially the same for both types of machines. ③

New words

vertical machining center 立式加工中心

horizontal machining center 卧式加工中心

address [ə'dres] vt. 讲解

orient ['ɔ:riənt] vi. 定向, 定位于

automatic tool changer 自动换刀系统, 通常简称为 ATC

mount [maʊnt] vt. 安装, 设置

load [ləʊd] vt. 加载

axis ['æksis] n. 轴

axes ['æksi:z] n. 轴 (axis 的复数)

component [kəm'pəʊnənt] n. 构成, 成分

compose [kəm'pəʊz] v. 组成

headstock ['hedstɒk] n. 主轴箱

column ['kɒləm] n. 立柱

spindle ['spɪndl] n. 主轴

saddle [sædl] n. 床鞍

bed [bed] n. 床身

chip [tʃɪp] n. 切屑

device [di'vaɪs] n. 装置, 设备

attach [ə'tætʃ] vt. 连接

eliminate [i'limineɪt] vt. 排除, 消除

splash [splæʃ] n. 溅

glance [glɑ:ns] n. 一瞥, 眼光, 匆匆一看

configuration [kən'fɪgju'reɪʃən] n. 构造, 结构, 配置, 外形

dramatically [drə'mætɪkəli] adv. 戏剧地, 引人注目地

perspective [pə'spektɪv] n. 观点, 看法

workpiece ['wɜ:kpi:s] n. 工件

layout ['lei,aut] n. 布置, 设计

essentially [i'senʃəli] adv. 本质上, 本来

Notes

① A vertical machining center has the spindle oriented in the vertical position.

立式加工中心的主轴沿垂直方向安置。

② At first glance, it may appear that the configuration of a horizontal machining center is dramatically different from that of a vertical machining center.

乍一看, 卧式加工中心和立式加工中心的结构好像非常不同。

③ However, notice that if you look at the machine from the perspective of a workpiece being machined, the basic layout for X, Y and Z is essentially the same for both types of machines.

然而, (如果) 从加工工件的角度看, 两种机床的 X、Y、Z 方向的基本布局实质上是一致的。

Words study

Task II. Match the following words (column A) to the descriptions (column B).

A	B
vertical	A part of a machine, which contains the machine's spindle.
horizontal	A part of a machine, which is mounted to the bed and slides along the Y axis on a vertical machining center.
spindle	A part of a machine, which rests on the floor.
saddle	A part being machined.
headstock	Going straight up or down from a level surface from top to bottom in a picture.
workpiece	A part of a machine. It rotates at a high speed together with the tool or workpiece held in it when the machine is running.
machine bed	A part of a machine, to which work holding devices are mounted.
machine table	Going across parallel to the ground rather than going up and down.

Language study

Let's see how to describe the construction(构成) of things.

(1) Dismantle(拆) a piece of equipment into its main parts. These expressions will help.

consists of
A is made up of X and Y.
is composed of

(2) Name components(给零件命名).

called
This kind of machining center is C-frame style.
known as

(3) Locate and connect components.

The saddle is mounted to the bed.

The column is attached to the bed.

Task III. Read the following passage and try to underline(画出) the key words which are used to describe the construction of a lathe. Then try to translate the passage.

A typical CNC lathe(车床) is made up of headstock, chuck(卡盘), turret(转塔刀架), carriage(托板), tailstock(顶尖,尾架), slant(倾斜的) bed and machine control unit, which is known as MCU. Headstock contains the spindle shaft and transmission gearing(传动齿轮). Chuck connects to the spindle and clamps(夹紧) the workpiece. Turret holds the cutting tool and replaces an old tool with a new tool during a tool change. Carriage consists of the saddle, cross slide(横向托板) and apron(托板箱). It moves the cutting tool into the revolving work. Tailstock is used to supports the right end of the workpiece if it is too long. All the components listed above are mounted on the slant bed. MCU is a computer used to store and process the CNC programs.

Task IV. Study these expressions for describing how components are connected to each other.

A is bolted to B = A is connected to B with bolts.

A is welded to B = A is connected to B by welding.

A is fixed to B = no specific method given.

Now try to explain each of these methods of connection by the help of your dictionary.

screwed

soldered

attached

wired

bonded

glued

riveted

brazed

nailed

Speaking practice

Task V. Work in pairs, students A and B. Student A tries to describe to student B how the vertical machining center (Figure 1 - 3) moves along the three axes. Student B should reproduce (重现, 画出) the three axes motions according to student A's description. Then, student B tries to describe how the horizontal machining center (Figure 1 - 4) moves along the three axes, and student A reproduces it. Remember, don't peek (偷看) the diagrams when your partner is describing, only use your ears and mouth please.

You may get more words and sentences you need from the Text or Technical reading.

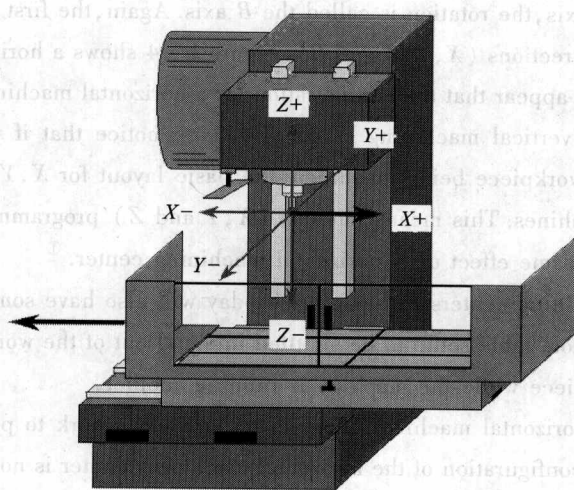


Figure 1 - 3 A vertical machining center

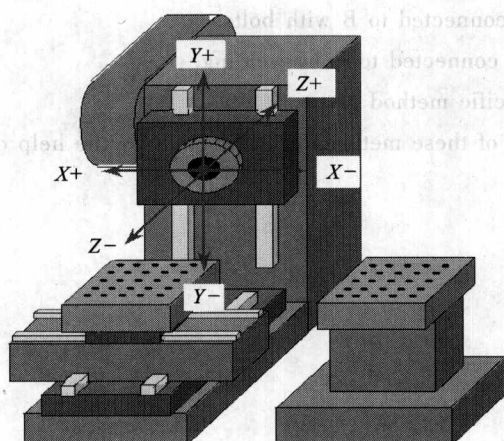


Figure 1 - 4 A horizontal machining center

Technical reading

Horizontal machining centers

A horizontal machining center has the spindle oriented in the horizontal position. Again, an automatic tool changer is equipped to allow tools to be automatically placed in the spindle. The table motion left to right (as viewed from the spindle) is still the X axis. But now the head motion up and down is considered the Y axis. And the table motion toward and away from the spindle is the Z axis. Note that on some horizontal machining centers, the Z axis is the column motion, not the table motion. In either case, the Z axis is the motion direction from the spindle face to the workpiece.

The table of most horizontal machining centers can rotate by either an indexer or a rotary axis. If the machine has a rotary axis, the rotation is called the B axis. Again, the first things a beginner should memorize are the motion directions (X, Y, Z and B). Figure 1 - 4 shows a horizontal machining center.

At first glance, it may appear that the configuration for a horizontal machining center is dramatically different from that of a vertical machining center. However, notice that if you look at the machine from the perspective of a workpiece being machined, the basic layout for X, Y and Z is essentially the same for both types of machines. This means motions (X, Y and Z) programmed for a vertical machining center will cause the same effect on a horizontal machining center. ^①

Many horizontal machining centers manufactured today will also have some form of automatic pallet changer to allow the whole table setup to be shuttled into and out of the work area. ^② This allows the operator to load one workpiece while the machine is running another.

Generally speaking, horizontal machining centers require more work to program than vertical machining centers. First, the configuration of the horizontal machining center is not nearly as familiar to the machinist as the previously discussed vertical machining center. ^③ Also, since the horizontal machining center allows access to any side of the workpiece, more machining operations can be done per setup. ^④

This makes the typical horizontal machining center program length much longer than that for a vertical machining center.

Note that a horizontal machining center is no more difficult to program than a vertical machining center.^⑤ It is just that the length of the program will usually increase when compared to the vertical machining center. Since more machining operations are being performed, preparation and organization effort is also increased.^⑥ But when it comes to actual programming format, a horizontal machining center is programmed in the same way as a vertical machining center.

New words

column ['kɒləm] n. 立柱

effect [ɪ'fekt] n. 结果, 效果

pallet ['pælɪt] n. 托盘

shuttle ['ʃʌtl] v. 穿梭往返

familiar [fə'mɪljə] adj. 熟悉的, 常见的

Notes

① This means motions (X, Y and Z) programmed for a vertical machining center will cause the same effect on a horizontal machining center.

也就是说, 针对立式加工中心编写的运动(X, Y 和 Z)在卧式加工中心上会产生同样的结果。

② Many horizontal machining centers manufactured today will also have some form of automatic pallet changer to allow the whole table setup to be shuttled into and out of the work area.

现在生产的许多卧式加工中心有托盘自动交换系统, 这样整个工作台的作业准备部分就可以往返进出于工作区。

③ First, the configuration of the horizontal machining center is not nearly as familiar to the machinist as the previously discussed vertical machining center.

首先, 机械师对卧式加工中心结构的熟悉程度不如前面讲到的立式加工中心。

④ Also, since the horizontal machining center allows access to any side of the workpiece, more machining operations can be done per setup.

同时, 由于卧式加工中心可以加工到工件的各个表面, 所以一次装卡可以完成更多的加工操作。

⑤ Note that a horizontal machining center is no more difficult to program than a vertical machining center.

值得注意的是, 卧式加工中心的编程并不比立式加工中心的编程困难。

⑥ Since more machining operations are being performed, preparation and organization effort is also increased.

由于要执行更多的加工操作, 所以准备和组织工作也会增加。

Unit 2 Automatic tool changer

Tuning-in (引入)

Task I. See the following figure (Figure 2 - 1) and discuss in your group:

- (1) What's the function of the chain?
- (2) How does it work?

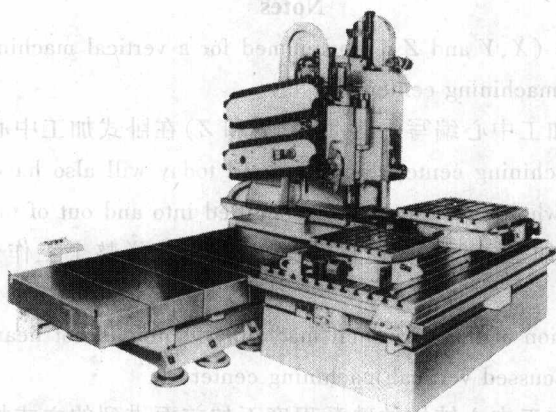


Figure 2 - 1 Chain-type storage matrix magazine

Text

Automatic tool changer system

Many different types of mechanisms have been designed for storing and changing tools. The three most important are turret head, carousel storage with spindle direct changing, and matrix magazine storage with pivot insertion tool changer.^① Tool storage magazines may be horizontal or vertical.

Turret head

This type of system is found on older NC drilling machines. The tools are stored in the spindles of a device called a turret head. When a tool is called by the program, the turret rotates (indexes) it into position.^② The tool can be used immediately without having to be inserted into a spindle. Thus, turret

head designs provide for very fast tool changes. The main disadvantage of turret head changers is the limit on the number of tool spindles that can be used. See Figure 2 - 2.

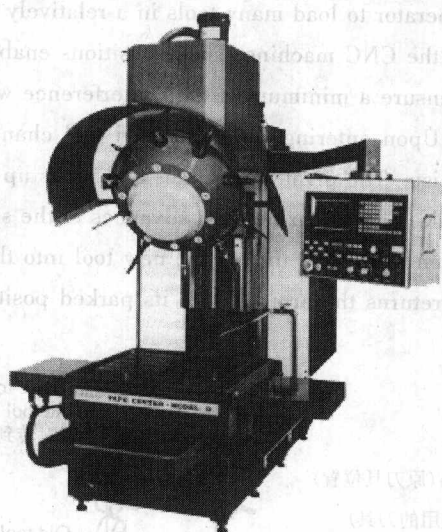


Figure 2 - 2 A turret head tool changing system

Carousel storage with spindle direct tool changer

Systems of this type are usually found in vertical machining centers. Tools are stored in a coded drum called a carousel. The drum rotates to the space where the current tool is to be stored. It moves up and removes the current tool, then rotates the new tool into position and places it into the spindle. See Figure 2 - 3.

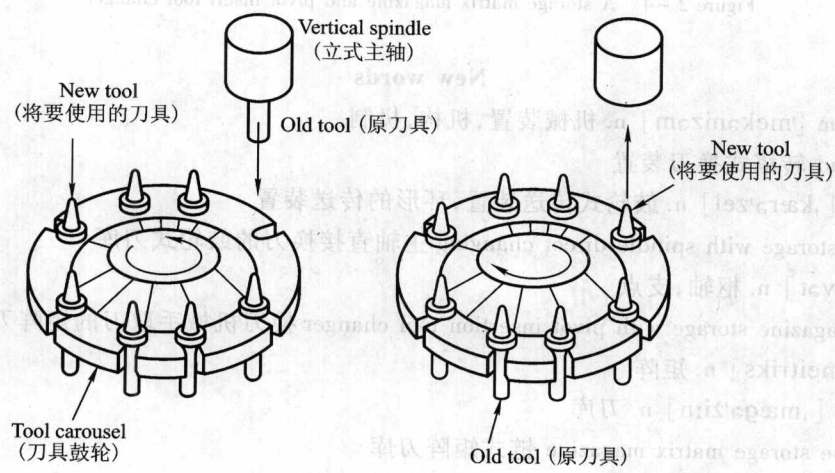


Figure 2 - 3 A carousel storage with spindle direct tool changer

Horizontal storage matrix magazine with pivot insertion tool changer^③

Chain-type storage matrix magazines have been popular in machining centers since early 1972. This type of system permits an operator to load many tools in a relatively small space. The chain may be located on the side or the top of the CNC machine. These positions enable tools to be stored away from the spindle and work. This will ensure a minimum of chip interference with the storage mechanism and a maximum of tool protection.^④ Upon entering a programmed tool change, the system advances to the proper tool via the chain mechanism. The pivot arm rotates and picks up both the new tool in the magazine and the old tool in the spindle. The magazine then advances to the space where the old tool is to be stored. The arm executes a rotation again and inserts the new tool into the spindle and the old tool into the magazine.^⑤ A final rotation returns the arm back to its parked position. These steps are illustrated in Figure 2-4.

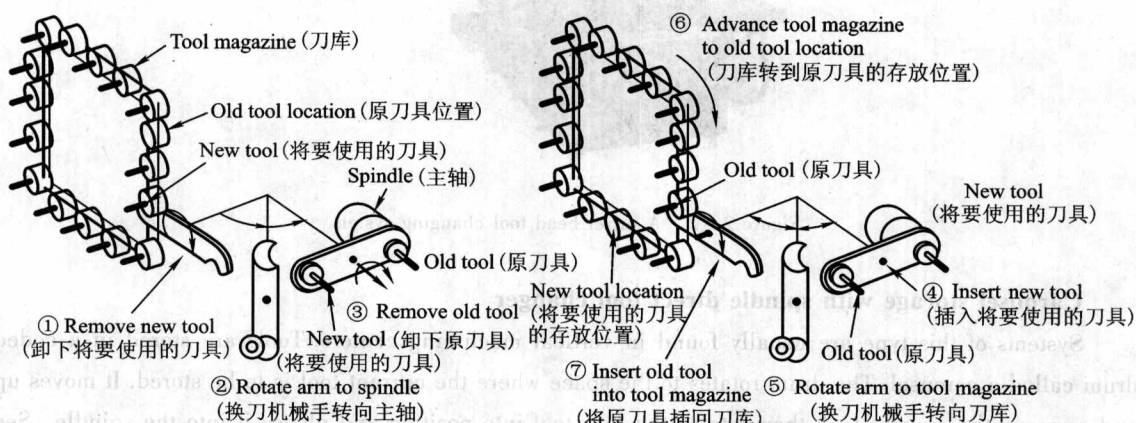


Figure 2-4 A storage matrix magazine and pivot insert tool changer

New words

mechanism [ˈmekənizəm] n. 机械装置, 机构, 机制

turret head 转塔式换刀装置

carousel [ˈkærəʊˈzel] n. 鼓轮式传送装置, 环形的传送装置

carousel storage with spindle direct changing 主轴直接换刀的鼓轮式刀库

pivot [ˈpivət] n. 枢轴, 支点

matrix magazine storage with pivot insertion tool changer 换刀机械手取刀的矩阵刀库

matrix [ˈmeɪtrɪks] n. 矩阵

magazine [ˌmæɡəˈziːn] n. 刀库

chain-type storage matrix magazine 链式矩阵刀库

advance [ədˈvɑːns] v. 前进

illustrate [ˈɪləstreɪt] vt. 举例说明, 图解, 加插图于, 阐明 vi. 举例

Notes

① The three most important are turret head, carousel storage with spindle direct changing, and matrix magazine storage with pivot insertion tool changer.

其中最重要的有转塔式换刀装置、主轴直接换刀的鼓轮式刀库及换刀机械手取刀的矩阵刀库。

② The tools are stored in the spindles of a device called a turret head. When a tool is called by the program, the turret rotates (indexes) it into position.

刀具存放在一个称为转塔的主轴装置中,当程序调用某刀具时,转塔就将其转到相应的位置上。

③ Horizontal storage matrix magazine with pivot insertion tool changer

换刀机械手取刀的水平矩阵刀库

④ The chain may be located on the side or the top of the CNC machine. These positions enable tools to be stored away from the spindle and work. This will ensure a minimum of chip interference with the storage mechanism and a maximum of tool protection.

链式矩阵刀库可以安装在 CNC 机床的侧面或顶部,这种位置可使存放的刀具远离主轴和工件,从而最大限度地减少切屑对存刀装置的影响,同时更好地保护刀具。

⑤ Upon entering a programmed tool change, the system advances to the proper tool via the chain mechanism. The pivot arm rotates and picks up both the new tool in the magazine and the old tool in the spindle. The magazine then advances to the space where the old tool is to be stored. The arm executes a rotation again and inserts the new tool into the spindle and the old tool into the magazine.

当程序要求换刀时,系统通过链条装置移动至适当的位置。换刀机械手旋转并同时从刀库和主轴上抓起新刀和旧刀,然后刀库前行至旧刀的存放位置,换刀机械手再次旋转并分别将新刀和旧刀插入主轴和刀库。

Words study

Can you rewrite this sentence replacing the verb in *italics* (斜体字) with another verb of phrase (短语) of similar meaning.

(1) These positions *enable* tools to be stored away from the spindle and work.

Here is one way it can be done:

These positions *make* the tools to *be able to* be stored away from the spindle and work.

(2) This will *ensure* a minimum of chip interference with the storage mechanism and a maximum of tool protection.

We can replace the verb this way:

This will *make sure* a minimum of chip interference with the storage mechanism and a maximum of tool protection.

Note: verbs beginning or ending with 'en' often have the meaning of become/make + adj.

Task II. Try to rewrite the following sentences with a suitable 'en' verb from this list. Notice that you don't have to use all of the words given.

ensure enlarge harden lengthen lessen lighten loosen roughen sharpen shorten sof-