机电工程专业英语

Fundamental and New Concept for Mechanical and Electrical Engineering

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哈尔滨工程大学出版社

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——Fundamental and New Concepts for Mechanical and Electrical Engineering

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内 容 简 介

本书较全面地介绍了“机械设计、制造及自动化”专业的有关知识。选材基本上涵盖了机电工程专业的学科领域，包括机械设计与制造的基本知识，机械加工及成型技术，自动化技术及现代设计制造等内容，还包括了绿色设计等新的技术理念。所有文章均选自英美原版书籍和期刊，部分选自英美大学机械系教材——Machine Design (Theory and Practice)。本书可作为高等院校机械工程，机电工程，机械设计、制造及自动化等领域的本科生和研究生的专业英语教材，也可供有关专业的工程技术人员使用。

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前　言

机电工程专业英语是机电工程专业的一门重要的基础课。对于机电工程专业的本、专科学生和研究生，以及从事相关专业工作的工程技术人员来说，熟练掌握专业英语对于促进国际交流，了解国外机电工程专业的最新发展动态，是十分必要的，并且有着越来越重要的意义。随着计算机辅助设计的兴起和国际互联网的发展，专业英语的学习更为迫切，为了满足机电工程专业英语的教学需求，我们编写了《机电工程专业英语》一书。

机电工程是一门交叉学科，内涵丰富，涉及面广。本书的选材是在有限的篇幅内尽可能地涵盖机电工程专业的学科领域。全书共分五个单元，第一单元介绍了机械加工与制造的基本知识，如机床与加工、初加工工艺、精加工工艺、铸造、锻造、焊接、塑料成型等；第二单元介绍了机械设计的基本知识；第三单元介绍了自动化技术的相关知识，如数控技术及软件、自动化系统、人工智能等；第四单元介绍了现代设计与制造技术，包括柔性制造系统、CAD/CAM/CIMS及绿色设计等新的设计制造技术和理念；第五单元介绍了其它一些相关知识，如工程图、工程材料、断裂机理及市场调研等。

本书由哈尔滨工程大学机电工程学院的李庆芬、朱世范和陈其廉共同编写。其中李庆芬负责全书的结构及第一单元的编写，陈其廉负责第二、三单元的编写，朱世范负责第四、五单元的编写，李赫担任本书主审。

由于时间仓促，水平有限，书中难免有错误和不当之处，敬请读者批评指正。

编者

2000年10月

再版前言

随着时代的进步及科学技术的不断发展，英语中的科技新词汇也在不断增加。为了及时地反映机电工程领域中最新科学技术的发展，本书在再版时对原书的内容作了适当的调整，增加了若干能体现当代最新科学技术成就的文章，并作了详细的注释，以便于读者能接触到最新的科技英语词汇。增添的内容包括：微机电系统、纳米技术、机器视觉、CAD 技术。

在再版之际，对原书中的个别印刷错误进行了订正。

所有增补部分，均由陈其廉负责编写。

由于编者水平有限，难免还会有错误及不当之处，欢迎读者批评指正。

编者

2003 年 12 月 25 日

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Unit One　Fundamentals of Manufacturing Techniques
机械制造基本知识

Lesson 1　Machine tools
机　　床

1.1　The Engine Lathe　普通车床

Lathe size is determined by the swing and the length of the bed (Fig.1 – 1 – 1).The swing is twice the distance from the live center point of the spindle to the top of the bed, or the largest diameter that can be turned over the ways of a lathe. For example, a 10-in. lathe will turn a 10-in. diameter workpiece over the ways, but not over the carriage cross-feed slide. Sometimes two numbers are used to indicate swing, such as 17-12. The 17-in. swing would be over the bed and the 12-in. swing over the cross slide.

The length of the bed includes the part the headstock rests on. It determines also the distance between centers. A typical size might be a 3-foot bed with a distance of 23 in. between centers. Lathe beds are offered in many different lengths for each available swing size.

A lathe should have a swing capacity and distance between centers that is at least 10 percent greater than needed to do any job that may be required. Standard lathes come in a variety of designs and styles and may have a swing changing from about 9 to 53 in. They are generally classified as small, medium swing, and heavy duty.

The bed is the base or foundation of the lathe. It is a heavy, rigid casting made in one piece. It is the “backbone” of the lathe and holds or

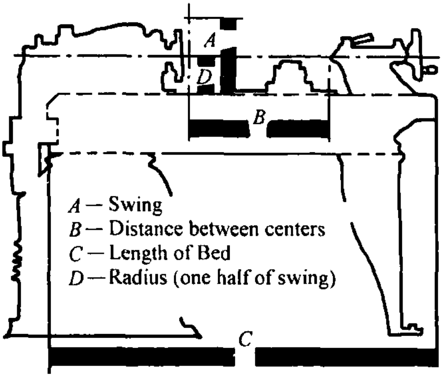

Fig. 1 - 1 - 1 Size is indicated by swing and the length of the bed

supports all the other parts. Located on the top of the bed are ways. More expensive lathes have a combination of V ways and flat ways. Less expensive lathes have flat ways only. Construction of ways varies according to the make. Some builders use ways made of hardened steel that can be replaced if necessary. Others use flame-hardened ways that are an integral part of the bed section.

The headstock assembly is permanently fastened to the left end of the lathe. It contains the headstock spindle, which is rotated by gears or by a combination of gears and pulleys. The spindle holds the attachments which, in turn, hold and turn the workpiece. Spindles come in several quality ratings and are supported in headstocks by three to five bearings. Since the accuracy of the work done on a lathe depends on the axis of rotation of the spindle holding the workpiece, the spindle and all its accessories must be built and assembled with the greatest possible care.

The tailstock can be moved along the bed ways and clamped in position. It consists of two castings or main parts. The lower part rests directly on the ways, and the upper part rests on the lower part. Adjusting screws hold the parts together. The upper casting can be moved toward or away from the operator to offset the tailstock for taper turning and to realign the tailstock center for straight turning. The tailstock spindle moves in and out of the upper casting when the tailstock handwheel is turned. This spindle has a taper hole into which the dead center or other tools such as drills and reamers fit. Only tools having the same taper as the tailstock spindle should be placed in the spindle hole. To remove tools from the spindle, it is only necessary to back up on the handwheel until the spindle end is nearly inside the casting. The end of the screw that moves the spindle loosens the taper shank so it can be removed.

The carriage consisting of the saddle and apron is the movable part which slides between the headstock and tailstock. It controls and supports the cutting tool.

1.2 Drilling Machines 钻床

Cutting round holes in metal stock is one of the most common operations performed in the machine shop. Very few metal pieces go through a factory without having holes drilled in them. Later operations are often located by referring to these holes. Drilling machines are used to produce most of these holes. They are also used in operations such as reaming, boring, countersinking, counterboring, and tapping (Fig. 1 - 1 - 2).

The size of a drilling machine is expressed in one or more of the following four ways:

1. By the diameter of the largest disk that can be center drilled. An 18-in. drill press, for example, can drill a hole through the center of an 18-in. diameter disk.

2. By the distance the spindle moves up and down.

3. By the maximum distance between the spindle and table.

4. By the distance from the column to the center of the spindle.

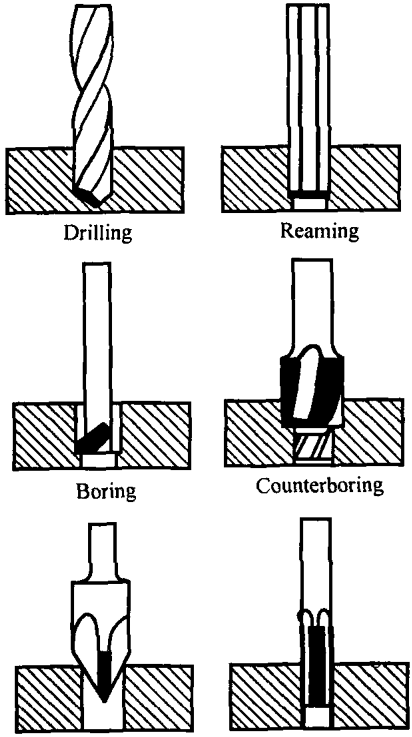

Fig.1 - 1 - 2 The six common operation that can be done on drilling machine

The principal parts of the drill press are the base (or lower table), column, table, and head. The heavy metal base and upright column have the table and drill head attached. The drill head consists of the main operating parts, including the speed and feed mechanisms, the motor, the spindle, and the quill.

There are several types of mechanisms used to control the speed of a drilling machine. The simplest arrangement utilizes a belt for transferring power from a four-step, five-step, or six-step V pulley located on the motor to a similar pulley attached to the drill press spindle. To increase power on some belt and pulley machines, a countershaft drive is sometimes added. Another mechanism used is the variable-speed pulley, which makes it possible to change the machine's speed without stopping it. In fact, the speed must only be changed while the machine is running. Pulleys of a variable-speed drive are made of two parts having V-shaped sides. By means of an adjusting screw attached to a crank wheel, one side of the driver pulley may be opened or spread apart. As it spreads, the belt moves inward toward the smaller diameter, producing slower speed in the driven pulley that has closed to make a larger pulley. As the sides of driver pulley are brought together, the belt is forced outward toward the larger diameter. This increases the speed of the driven pulley that opens to make the smaller pulley (Fig. 1 – 1 – 3).

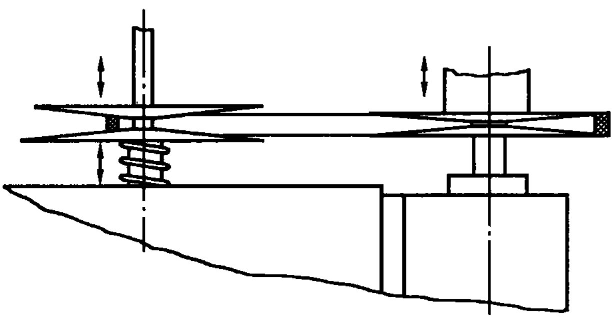

Fig. 1 – 1 – 3　Variable-speed drive

The feed on most drill presses is hand controlled with a hand-feed lever. An automatic power feed attachment is available for some drill presses.

The spindle, which rotates and moves the cutting tool up or down, may have either a taper hole or a threaded end. Small drill presses usually have a threaded or short taper end on the spindle for attaching a drill